**Mandatory Disclosure**

<table>
<thead>
<tr>
<th>Mandatory Disclosure updated on</th>
<th>26th March 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>AICTE File No.</td>
<td>1-773520091</td>
</tr>
<tr>
<td>Date and Period of last approval</td>
<td>30(^{th}) April 2020 (2020-21)</td>
</tr>
<tr>
<td>1 Name of the Institution</td>
<td>Sant Gajanan Maharaj College of Engineering, Mahagaon</td>
</tr>
<tr>
<td>Address of the Institution</td>
<td>Mahagaon Site-Chinchewadi Tal-Gadhinglaj Dist-Kolhapur</td>
</tr>
<tr>
<td>City and Pin Code</td>
<td>Gadhinglaj -416502</td>
</tr>
<tr>
<td>State /UT</td>
<td>Maharashtra</td>
</tr>
<tr>
<td>Phone number with STD code</td>
<td>9922892160</td>
</tr>
<tr>
<td>FAX number with STD code</td>
<td>02327-275581</td>
</tr>
<tr>
<td>Office hours at the Institution</td>
<td>9.00 am to 05.00 pm</td>
</tr>
<tr>
<td>Academic hours at the Institution</td>
<td>9.30 am to 04.30 pm</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:sgmcoe@gmail.com">sgmcoe@gmail.com</a></td>
</tr>
<tr>
<td>Website</td>
<td><a href="http://www.sgmcoe.in">www.sgmcoe.in</a></td>
</tr>
<tr>
<td>Nearest Railway Station (dist in Km)</td>
<td>Kolhapur Railway Station, 70 Km</td>
</tr>
<tr>
<td>Nearest Airport (dist in Km)</td>
<td>Kolhapur, 70Km</td>
</tr>
<tr>
<td>Type of Institution</td>
<td>Private-Self Financed</td>
</tr>
<tr>
<td>Category (1) of the institution</td>
<td>Non Minority</td>
</tr>
<tr>
<td>Category (2) of the institution</td>
<td>Co-Ed</td>
</tr>
<tr>
<td>2 Name of the organization running the Institution</td>
<td>Sant Gajanan Maharaj Rural Hospital &amp; Research centre</td>
</tr>
<tr>
<td>Address of the Organization</td>
<td>A/P- Mahagaon Tal-Gadhinglaj Dist-Kolhapur 416503</td>
</tr>
<tr>
<td>Registered with</td>
<td>Society Reg. Act, 1950</td>
</tr>
<tr>
<td>Registration date</td>
<td>03/03/1992</td>
</tr>
<tr>
<td>Website of the organization (Society or Trust website)</td>
<td><a href="http://www.sgmrh.com">www.sgmrh.com</a></td>
</tr>
<tr>
<td>Latest affiliation period</td>
<td>2020-2021</td>
</tr>
<tr>
<td>3 Name of Principal / Director</td>
<td>Dr. Sanjay Hari Sawant</td>
</tr>
<tr>
<td>Exact Designation</td>
<td>Principal</td>
</tr>
<tr>
<td>Phone number with STD code</td>
<td>8605009623</td>
</tr>
<tr>
<td>FAX number with STD code</td>
<td>02327-275581</td>
</tr>
<tr>
<td>Email</td>
<td><a href="mailto:sanjaysawant2010@gmail.com">sanjaysawant2010@gmail.com</a></td>
</tr>
<tr>
<td>Highest Degree</td>
<td>Ph.D</td>
</tr>
<tr>
<td>Field of Specialization</td>
<td>Engineering</td>
</tr>
<tr>
<td>4 Name of the affiliating University</td>
<td>Shivaji University, Kolhapur</td>
</tr>
<tr>
<td>Address</td>
<td>Vidyanagar, Kolhapur 416004.</td>
</tr>
</tbody>
</table>
5. Governance:

- Members of the Board and their brief background:

<table>
<thead>
<tr>
<th>NAME</th>
<th>DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adv. Annasaheb D. Chavan</td>
<td>Chairman – SGM R&amp;RC</td>
</tr>
<tr>
<td>Adv. Balasaheb N. Chavan</td>
<td>Secretary – SGM R&amp;RC</td>
</tr>
<tr>
<td>Mrs. Vijaymala A. Chavan</td>
<td>Trustee – SGM R&amp;RC</td>
</tr>
<tr>
<td>Dr. Yashwant A. Chavan</td>
<td>Trustee – SGM R&amp;RC</td>
</tr>
<tr>
<td>Dr. Sanjay A. Chavan</td>
<td>Trustee – SGM R&amp;RC</td>
</tr>
<tr>
<td>Dr. Pratibha Y. Chavan</td>
<td>Trustee – SGM R&amp;RC</td>
</tr>
<tr>
<td>Dr. Surekha Chavan</td>
<td>Trustee – SGM R&amp;RC</td>
</tr>
<tr>
<td>Mr. Balaku B. Shinde</td>
<td>Trustee – SGM R&amp;RC</td>
</tr>
</tbody>
</table>

- Members of Academic Advisory Body:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of Person</th>
<th>Designation</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adv. Annasaheb D. Chavan</td>
<td>Chairman – SGM GROUP</td>
<td>Chairman</td>
</tr>
<tr>
<td>2</td>
<td>Dr. Yashwant A. Chavan</td>
<td>Trustee SGM Group</td>
<td>Member-Trustee</td>
</tr>
<tr>
<td>3</td>
<td>Dr. Sanjay A. Chavan</td>
<td>Trustee SGM Group</td>
<td>Member-Trustee</td>
</tr>
<tr>
<td>4</td>
<td>Mr. Shirish Ganachari</td>
<td>Registrar</td>
<td>Member-Registrar</td>
</tr>
<tr>
<td>5</td>
<td>Mr. R. S. Desai</td>
<td>Assistant Professor</td>
<td>Member- Administrative Officer Representative</td>
</tr>
<tr>
<td>6</td>
<td>Mr. S. T. Matale</td>
<td>Assistant Professor</td>
<td>Member- Faculty Representative</td>
</tr>
<tr>
<td>7</td>
<td>Mr. V. R. Ghatage</td>
<td>HOD, Mech Engg.</td>
<td>Member- Faculty Representative</td>
</tr>
<tr>
<td>8</td>
<td>Mr. P. S. Chindhi</td>
<td>Assistant Professor</td>
<td>Member- IQAC Representative</td>
</tr>
<tr>
<td>9</td>
<td>Mrs. M. N. Patil</td>
<td>Assistant Professor</td>
<td>Member- Ladies Faculty Representative</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td>Economist</td>
</tr>
<tr>
<td>11</td>
<td>Dr. Subhash Kulkarni</td>
<td>Industrialist</td>
<td>Member- Industrialist Representative</td>
</tr>
<tr>
<td>12</td>
<td>Mr. Shashikant A. Chuyekar</td>
<td>Social Worker</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Mr. Tushar Yemgekar</td>
<td>Alumni Representative</td>
<td>Member- Student Representative</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>President, Student</td>
<td>Member- Student</td>
</tr>
</tbody>
</table>
Organizational chart and processes:

<table>
<thead>
<tr>
<th>Council</th>
<th>Representative</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Secretary, Student Council</td>
</tr>
<tr>
<td>16</td>
<td>Dr. Sanjay Hari Sawant</td>
</tr>
</tbody>
</table>

- Trust - Headed by Chairman
  - Principal
  - Governing Body
  - Committee Members
Organizational chart and processes:
Frequently of the Board of Governors:

<table>
<thead>
<tr>
<th>SR. NO.</th>
<th>NAME</th>
<th>DESIGNATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. S. A. Chavan</td>
<td>Chairman</td>
</tr>
<tr>
<td>2</td>
<td>Mr. S. H. Kulkarni</td>
<td>Member Industrialist</td>
</tr>
<tr>
<td>3</td>
<td>Dr. A. T. Pise</td>
<td>Member Educationalist</td>
</tr>
<tr>
<td>4</td>
<td>University Nominee</td>
<td>Nominee of the Affiliating Body/University/State Board of Technical Education(Ex-officio)</td>
</tr>
<tr>
<td>5</td>
<td>DTE Nominee</td>
<td>Nominee of State Government-Director of Technical Education (Ex-officio)</td>
</tr>
<tr>
<td>6</td>
<td>State Government Nominee</td>
<td>Nominee of State Government/UT(Ex-officio)</td>
</tr>
<tr>
<td>7</td>
<td>Dr. B.R. Badave</td>
<td>An Industrialist/ Technologist/Educationist from the Region Nominated by the State Government/</td>
</tr>
<tr>
<td>8</td>
<td>AICTE Nominee</td>
<td>Nominee of the All India Council for Technical Education-Regional Officer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(Ex-Officio)</td>
</tr>
<tr>
<td>9</td>
<td>Dr. S. H. Sawant</td>
<td>Member Secretary</td>
</tr>
<tr>
<td>10</td>
<td>Dr. K. Ravi</td>
<td>Faculty Member</td>
</tr>
<tr>
<td>11</td>
<td>Mr. S. T. Matale</td>
<td>Faculty Member</td>
</tr>
</tbody>
</table>
Student Feedback on Institutional Governance/ Faculty performance:

Students give formal feedback (mid-term feedback and end of semester feedback) on the prescribed parameters, which reviewed by the top management and the faculty w.r.t. improvement, level up gradation. Informal feedback also taken by the top management from time to time to ensure continual improvement. Mentor –mentee feedback is collected twice in year and accordingly instruction is given.

STUDENT GRIEVANCE REDRESSAL COMMITTEE

Following are the committee members appointed in the Grievance Committee of our institute for academic year 2020-2021.

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of Person</th>
<th>Designation</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Sanjay Hari Sawant</td>
<td>Principal</td>
<td>Chairman</td>
</tr>
<tr>
<td>2</td>
<td>Mr. S.T. Matale</td>
<td>Assistant Professor</td>
<td>Member- Academic</td>
</tr>
<tr>
<td>3</td>
<td>Mr. R. S. Desai</td>
<td>Assistant Professor</td>
<td>Member- Administrative Officer</td>
</tr>
<tr>
<td>4</td>
<td>Mr. A. J. Deokar</td>
<td>Assistant Professor</td>
<td>Member- Student Council Cell Head</td>
</tr>
<tr>
<td>5</td>
<td>Mrs. G.B.Kalkamkar</td>
<td>Assistant Professor</td>
<td>Member- I.C.C. Head</td>
</tr>
<tr>
<td>6</td>
<td>Mr. S.S. Gurav</td>
<td>Assistant Professor</td>
<td>Member- Faculty Representative</td>
</tr>
<tr>
<td>7</td>
<td>Mr. S. M.Chavan</td>
<td>Librarian</td>
<td>Member- Faculty Representative</td>
</tr>
<tr>
<td>8</td>
<td>Mr. S. G. Swami</td>
<td>Assistant Professor</td>
<td>Member Secretary</td>
</tr>
</tbody>
</table>

Grievance Redressal mechanism for Faculty, staff and students:

Grievance Redressal mechanism at Dr. Sanjay Hari Sawant underlines accountability and monitoring towards the customers (faculty, staff and students). A five member committee monitors and addresses the complaints /suggestions received from the stakeholders and appropriate action is taken by the committee. A complaint/suggestion box has been placed on the ground floor and second floor.

Following members are hereby informed that they are appointed as members of Women
Grievance Cell for the academic year 2020-2021.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Member</th>
<th>Designation</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. S. H. Sawant</td>
<td>Principal</td>
<td>Chairman</td>
</tr>
<tr>
<td>2</td>
<td>Prof. A. B. Farakte</td>
<td>Assistant Professor</td>
<td>Member - Nominated by Principal</td>
</tr>
<tr>
<td>3</td>
<td>Prof. S.T. Matale</td>
<td>Assistant Professor</td>
<td>Member - Nominated by Principal</td>
</tr>
<tr>
<td>4</td>
<td>Dr. M. B. Mohite</td>
<td>Assistant Professor</td>
<td>Member - Nominated by Principal Lady</td>
</tr>
<tr>
<td>5</td>
<td>Shri. A. G. Shinde</td>
<td>Lab Asst.</td>
<td>Member - Non- Teaching Staff</td>
</tr>
<tr>
<td>6</td>
<td>Shri. J. R. Todkar</td>
<td>Clerk</td>
<td>Member - Non- Teaching Staff</td>
</tr>
<tr>
<td>7</td>
<td>Prof. R.S. Desai</td>
<td>Registrar</td>
<td>Member - Secretary</td>
</tr>
</tbody>
</table>

➢ Establishment of Anti Ragging Committee:

Anti-Ragging Committee & Anti- Ragging Squad

The Anti-Ragging Committee & Anti- Ragging Squad have been constituted for the academic year 2019-2020 as per AICTE norms (Refer : Approval Process Hand-book 2015, Appendix 12) & UGC Draft Regulations on curbing the menace of ragging in higher educational institutions, 2009.

Anti-Ragging Committee

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Member</th>
<th>Designation</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Sanjay Hari Sawant</td>
<td>Principal</td>
<td>Chairman</td>
</tr>
<tr>
<td>2</td>
<td>Mr. C. H. Kambale</td>
<td>Assistant Professor</td>
<td>Member</td>
</tr>
<tr>
<td>3</td>
<td>Mr. R. S. Desai</td>
<td>Office Superintendent</td>
<td>Member - Administrative Officer</td>
</tr>
<tr>
<td>4</td>
<td>Ms. A. P. Narayankar</td>
<td>Assistant Professor</td>
<td>Member - Faculty Representative</td>
</tr>
<tr>
<td>5</td>
<td>Mr. A. B. Chavan</td>
<td>Rector</td>
<td>Rector</td>
</tr>
<tr>
<td>6</td>
<td>Mrs. S. R. Dhagate</td>
<td>Clerk</td>
<td>Member - Non Teaching Representative</td>
</tr>
<tr>
<td>7</td>
<td>Mr. Prakash Gaikwad</td>
<td>Police Representative</td>
<td>Member - Police Representative</td>
</tr>
<tr>
<td>8</td>
<td>Mr. Vijay Bhosale</td>
<td>Media Administration</td>
<td>Member - Media Administration</td>
</tr>
<tr>
<td>9</td>
<td>Mr. Annasaheb Patil</td>
<td>Parent</td>
<td>Member - Parent Representative</td>
</tr>
<tr>
<td>10</td>
<td>Dr. P. N. Kesarkar</td>
<td>Psychiatrist</td>
<td>Member - Psychiatrist</td>
</tr>
<tr>
<td>11</td>
<td>Mr. Ravindra Gavali</td>
<td>News Reporter</td>
<td>Member - News Reporter</td>
</tr>
<tr>
<td>12</td>
<td>Mr. Akshay Sutar</td>
<td>Student</td>
<td>Member - Student Representative</td>
</tr>
<tr>
<td>13</td>
<td>Ms. Sayali Mande</td>
<td>Student</td>
<td>Member - Student Representative</td>
</tr>
<tr>
<td>14</td>
<td>Mr. P. S. Chindhi</td>
<td>Assistant Professor</td>
<td>Member Secretary</td>
</tr>
</tbody>
</table>
Internal Complaint Committee:

Sant Gajanan Maharaj college of Engineering, Mahagaon is committed to providing safe academic and working environment to all students and its women employees. As per the guidelines of Supreme Court, UGC, Sexual Harassment of Women at Workplace (Prevention, Prohibition & Redressal) Act, 2013, an Internal Complaints Committee has been established by the College for a period of 3 years. The aim and objective of the Internal Complaints Committee is to take consistent action for prevention, prohibition and Redressal of complaints received regarding sexual harassment and gender discrimination of women personnel at the workplace.

The following members are nominated as the committee members for Internal Complaint Committee (ICC)

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Person</th>
<th>Designation</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Sanjay Hari Sawant</td>
<td>Principal</td>
<td>Chairman</td>
</tr>
<tr>
<td>2</td>
<td>Mrs. Ujawala Dalvi</td>
<td>NGO Representative</td>
<td>Member-Ladies NGO Representative</td>
</tr>
<tr>
<td>3</td>
<td>Adv. Asha V. Ghatage</td>
<td>Legal Representative</td>
<td>Member-Ladies Legal Representative</td>
</tr>
<tr>
<td>4</td>
<td>Ms. Achala P Narayankar</td>
<td>Assistant Professor</td>
<td>Member-Ladies Faculty Representative</td>
</tr>
<tr>
<td>5</td>
<td>Dr. Monica B. Mohite</td>
<td>Assistant Professor</td>
<td>Member-Ladies Faculty Representative</td>
</tr>
<tr>
<td>6</td>
<td>Ms. P.R. Gadyanavar</td>
<td>Assistant Professor</td>
<td>Member-Ladies Faculty Representative</td>
</tr>
<tr>
<td>7</td>
<td>Mr. S. B. Powar</td>
<td>Assistant Professor</td>
<td>Member- Faculty Representative</td>
</tr>
<tr>
<td>8</td>
<td>Mr. A. A. Deshpande</td>
<td>Assistant Professor</td>
<td>Member- Faculty Representative</td>
</tr>
<tr>
<td>9</td>
<td>Mr. Pratik Jadhav</td>
<td>Student</td>
<td>Member- Student Representative</td>
</tr>
<tr>
<td>10</td>
<td>Ms. Poonam Upalkar</td>
<td>Student</td>
<td>Member- Student Representative</td>
</tr>
<tr>
<td>11</td>
<td>Mrs. Geeta Kalkamkar</td>
<td>Assistant Professor</td>
<td>Member-Secretary</td>
</tr>
</tbody>
</table>
SC/ST CELL:

India is a country of diversity. It is a hub of different religions, castes and cultures. However, the Indian society is characterized by a highly-entrenched system of social stratification. Social inequalities have led to denial of access to materials, cultural and educational resources to the disadvantaged groups of societies. Higher education is a tool for social and economic equality.

Scheduled Castes (SC) and Scheduled Tribes (ST) have been identified as the two most backward groups of Indian Society. They include all the castes, races or tribes, which have been socially, economically and educationally backward.

The institute has constituted SC/ST Cell which would help in eliminating the social disparities as well as to empower the SC/ST students in the college. The purpose of these Cells is to help the universities in implementing the reservation policy with regard to the admission of students and the recruitment of teaching and non-teaching staff at various levels. SC ST CELL was established in our institute for the period of 3 years.

Constitution of the Cell

Sant Gajanan Maharaj College of Engineering, Mahagaon has constituted the SC/ST CELL committee with the following members:

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of Person</th>
<th>Designation</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Sanjay Hari Sawant</td>
<td>Principal</td>
<td>Chairman</td>
</tr>
<tr>
<td>2</td>
<td>Mr. R. S. Desai</td>
<td>Assistant Professor</td>
<td>Member- Administrative Officer Representative</td>
</tr>
<tr>
<td>2</td>
<td>Ms. A. P. Narayankar</td>
<td>Assistant Professor</td>
<td>Member-Faculty Representative</td>
</tr>
<tr>
<td>3</td>
<td>Mr. S. M. Chavan</td>
<td>Librarian</td>
<td>Member-Faculty Representative</td>
</tr>
<tr>
<td>4</td>
<td>Mr. A.T. Kambale</td>
<td>Assistant Professor</td>
<td>Member-Faculty Representative</td>
</tr>
<tr>
<td>5</td>
<td>Mr. L.A. Dodamani</td>
<td>Assistant Professor</td>
<td>Member-Faculty Representative</td>
</tr>
<tr>
<td>6</td>
<td>Mr. S. R. Sankpal</td>
<td>Assistant Professor</td>
<td>Member-Faculty Representative</td>
</tr>
<tr>
<td>7</td>
<td>Mr. Y. S. Bajantri</td>
<td>Assistant Professor</td>
<td>Member-Faculty Representative</td>
</tr>
<tr>
<td>8</td>
<td>Ms. Shital Narvekar</td>
<td>Non Teaching Staff</td>
<td>Member-Non Teaching Representative</td>
</tr>
<tr>
<td>9</td>
<td>Mr. C. H. Kambale</td>
<td>Assistant Professor</td>
<td>Member-Secretary</td>
</tr>
</tbody>
</table>
### Internal Quality Assurance Cell (IQAC):

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Person</th>
<th>Designation</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dr. Sanjay Hari Sawant</td>
<td>Principal</td>
<td>Chairman</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. Sanjay A. Chavan</td>
<td>Trustee</td>
<td>Member-Trustee</td>
</tr>
<tr>
<td>3.</td>
<td>Mr. S. P. Ganachari</td>
<td>Administrative Officer</td>
<td>Member- Administrative Officer</td>
</tr>
<tr>
<td>4.</td>
<td>Mr. S. T. Matale</td>
<td>Assistant Professor</td>
<td>Member- Academic Representative</td>
</tr>
<tr>
<td>5.</td>
<td>Mr. R. S. Desai</td>
<td>Office Superintendent</td>
<td>Member- Administrative Officer Representative</td>
</tr>
<tr>
<td>6.</td>
<td>Mr. S.I. Jabade</td>
<td>Training &amp; Placement Officer</td>
<td>Member-Faculty Representative</td>
</tr>
<tr>
<td>7.</td>
<td>Mr. Sandeep Tejam</td>
<td>Accountant</td>
<td>Member-Accountant Representative</td>
</tr>
<tr>
<td>8.</td>
<td>Mr. S. N. Sanadi</td>
<td>Assistant Professor</td>
<td>Member-Faculty Representative</td>
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<td>Mr. A. B. Farakte</td>
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<td>Mr. M. B. Patil</td>
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<td>13.</td>
<td>Dr. A. A. Mane</td>
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<td>14.</td>
<td>Mr. Rajgonda Patil</td>
<td>Industrial Expert</td>
<td>Member-Industrial Expert</td>
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<td>15.</td>
<td>Dr. S. R. Kumbhar</td>
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<td>16.</td>
<td>Mr. Shashikant Patil</td>
<td>Social Worker</td>
<td>Member- Social Expert</td>
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<td>17.</td>
<td>Mr. T. V. Yamagekar</td>
<td>Alumni</td>
<td>Member-Student Representative</td>
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<td>Ms. A. S. More</td>
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<td>19.</td>
<td>Mr. S. R. Shintre</td>
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<td>20.</td>
<td>Mr. P.S. Chindhi</td>
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6. PROGRAMMES

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<th>Name of Programmes approved by AICTE</th>
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Details of Programme:

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Name and duration of Programme(s) having Twinning and Collaboration with Foreign University(s) and being run in the same Campus along with status of their AICTE approval.

NA
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<tr>
<th>List of Faculty</th>
<th>Name of Staff</th>
<th>Nature of appointment</th>
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<td>01</td>
<td>DR. SANJAY HARI SAWANT</td>
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<tr>
<td>02</td>
<td>MR. VINAYAK R GHATAGE</td>
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<td>03</td>
<td>MR. R V BAMMANKATTI</td>
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<td>04</td>
<td>MR. SANJIV R MARAJAKKE</td>
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<td>05</td>
<td>MR. M.G. MULLA</td>
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<tr>
<td>06</td>
<td>MR. SHIDADONGA I JABADE</td>
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<tr>
<td>07</td>
<td>MR. AMOL THALU KAMBLE</td>
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<td>08</td>
<td>MR. A A DESHPANDE</td>
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<tr>
<td>09</td>
<td>MR. AMIT JAYWANT DEOKAR</td>
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<td>MR. SACHIN A CHOGULE</td>
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<td>MR. DESAI SUHAS RAGHUNATH</td>
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<td>MR. UADAY D PATIL</td>
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<td>MS. PADMINI SANMANE</td>
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<td>MRS. NIKITA R DESAI</td>
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<td>70</td>
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<td>71</td>
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**PERMANENT FACULTY: STUDENT RATIO**

**NUMBER OF FACULTY EMPLOYED AND LEFT DURING THE LAST THREE YEARS**

1:20

07
### Nature and Extent of involvement of Faculty and students in academic affairs/improvements:

**Accredited by NAAC with B++ and ISO 9001:2015 Certified Institute**

**Sant Gajanan Maharaj College of Engineering, Mahagaon**

Site- Chinchewadi, Tal- Gadhinglaj, Dist- Mahagaon, Maharashtra, India-416502 www.sgmrh.com

**Department of Computer Science and Engineering**

Nature and Extent of involvement of Faculty in academic affairs/improvements:

<table>
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<th>Sr. No.</th>
<th>Date</th>
<th>Organizer/place</th>
<th>Name of the Event</th>
<th>Name of the faculty Participated</th>
<th>Result / Won</th>
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<td>1</td>
<td>11-12-2017</td>
<td>Annasaheb Dange College of Engineering and Technology, Astha.</td>
<td>Workshop on Information Security</td>
<td>Mr. S.S. Gurav, Mr. S. G. Swami</td>
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<td>To 15-12-2017</td>
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<td>28-12-2017</td>
<td>Sant Gajanan Maharaj College of Engineering, Mahagaon</td>
<td>Digital Image Processing using MATLAB</td>
<td>Mr. Swami S. G., Mr. S. S. Dhere</td>
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**Academic Year 2018-2019**

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<td>Sant Gajanan Maharaj College of Engineering, Mahagaon</td>
<td>Three Days FDP on Angular</td>
<td>Mr. S. S. Dhere, Mr. S. G. Swami, Mr. M. S. Bhandigare, Mr. B. B. Gutte, Mr. U. D. Patil, Miss A. P. Narayankar, Miss P. R. Gadyanavar</td>
<td>Participants</td>
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<td></td>
<td>To 19-04-2018</td>
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<td>28-01-2018</td>
<td>Sant Gajanan Maharaj College of Engineering, Mahagaon</td>
<td>Two Days workshop on “Data Analytics using Hadoop and R”</td>
<td>Mr. S. S. Dhere, Mr. S. G. Swami, Mr. M. S. Bhandigare, Mr. B. B. Gutte, Mr. U. D. Patil, Miss A. P. Narayankar, Miss P. R.</td>
<td>Participants</td>
</tr>
<tr>
<td>Sr. No.</td>
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<td>Organizer/place</td>
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<td>1</td>
<td>14/01/2020</td>
<td>TKIET, Warna Nagar</td>
<td>Workshop on TY B-Tech CBCS Pattern Syllabus Setting</td>
<td>Mr. S. G. Swami</td>
<td>Participant</td>
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<tr>
<td>2</td>
<td>14/01/2020</td>
<td>TKIET, Warna Nagar</td>
<td>Workshop on TY B-Tech CBCS Pattern Syllabus Setting</td>
<td>Mr. B. B. Gutte</td>
<td>Participant</td>
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<tr>
<td>3</td>
<td>08/01/2020 to 11/01/2020</td>
<td>Hirasugar Institute of TechnologyNidsoshi</td>
<td>Four Days FDP on Machine Learning &amp; Data Analytics</td>
<td>Ms. A. P. Narayankar</td>
<td>Participant</td>
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<tr>
<td>4</td>
<td>08/01/2020 to 11/01/2020</td>
<td>Hirasugar Institute of TechnologyNidsoshi</td>
<td>Four Days FDP on Machine Learning &amp; Data Analytics</td>
<td>Ms. P. R. Gadyanavar</td>
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<td>23/12/2019 to 24/12/2019</td>
<td>Bharti Vidyapeeths College of Engineering Kolhapur</td>
<td>Workshop on Steeping toward Problem &amp; Project Best Learning</td>
<td>Mr. C.H Kamble</td>
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<td>04/10/2019</td>
<td>Bharti Vidyapeeths College of Engineering Kolhapur</td>
<td>Workshop on Technical Methodology for CBCS Syllabus of SY B-Tech CSE</td>
<td>Ms. P. R. Gadyanavar</td>
<td>Participant</td>
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<td>Bharti Vidyapeeths College of Engineering Kolhapur</td>
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<td>8</td>
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<td>One Day</td>
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<td>2 Days workshop on Blockchain Technology</td>
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**Academic Year 2017-2018**

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<th>Name of the Event</th>
<th>Name of the students Participated</th>
<th>Result / Won</th>
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<td>SGMCOE</td>
<td>Navapravartya 2K17</td>
<td>Ms. Mane Laxami B</td>
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<td>Paper Presentation</td>
<td>Ms. Mane Laxami B</td>
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<td>Online Programming</td>
<td>Ms. Kadam Shruti</td>
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<td>IPR Patentes &amp; Technology Transfer</td>
<td>Ms. Keerti Jadhav</td>
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<td>Name of the Event</td>
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<td>8</td>
<td>4/3/2018</td>
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<td>Open Book Programming Contest</td>
<td>Miss. Shruti kadam</td>
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<td>9</td>
<td>4/3/2018</td>
<td>D.Y.P Kolhapur</td>
<td>Open Book Programming Contest</td>
<td>Ms. Mane Laxmi</td>
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<td>SGMCOE</td>
<td>Spandhan</td>
<td>Ms. Sanjivani Patil</td>
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### Academic Year 2018-2019

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<td>C-Pro</td>
<td>Ms. Mrunali Patil</td>
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<td>7</td>
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### Academic Year 2019-2020

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### Academic Year 2020-2021

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<td>Department of General Science &amp; Humanities SGMCOE</td>
<td>Project Competition “National Science Day”</td>
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<td>Department of General Science &amp; Humanities SGMCOE</td>
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<td>27th &amp; 28th March 2021</td>
<td>DKTE, Ichalkaranji</td>
<td>Two Day’s Workshop On Block chain Technology</td>
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<td>8</td>
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<td>Intellectual Property Rights, Parents and Technology Transfer</td>
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<td>INTERNET OF THINGS</td>
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<td>Sant Gajanan Maharaj College Of Engineering, Mahagaon</td>
<td>Understanding CO PEO PEO PEO in Revised NAAC Structure</td>
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<td>28 TO 29 Dec, 2017</td>
<td>Sant Gajanan Maharaj College Of Engineering, Mahagaon</td>
<td>Digital Image Processing Using MATLAB</td>
<td>Prof. S. R. Desai</td>
<td>Participation</td>
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<td>Prof. G. B. Kalkhambkar</td>
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<td>Digital Image Processing Using MATLAB</td>
<td>Prof. S. G. Tamburimath</td>
<td>Participation</td>
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<td>Digital Image Processing Using MATLAB</td>
<td>Prof. S. R. Sankpal</td>
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<td>13</td>
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<td>Digital Image Processing Using MATLAB</td>
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<td>Participation</td>
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<td>Digital Image Processing Using MATLAB</td>
<td>Prof. B. B. Repe</td>
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<td>Sant Gajanan Maharaj College Of Engineering, Mahagaon</td>
<td>Digital Image Processing Using MATLAB</td>
<td>Prof. Veeranna Melmuri</td>
<td>Participation</td>
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<td>17</td>
<td>11 Nov, 2017</td>
<td>GOGTE INSTITUTE OF TECHNOLOGY</td>
<td>Research Methodology</td>
<td>Prof. P. M. Palkar</td>
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<td>11 May, 2017</td>
<td>Vishvesvaraya Technological University, Belagavi</td>
<td>Digital Manufacturing</td>
<td>Prof. G. B. Kalkhambkar</td>
<td>Participation</td>
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<td>Shivaji University Kolhapur</td>
<td>Choice Based Credit Systems</td>
<td>Prof. S. T. Matale</td>
<td>Participation</td>
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**Academic Year 2018-2019**

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<td>21-Mar-19</td>
<td>SGMCOE, Mahagaon</td>
<td>1st National Conference of Recent Trends in Science &amp; Technology (NC-RTST-)</td>
<td>Prof. Geeta B. Kalkhambkar</td>
<td>Winner</td>
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<td>Date</td>
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<td>Syllabus Formation of Second Year (E&amp;TC)</td>
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<td>Design &amp; Implementation of Hardware Accelerators and Protocols on FPGA</td>
<td>V.P. Dr. P. G. Halakatti College of Engineering &amp; Technology</td>
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<td>Design &amp; Implementation of Hardware Accelerators and Protocols on FPGA</td>
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<td>Quality of Answer Sheet Evaluation</td>
<td>Dr. J. J. Magadum College of Engineering</td>
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<td>Choice Based Credit Systems</td>
<td>Sant Gajanan Maharaj College Of Engineering, Mahagaon</td>
<td>Prof. Farakте A.B.</td>
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<td>Introduction to Active Presenter Software for Creating ClassroomVedio</td>
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<td>Trends in Neural Computing as a Web Service</td>
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<td>Internshala Trainings</td>
<td>Programming with Python</td>
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<td>IETE Dharwad Sub Centre</td>
<td>Use of Active Presenter</td>
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<td>CODEGNAN IT Solutions</td>
<td>Building Random Forest Model</td>
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<td>Shahid Vidya Laxmi Mahavidyalaya, Titave</td>
<td>Science Behind Corona Virus, Awarness&amp; it's Impact on Environment</td>
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<td>KPR Institute of Engineering &amp; Technology, Coimbatore</td>
<td>Insite of Antenna &amp; Radio Radiation</td>
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<td>Tech Manthan</td>
<td>Miss. Asmita Maruti Chavan</td>
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<td>17</td>
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<td>Annasaheb Dange College of Engineering &amp; Technology, Ashta</td>
<td>Technical Quiz</td>
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<td>49</td>
<td>7-May-20</td>
<td>KPR Institute of Engineering &amp; Technology, Coimbatore</td>
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<td>Rohan Ramesh Patil</td>
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<td>6-May-20</td>
<td>Government Polytechnic, Yavatmal</td>
<td>Quiz</td>
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<td>KIT College of</td>
<td>Workshop</td>
<td>Patane Poonam Pandurang</td>
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**Sant Gajanan Maharaj College of Engineering, Mahagaon**

Site- Chinchewadi, Tal- Gadchinglaj, Dist- Mahagaon, Maharashtra, India-416502 www.sgmrh.com

### Department of Mechanical Engineering

Nature and Extent of involvement of students in academic affairs/improvements:

#### Academic Year 2017-2018

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Date</th>
<th>Organizer/place</th>
<th>Name of the Event</th>
<th>Name of the Faculty Participated</th>
<th>Result / Won</th>
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<td>11/5/2017</td>
<td>Visvesvaraya Technological University, Belagavi</td>
<td>Digital Manufacturing</td>
<td>Mr. P.A. Harari</td>
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<td>2</td>
<td>1/9/2017</td>
<td>Annasaheb Dange college of Engineering and Technology, Ashta. Dist – Sangli</td>
<td>Computer Aided Machining Using Edgecam Software</td>
<td>Mr. R.V. Bammankatti</td>
<td>Participant</td>
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<td>3</td>
<td>1/9/2017</td>
<td>Annasaheb Dange college of Engineering and Technology, Ashta. Dist – Sangli</td>
<td>Computer Aided Machining Using Edgecam Software</td>
<td>Mr. A.T. Kamble</td>
<td>Participant</td>
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<tr>
<td>4</td>
<td>11 to 23/12/2017</td>
<td>Department of Mechanical Engineering, PVPIT, Budhgaon.</td>
<td>Scope of Material Testing of Advanced Materials</td>
<td>Mr. Sachin A. Chougule</td>
<td>Participant</td>
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<tr>
<td>5</td>
<td>11 to 23/12/2017</td>
<td>Department of Mechanical Engineering, PVPIT, Budhgaon.</td>
<td>Scope of Material Testing of Advanced Materials</td>
<td>Mr. A.A. Deshpande</td>
<td>Participant</td>
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<td>6</td>
<td>22/12/2017</td>
<td>Shivaji University Kolhapur</td>
<td>Teaching Methodologies In the Subject Of Noise Vibration</td>
<td>Mr. R.D. Ghulanavar</td>
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<td>Shivaji University Kolhapur</td>
<td>Teaching Methodologies In the Subject Of Noise Vibration</td>
<td>Mr. A.T. Kamble</td>
<td>Participant</td>
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#### Academic Year 2018-2019

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<td>Mechanical Engineering Department, Rajarambapu Institute of Technology,</td>
<td>Advance In Materials Micro Machining And</td>
<td>Mr. A.A. Deshpande</td>
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<td>Advance In Materials Micro Machining And Management Practices</td>
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<td>SDM College of Engineering and Technology, Dharwad</td>
<td>FDP on Technical Education and Skill Development in India</td>
<td>Mr. P.A.Harari</td>
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<td>S.Y.B. Tech Mechanical Engineering Syllabus setting</td>
<td>Mr. M.G.Mulla</td>
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<td>R.B. Madkholkar Mahavidyalaya, Chandgad.</td>
<td>Biofertilizer’s and Competitive Examination Guidance</td>
<td>Mr. V.R. Ghatage</td>
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### Academic Year 2019-2020

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### Academic Year 2017-2018

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<td>Mechtantra 2018</td>
<td>Akshay Powar</td>
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<td>Shri Vijaysinha Yadav Arts And Science College Pethvadagon</td>
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**Academic Year 2018-2019**

**Academic Year 2019-2020**
**8 FEES**

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| Time schedule for payment of Fee for the entire Programme | Fee collected in 3 installment  
1. Month of June  
2. Month of November  
3. Month of February |
| No. of Fee waivers granted with amount and name of students | ------- |
| Number of scholarship offered by the Institution, duration and amount | ------- |
| Criteria for Fee waivers/scholarship | As per DTE Norms |
| Estimated cost of Boarding and Lodging in Hostels | 9000/- per student |
| Any other fee please specify | ------- |

**9 ADMISSION**

Number of seats sanctioned with the year of approval A.Y.2020-21
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**CAP Seats: 60**

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**PWD Common Reserved Seats: 1**

**Defence Common Reserved Seats: 1**

Economically Weaker Section (EWS) Seats: 6

Tuition Fee Waiver Scheme Choice Code: 680332511T Seats: 3

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**CAP Seats: 60**

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**PWD Common Reserved Seats: 1**

**Defence Common Reserved Seats: 1**

Economically Weaker Section (EWS) Seats: 6

Tuition Fee Waiver Scheme Choice Code: 680361211T Seats: 3

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<th>All India</th>
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**CAP Seats: 60**

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<th>NTC</th>
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**PWD Common Reserved Seats: 1**

**Defence Common Reserved Seats: 1**

Economically Weaker Section (EWS) Seats: 6

Tuition Fee Waiver Scheme Choice Code: 680339311T Seats: 3
### Number of seats sanctioned with the year of approval A.Y.202019-20

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<td>MU</td>
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| Economically Weaker Section (EWS) | Seats: 6 |

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| Economically Weaker Section (EWS) | Seats: 6 |

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| Economically Weaker Section (EWS) | Seats: 6 |

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| Economically Weaker Section (EWS) | Seats: 6 |

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| Economically Weaker Section (EWS) | Seats: 8 |

| Tuition Fee Waiver Scheme Choice Code: 6803181117 | Seats: 3 | Tuition Fee Waiver Scheme Choice Code: 6803327211 | Seats: 3 | Tuition Fee Waiver Scheme Choice Code: 6802324217 | Seats: 3 | Tuition Fee Waiver Scheme Choice Code: 6803293117 | Seats: 3 |
Number of seats sanctioned with the year of approval A.Y.2020-19

Students get admission into B. Tech. Course based on centralized Allotment Process (CAP). The entire admission process is carried out under the government of Maharashtra and Director Board of technical education.

**Course Duration 2 Years**

<table>
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<tr>
<th>Course Duration</th>
<th>4Years</th>
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<td>Annual Intake</td>
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<td>CAP Seats</td>
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<td>Institute level Seats</td>
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<table>
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<th>Number of applications received during last two years for</th>
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<th>2019-20</th>
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<tbody>
<tr>
<td>Number of applications received</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Number of student admitted</td>
<td>27</td>
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</table>
Eligibility:
The Candidate should be an Indian National;

(ii) Passed HSC or its equivalent examination with Physics and Mathematics as compulsory subjects along with one of the Chemistry or Biotechnology or Biology or Technical Vocational subject or Computer Science or Information Technology or Informatics Practices or Agriculture or Engineering Graphics or Business Studies, and obtained at least 45% marks (at least 40% marks, in case of Backward class categories, Economically Weaker Section and Persons with Disability candidates belonging to Maharashtra State only) in the above subjects taken together and The Candidate should have appeared in all the subjects in MHT-CET 2020 and should obtain non zero score in MHT-CET 2020. Or

(ii) Passed Diploma in Engineering and Technology and obtained at least 45% marks (at least 40% marks, in case of Backward class categories, Economically Weaker Section and Persons with Disability candidates belonging to Maharashtra State only); Other criterion declared from time to time by the Directorate of Technical Education, Maharashtra State, Mumbai.

Other than Maharashtra State Candidates shall be eligible for Institution quota only

For Maharashtra State Candidature Candidate and All India Candidature

Candidate,

(i) The Candidate should be an Indian National;

(ii) Passed Diploma Course in Engineering and Technology with at least 45% marks (40% marks in case of candidates of backward class categories, Economically Weaker Section and Persons with Disability belonging to Maharashtra State only) in appropriate branch of Engineering and Technology from an All India Council for Technical Education or Central or State Government approved Institution or its equivalent;

Or
(ii) Passed B.Sc. Degree from a University Grants Commission (UGC) or Association of Indian Universities recognized University with at least 45% marks (40% in case of candidates of backward class categories, Economically Weaker Section and Persons with Disability belonging to Maharashtra State only) and passed HSC with Mathematics as a subject. Provided that students belonging to this category shall clear the subjects of Engineering Graphics/Engineering Drawing and Engineering Mechanics of the first year Engineering Program along with second year subjects.

Or

(ii) Passed D. Voc. Stream in the same/allied sector. (iii) In the above cases, a suitable bridge Courses, if required such as in Mathematics may be conducted.

(iv) Any other criterion declared from time to time by the appropriate authority as defined under the Act.


**Calendar for admission against Management/vacant seats:**

**ADMISSION PROCESS**

**A.CAP & INSTITUTE LEVEL SCHEDULE 2020-2021**

<table>
<thead>
<tr>
<th>01</th>
<th>Sale of Admission Form &amp; Brochure</th>
<th>31.01.2021 To 03.02.2021 Up to 03.00 PM</th>
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</thead>
<tbody>
<tr>
<td>02</td>
<td>Submission of Admission Form</td>
<td>03.02.2021 Up to 05.00 PM</td>
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<tr>
<td>03</td>
<td>Display of Provisional Merit List on Notice Board &amp; Web ite</td>
<td>03.02.2021 Up to 06.00 PM</td>
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<tr>
<td>04</td>
<td>Last Date of receiving written Complaints Regarding Provisional Merit List</td>
<td>04.02.2021 Before 11.00 AM</td>
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<tr>
<td>05</td>
<td>Display of Final Merit List</td>
<td>04.02.2021 After 11.30 AM</td>
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<td>06</td>
<td>Reporting to institute for confirmation of Admission</td>
<td>04.02.2021 to 05.02.2021 Up to 05.00 PM</td>
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<tr>
<td>07</td>
<td>Starting of Academic Session</td>
<td>05.02.2021</td>
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<tr>
<td>08</td>
<td>The policy of refund of the Fee, in case of withdrawal, shall be clearly notified</td>
<td>Yes, as per DTE, ARA Norms</td>
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</table>

The policy of refund of the Fee, in case of withdrawal, shall be clearly notified as per DTE, ARA Norms.
9. Criteria and Weight ages for Admission:

### CRITERIA FOR ADMISSION

Candidate should pass Higher Secondary School Certificate (Standard XII) examination conducted by the Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent certificate awarded by a recognized Board with Physics and Mathematics as compulsory subjects along with one of the subject Chemistry/Biology/ Technical from a recognized institution. Candidate should be an Indian National. Other criterion declared from time to time by the Directorate of Technical Education, Maharashtra State, Mumbai. Other than Maharashtra State Candidates shall be eligible for Institution quota only.

### MENTION THE MINIMUM LEVEL OF ACCEPTANCE

Passed 10+2 examination with Physics and Mathematics as compulsory subjects along with Chemistry/Biology/Technical subject.

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<th>Mention the cut-off Levels of percentage for the last three years</th>
<th>2020-21</th>
<th>2019-2020</th>
<th>2018-2019</th>
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<td>81.81</td>
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<td><strong>SC</strong></td>
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<td>37.82</td>
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<td><strong>ST</strong></td>
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10. LIST OF APPLICANT:

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#### Score of the individual candidate admitted arranged in order or merit

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Score of the individual candidate admitted arranged in order of merit : DSE Year
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- List of candidate who have been offered Final Merit List of admission for DSE year

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<td>Name</td>
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</table>
Name: Prof. (Dr.) S.H. Sawant
Address: Sant Gajanan Maharaj College of Engineering,
Mahagaon.
Tal: Gadilinglaj, Dist: Kolhapur. Pin-416503
Contact No.: 9421038723
Email ID: sanjaysawant2010@gmail.com
Date of Birth: 01/01/1968
Designation: Principal

Educational Qualifications:

<table>
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<th>Degree</th>
<th>Institute/University</th>
<th>Year of Passing</th>
<th>Field of Specialization</th>
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<td>Ph. D. (Mechanical)</td>
<td>Shivaji University, Kolhapur</td>
<td>2013</td>
<td>Vehicle Dynamics</td>
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<tr>
<td>M.E. Mechanical (Design Engg.)</td>
<td>Shivaji University, Kolhapur</td>
<td>2001</td>
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<td>M.B.A. (Mark. Mgt.) (Distance Mode)</td>
<td>Adam Smith University, USA</td>
<td>2008</td>
<td>Marketing Management</td>
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<td>B.E. (Mechanical)</td>
<td>Shivaji University, Kolhapur</td>
<td>1990</td>
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Professional Appointments/ Employment:

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<th>Subject Taught</th>
<th>Teaching/Research/ Industry Experience</th>
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<tr>
<td>Sant Gajanan Maharaj College of Engineering, Gadilinglaj</td>
<td>Principal</td>
<td>01/02/2020 to Till Date</td>
<td>Theory of Machines-I,</td>
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<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
<td>Principal</td>
<td>22/08/2017 to 31/01/2020</td>
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<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
<td>Professor</td>
<td>01/01/2014 to 31/01/2020</td>
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<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
<td>Asso. Professor</td>
<td>01/02/2006 to 31/12/2013</td>
<td>Design-I,</td>
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<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
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<td>01/02/2005 to 31/01/2006</td>
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<td>05/04/2002 to 31/01/2005</td>
<td>Design-III,</td>
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<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
<td>Lecturer</td>
<td>25/10/1995 to 04/04/2002</td>
<td>Machine System Design,</td>
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<tr>
<td>Rajarambapu Institute of Technology, Sakhrale</td>
<td>Lecturer</td>
<td>25/07/1990 to 31/07/1993</td>
<td>Machine Tool Design,</td>
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<tr>
<td>M/s S.B. Industries, Palus</td>
<td>Asst. Manager</td>
<td>01/09/1993 to 30/09/1995</td>
<td>Mechanical Vibrations and</td>
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<td>02 Years</td>
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Research Guidance:
- Guided 10 M.E (Machine Design, Design Engg. and Automobile) Dissertations and 8 Dissertations are in progress
- Allotted 6 Students for Ph.D. in Mechanical Engineering in Shivaji University, Kolhapur

Books Published:

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<td>Vibrational Analysis of Active and Semi Active Suspension System Subjected to Random Road Excitation with Time Delay and Non-Linear Parameters</td>
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<td>Abhiyantriki Shikshan-Ek Drushtikshep</td>
<td>Deepawali Vishesh Ank-Shabdotsav</td>
<td>Shabdotsav Madyam Seva</td>
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<td>Abhiyantriki va Tantradhyanatil Navinya Nirmiti, Navin Shaikshanik Dhorantil Udyojakta Nirmitcha Strot</td>
<td>Deepawali Vishesh Ank-Shabdotsav</td>
<td>Shabdotsav Madyam Seva</td>
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Patents:

Total 3 Patents are filed as follows:
- Patent on “Multifunctional Construction Machine (MCM)” CBR Number: 11881
- Patent on “Digital Gun” CBR Number: 11297, Application Number 307286
- Patent on “Pedal Operated Drilling Machine” CBR Number: 11297, Application Number 307285

Publication Details:

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<td>03</td>
<td>45+2**</td>
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*Accepted, ** In Review Process, *** Accepted and in process

Books Reviewed:

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Reviewer Details:

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<th>International Journal</th>
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*Reviewer of American Society of Mechanical Engineers Journal

Awards:-
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<th>Reason /Place</th>
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<td>01</td>
<td>Best Faculty Member</td>
<td>Efforts taken for the Development of the Department</td>
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<tr>
<td>02</td>
<td>1st Prize for the Project Guided</td>
<td>VISION-2001 held at WCE, Sangli.</td>
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<tr>
<td>03</td>
<td>Best Session Research Paper Award</td>
<td>International Conference at Pattaya (Thailand)</td>
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<tr>
<td>04</td>
<td>Best Engineer Award</td>
<td>Institution of Engineers (Kolhapur Local Chapter)</td>
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<tr>
<td>05</td>
<td>Highest API Score 191.07 out of 200 for academic year 2011-12</td>
<td>Performance Based Appraisal System</td>
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<td>06</td>
<td>“Sawantpur Bhushan”</td>
<td>Excellent Educational Work</td>
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<td>43rd ISTE National Convention at TKIET, Warananagar.</td>
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### Grants Received:

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<td>AICTE, New Delhi</td>
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<td>04</td>
<td>International Workshop on “Fundamentals of Vehicle Dynamics”</td>
<td>Shivaji University, Kolhapur</td>
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<td>05</td>
<td>Two Days Seminar on “Recent Advances in Design”</td>
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<td>06</td>
<td>Three Days National Seminar on “Vibration and Noise: Methods of Analysis, Measurement and Control “</td>
<td>Shivaji University, Kolhapur</td>
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<td>One Week STC on “Research Methodology: Tools and Techniques”</td>
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<td>32062.00</td>
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<td>Project on “Design and Development of Pedal Operated Feeding Mechanism for Drilling Machine”</td>
<td>Lead College Cluster, Kolhapur</td>
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### Professional Societies Membership:

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<td>Life</td>
<td>LM 1327445</td>
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<td>Society of Automotive Engineers</td>
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<td>Sr. No.</td>
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<tr>
<td>01</td>
<td>*AICTE</td>
<td>Expert, Spot Verification Committee</td>
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<td>02</td>
<td>*AICTE</td>
<td>Evaluator, AQIS (MODROBS)</td>
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<td>03</td>
<td>*AICTE</td>
<td>Evaluator, AQIS (FDP)</td>
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<tr>
<td>04</td>
<td>*AICTE</td>
<td>Evaluator, AQIS (RPS)</td>
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<td>05</td>
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<td>Evaluator, AQIS (Travel Grant)</td>
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<td>*University Grants Commission (UGC)</td>
<td>Evaluator, STRIDE Cell</td>
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<td>*National Assessment and Accreditation Council (NAAC)</td>
<td>Member, Peer Team</td>
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<td>08</td>
<td>*Union Public Service Commission (UPSC)</td>
<td>Subject Expert</td>
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<tr>
<td>09</td>
<td>*Faculty of Science and Technology</td>
<td>Associate Dean</td>
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<td>13</td>
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<td>14</td>
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<td>National Board of Accreditation (NBA)</td>
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<td>38</td>
<td>P.G.(Mechanical-Machine Design)</td>
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<td>Redressal and Grievance Committee</td>
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<td>42</td>
<td>Workshop</td>
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<td>Estate Office</td>
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<tr>
<td>44</td>
<td>Indian Society for Technical Education</td>
<td>Office Bearer / Chairman</td>
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</table>

*Existing Positions*

**Industrial Institute Interaction:**

Visited Number of Industries to enhance the III with a help of Consultancy Work in the areas of Machine Design, Vibrations etc. over a span of 15 years.

**Details of Programs Organised:**

- Organised more than 50 programs such as STTP, Seminar, Workshop, Training Program and Motivational Speech etc. for Faculty Members, Staff Members, Industry Persons and Students.
- Successfully organised International Conference on “Emerging Trends in Engineering and Technology” as Organising Secretary in 2013-14.

**Details of Programs Attended:**

- Attended more than 100 programs such as STTP, Seminar, Workshop, Conference, Orientation Program, Training Program and Motivational Speech etc.

**Contribution to the area of Engineering Education and activities related to Engineering Research:**

- Carried out Research and Consultancy Work in many of the Industries and Academic Institutes.
- Developed many advanced Laboratory Equipments.
- Invited as a Resource Person for many STTPs, Seminars and Workshops.
- Working as an Editorial Board Member/Advisory Committee Member/Chief Guest/Reviewer/Session Chair for Many National/International Journals/Conferences.
- Worked as a Faculty Coordinator of National Level Students Technical Event “ASCENT 2009”, SPECTRUM, TECHVAGANZA etc.
- Delivered Guest/Expert Lectures in Subject Mechanical Vibrations, Machine Design, Mechanical System Design, Vehicle Dynamics etc. in more than 20 institutes.
Working as Examiner for Shivaji University, Savitribai Phule University, Solapur University, North Marathawada University, Goa University, Government College of Engineering, Pune (An Autonomous Institute) etc.

Social Work: Life Member and Subsequent

- Donated notebooks to students at Jilhaparishad School, Sawantpur – 09/09/2017.
- Donated Education Charts to Deaf and Dumb School, Muk Badhir Vidyalaya, Palus.
- Donated Chairs to Ashok Vachanalaya Sawantpur.
- Member of “Maharashtra Police Mitra Mandal” (All India Police Friends Association) Warali, Mumbai.
- Delivered motivational lecture on the topic “Advances in Science Engineering and Technology” at Navjeevan Jyestha Nagarik Sangh, Sawantpur – 06/08/2017.
- Delivered lecture on “Role of Senior Citizen for inculcating educational awareness in their grandchildren” at sawantpur on 14/10/2016.
- Member of “Tanta Mukti Samiti” at Sawantpur (Won 8 Lakh prize for “Tanta Mukti Samiti”).
- Tree Plantation and subsequent responsibility of nurture of trees planted at “Dharangutti-Gayran” through National Service Scheme (NSS) Dr, JJMCOE, Jaysingpur.
- Donation to many organizations for overall development such as “Rayat Shikshan Santha’s, Swami Ramanand Vidyalaya” Ramanadnagar.

Over the last 25 years:

Since Last 25 years I have been in Engineering Education (Mechanical Engineering). I am in Continuous contact with Alumni. I developed many curricular and co-curricular Projects/Programs for Students in order to imbibe technical attitude in them i.e. Paper Publications, Model Making, Sponsored Projects, etc.

Prof. (Dr.) Sanjay H. Sawant
<table>
<thead>
<tr>
<th>NAME OF THE FACULTY</th>
<th>SACHIN NARAYAN SANADI</th>
</tr>
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<tbody>
<tr>
<td>DESIGNATION</td>
<td>ASSISTANT PROFESSOR</td>
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<td>DEPARTMENT</td>
<td>CIVIL ENGINEERING</td>
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<td>DATE OF JOINING THE INSTITUTE</td>
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<td>PAPERS PUBLISHED</td>
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<td>WORKSHOPS ATTENDED</td>
<td>04</td>
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</tbody>
</table>
Name - Lokesh A Doddamani

Address - MIG 54 KHB colony, Sankeshwar, Taluka: Hukkeri, Dis: Belagavi, Pin: 591313

Email id - lokeshgit@gmail.com

Contact No - +917349756455

Academic Qualification -

- S.S.L.C. - 77 %
- 12th - 50 %
- B.E. Civil - 56 %
- MTech - 65 %

Work Experience - 6 years

- Assistant Professor - SGMCOE, Mahagaon.
- Assistant Professor - GHRCEM, Pune
- Assistant Professor - SSCOE, Chikkaballapur

Skills - Auto CAD, Sketch up STAAD-Pro, ETABS, MS Office

Personal Details -

- Date of Birth - 22/07/1989
- Sex - Male
- Languages known - English, Hindi, Kannada, Marathi.
- Nationality - Indian.
<table>
<thead>
<tr>
<th>Name Of Faculty : Mr. GAWADE SAMBHAJI LAXMAN</th>
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<tbody>
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<td>Unique ID</td>
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<td>Qualifications</td>
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<td>Courses Taught At Degree Level</td>
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<td>Total Experience</td>
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<td>Workshops</td>
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Name of Faculty: Miss. Shinde Vasudha Vasantrao

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<td>Workshops:</td>
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<tr>
<td>Name Of Faculty : Mr. Dewarde Ajit Anant</td>
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<td><strong>Designation</strong></td>
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<td>Geotechnical Engineering, Theory Of Structures, Fluid Mechanics, Estimating And Costing, Plumbing Services, Irrigation Engineering</td>
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<td><strong>Workshops</strong></td>
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<td>02. Micro, Small And Medium Enterprise Development. (Govt. Of India)</td>
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<tr>
<td>Name Of Faculty</td>
<td>Miss. Ashwini A. Kodoli</td>
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<td>Qualification</td>
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<td>Name of the Faculty</td>
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</table>
**Name:** Prof. (Dr.) S.H. Sawant  
**Address:** Sant Gajanan Maharaj College of Engineering, Mahagaon,  
Tal: Gadhinglaj, Dist: Kolhapur. Pin-416503  
**Contact No.:** 9421038723  
**Email ID:** sanjaysawant2010@gmail.com  
**Date of Birth:** 01/01/1968  
**Designation:** Principal

### Educational Qualifications:

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<th>Institute/University</th>
<th>Year of Passing</th>
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<tr>
<td>Ph. D. (Mechanical)</td>
<td>Shivaji University, Kolhapur</td>
<td>2013</td>
<td>Vehicle Dynamics</td>
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<tr>
<td>M.E. Mechanical (Design Engg.)</td>
<td>Shivaji University, Kolhapur</td>
<td>2001</td>
<td>Design Engineering</td>
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<tr>
<td>M.B.A. (Mark.Mgt.) (Distance Mode)</td>
<td>Adam Smith University, USA</td>
<td>2008</td>
<td>Marketing Management</td>
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<tr>
<td>B.E. (Mechanical)</td>
<td>Shivaji University, Kolhapur</td>
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### Professional Appointments/ Employment:

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<tr>
<td>Sant Gajanan Maharaj College of Engineering, Gadhinglaj</td>
<td>Principal</td>
<td>01/02/2020 to Till Date</td>
<td>Theory of Machines-I, Theory of Machines-II, Machine</td>
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<tr>
<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
<td>Principal</td>
<td>22/08/2017 to 31/01/2020</td>
<td>Design-I, Machine</td>
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<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
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<td>01/01/2014 to 31/01/2020</td>
<td>Design-II, Machine</td>
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<tr>
<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
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<td>01/02/2006 to 31/12/2013</td>
<td>Design-III, Machine</td>
<td>25 Years</td>
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<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
<td>Professor (Against Post)</td>
<td>01/02/2005 to 31/01/2006</td>
<td>Mechanical System Design, Machine Tool Design, Mechanical Vibrations and Noise and Vibration</td>
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<tr>
<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
<td>Asso. Professor</td>
<td>05/04/2002 to 31/01/2005</td>
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<td>02 Years</td>
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<tr>
<td>Dr. J.J. Magdum College of Engineering, Jaysingpur</td>
<td>Lecturer</td>
<td>25/10/1995 to 04/04/2002</td>
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<tr>
<td>Rajarambapu Institute of Technology, Sakhrade</td>
<td>Lecturer</td>
<td>25/07/1990 to 31/07/1993</td>
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Research Guidance:
- Guided 10 M.E (Machine Design, Design Engg. and Automobile) Dissertations and 8 Dissertations are in progress
- Allotted 6 Students for Ph.D. in Mechanical Engineering in Shivaji University, Kolhapur

Books Published:

<table>
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<th>Title of the Book</th>
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<tr>
<td>01</td>
<td>Vibrational Analysis of Active and Semi Active Suspension System Subjected to Random Road Excitation with Time Delay and Non -Linear Parameters</td>
<td>PraRup Publications</td>
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<tr>
<td>01</td>
<td>Abhiyantriki Shikshan-Ek Drushtikshep</td>
<td>Deepawali Vishesh Ank-Shabdotsav</td>
<td>Shabdotsav Seva</td>
<td>2019</td>
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<td>02</td>
<td>Abhiyantriki va Tantradhyanatil Navinya Nirmiti, Navin Shaikshanik Dhorantil Udyojakta Nirmiteche Strot</td>
<td>Deepawali Vishesh Ank-Shabdotsav</td>
<td>Shabdotsav Seva</td>
<td>2020</td>
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Patents:

Total 3 Patents are filed as follows:-

- Patent on “Multifunctional Construction Machine (MCM)” CBR Number: 11881
- Patent on “Digital Gun” CBR Number: 11297, Application Number 307286
- Patent on “Pedal Operated Drilling Machine” CBR Number: 11297, Application Number 307285

Publication Details:

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*Accepted, ** In Review Process, *** Accepted and in process

Books Reviewed:

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<tr>
<td>01</td>
<td>Machinist Theory</td>
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Reviewer Details:

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<th>International Journal</th>
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*Reviewer of American Society of Mechanical Engineers Journal

Awards:
### Name / Type of Award

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<th>Sr. No.</th>
<th>Name / Type of Award</th>
<th>Reason / Place</th>
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<tr>
<td>01</td>
<td>Best Faculty Member</td>
<td>Efforts taken for the Development of the Department</td>
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<tr>
<td>02</td>
<td>1st Prize for the Project Guided</td>
<td>VISION-2001 held at WCE, Sangli.</td>
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<td>03</td>
<td>Best Session Research Paper Award</td>
<td>International Conference at Pattaya (Thailand)</td>
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<td>Best Engineer Award</td>
<td>Institution of Engineers (Kolhapur Local Chapter)</td>
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<td>Highest API Score 191.07 out of 200 for academic year 2011-12</td>
<td>Performance Based Appraisal System</td>
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<td>06</td>
<td>“Sawantpur Bhushan”</td>
<td>Excellent Educational Work</td>
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<td>2nd Prize for the Project Guided</td>
<td>43rd ISTE National Convention at TKIET, Warananagar.</td>
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<td>Best Teacher Award</td>
<td>Excellent Performance Appraisal for 2012-13</td>
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<td>3rd Prize for the Project Guided</td>
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### Grants Received:

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<td>AICTE, New Delhi</td>
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<td>10000.00</td>
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### Professional Societies Membership:

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<td>Evaluator, AQIS (MODROBS)</td>
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<td>*University Grants Commission (UGC)</td>
<td>Evaluator, STRIDE Cell</td>
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<td>Chairman</td>
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<td>*Board of Studies in Mechanical Engg.</td>
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<td>32</td>
<td>National Cyber Safety and Security Standards</td>
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Industrial Institute Interaction:

Visited Number of Industries to enhance the III with a help of Consultancy Work in the areas of Machine Design, Vibrations etc. over a span of 15 years.

Details of Programs Organised:

- Organised more than 50 programs Such as STTP, Seminar, Workshop, Training Program and Motivational Speech etc. for Faculty Members, Staff Members, Industry Persons and Students.
- Successfully Organised International Conference on “Emerging Trends in Engineering and Technology” as Organizing Secretary in 2013-14.

Details of Programs Attended:

- Attended more than 100 programs Such as STTP, Seminar, Workshop, Conference, Orientation Program, Training Program and Motivational Speech etc.

Contribution to the area of Engineering Education and activities related to Engineering Research:

- Carried out Research and Consultancy Work in many of the Industries and Academic Institutes.
- Developed many advanced Laboratory Equipments.
- Invited as a Resource Person for many STTPs, Seminars and Workshops.
- Working as an Editorial Board Member/Advisory Committee Member/Chief Guest/Reviewer/Session Chair for Many National/International Journals/Conferences.
- Worked as a Faculty Coordinator of National Level Students Technical Event “ASCENT 2009”, SPECTRUM, TECHVAGANZA etc.
- Delivered Guest/Expert Lectures in Subject Mechanical Vibrations, Machine Design, Mechanical System Design, Vehicle Dynamics etc. in more than 20 institutes.
Working as Examiner for Shivaji University, Savtribai Phule University, Solapur University, North Marathawada University, Goa University, Government College of Engineering, Pune (An Autonomous Institute) etc.

Social Work: Life Member and Subsequent

- Donated notebooks to students at Jilhaparishad School, Sawantpur – 09/09/2017.
- Donated Education Charts to Deaf and Dumb School, Muk Badhir Vidyalaya, Palus.
- Donated Chairs to Ashok Vachanalaya Sawantpur
- Member of “Maharashtra Police Mitra Mandal” (All India Police Friends Association) Warali, Mumbai.
- Delivered motivational lecture on the topic “Advances in Science Engineering and Technology” at NavjeevanJyesthaNagarikSangh, Sawantpur – 06/08/2017.
- Delivered lecture on “Role of Senior Citizen for inculcating educational awareness in their grandchildren” at sawantpur on 14/10/2016.
- Member of “Tanta MuktiSamiti” at Sawantpur (Won 8 Lakh prize for “Tanta MuktiSamiti”).
- Tree Plantation and subsequent responsibility of nurture of trees planted at “Dharangutti-Gayran” through National Service Scheme (NSS) Dr, JJMCOE, Jaysingpur.
- Donation to many organizations for overall development such as “Rayat Shikshan Santha’s, Swami Ramanand Vidyalaya” Ramanadnagar.

Over the last 25 years:

Since Last 25 years I have been in Engineering Education (Mechanical Engineering). I am in Continuous contact with Alumni. I developed many curricular and co-curricular Projects/Programs for Students in order to imbibe technical attitude in them i.e. Paper Publications, Model Making, Sponsored Projects, etc.

Prof. (Dr.) Sanjay H.Sawant
DR. VILAS B. SONDUR

CONTACT DETAILS

Address:
“Raghavendra Krupa”
52, V Cross, Dr. R. K. Marg,
Near Subhash Market, Hindwadi,
Belgaum, Karnataka 590011
E-mail: vbsondur@gmail.com
Mob: (+91 9886750242)

EDUCATION

Doctor of Philosophy (Ph.D.) in Mechanical Engineering,
Visvesvaraya Technological University, Belgaum, Karnataka, India
Thesis -“Performance Optimization of a Single-Stage Relief Valve Using Bond Graph Method”

Master of Engineering,(M.E.) in Mechanical Engineering,
Distinction,
Indian Institute of Science (IISc), Bangalore, Karnataka, India 1978

Bachelor of Engineering,(B.E.) in Mechanical Engineering,
First Class with Distinction
Karnataka Regional Engineering College (presently known as NITK), Surathkal,
Karnataka, India 1976
Generally was a rank holder to university throughout engineering education

Education prior to B.E course,
Generally the academic performance was very good throughout. Since father was a state government employee, the schooling was in different parts of Karnataka state. Completed the S.S.L.C. from Belgaum and secured National Merit Scholarship. Completed the P.U.C. from Karnataka Science College, Dharwad, affiliated to Karnataka University.
PROFESSIONAL EXPERIENCE

1) After a brief stint in industry, joined M S Ramaiah Institute of Technology, Bangalore as Lecturer in Mechanical Engineering in 1979.

2) Joined Gogte Institute of Technology, Belgaum in 1982 as Assistant Professor of Mechanical Engineering. Was with Gogte Institute till 2009 and occupied positions of Professor (Mech Engg), Head of Department (Mech Engg & IP Engg) at different times.

3) Towards the end of 2009 joined Amruta Institute of Engineering and Management sciences, Bangalore as its Principal till April 2011.

4) Joined Maratha Mandal Engineering College in April 2011. Worked as its Principal & Director till July 2014.

5) Worked as a visiting Post Graduate Faculty member at the engineering college of Ashok Rao Mane Group of Institutions from August 2014 to November 2014.

6) Presently, running an academy to train students for Joint Entrance Examination for admission to IITs - teaching Physics and Mathematics of JEE syllabus.

✓ Worked on several committees of Visvesvaraya Technological University.
✓ Have been chairman / member of Board of Examiners of VTU several times.
✓ Carried out inspection of engineering colleges affiliated to VTU as a member of Local Inquiry committee, on many occasions.

ACADEMIC ACHIEVEMENTS

- Have reviewed a few research papers for the prestigious international journal Simulation, Modeling Practice and Theory (Elsevier B.V.).

- Published many research articles in National and International Journals of repute

- Presented research papers in prestigious conferences held in India and abroad

- Three candidates secured their Ph.D. degree under my supervision and one more has submitted his thesis and is likely to be awarded Ph.D. shortly.
• Given a number of invited talks in many engineering and management educational institutions. Given talks on preparation for NBA accreditation, Bondgraph technique, and on many other technical topics.

• Presented a research paper titled "Issues in the design of equiripple FIR higher order digital differentiators using weighted least squares technique", at the 2007 IEEE International Conference on Signal Processing and Communications (ICSPC 2007), Nov 24-27, 2007, Dubai, UAE
**NAME OF FACULTY:** Vinayak R.Ghatage  
**Qualification:** M. Tech [Design Eng.], B.E (Mech.)  
**Designation:** Asst. Prof. Mechanical Eng. Dept.  
SGMCOE, Mahagaon  
Tal: Gadchinglaj, Dist: Kolhapur (MH) - 416503.

- Date of Birth: 18/04/1984
- Experience: Teaching- 10 Years  Total-10Years
- Papers Presented in National / International Conferences: 020
- Papers Published: 00
- Workshop/FDP/STTP’s attended: 02
- Participation in Course/Syllabus Material Developed: 01
- Book Published: 00
- Expert Session /Guest Lectures Delivered: 00

**Major Responsibilities:**

- I/C HOD (2016 to till date)
- NAAC Criteria 06 Head
- Internal Sr. Supervisor A.Y.2017_18 [Odd SEM]
- Worked as I/C H.O.D. at SGM Poly. For A.Y.2015-16

**Professional Membership:**

- Life Time Member of International Association of Engineering

**Area of Expertise:** Design eng., Metrology, Automobile
<table>
<thead>
<tr>
<th>Name of Faculty:</th>
<th>Prof. Sanjeev R Marajakke</th>
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<td>Prof. Shidagonda I. Jabade</td>
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<tr>
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<td>Prof. Digvijay Dinkar Powar</td>
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<td><strong>Name of Faculty</strong></td>
<td>Prof. Desai Rahul Shivajirao</td>
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<td><strong>Designation</strong></td>
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<tr>
<td><strong>Email ID</strong></td>
<td><a href="mailto:desairahul035@gmail.com">desairahul035@gmail.com</a></td>
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<td><strong>Date of Joining the Institute:</strong></td>
<td>01/06/2017</td>
</tr>
<tr>
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<td>-</td>
</tr>
<tr>
<td><strong>Qualifications:</strong></td>
<td>M-Tech</td>
</tr>
<tr>
<td><strong>Courses taught at Diploma level:</strong></td>
<td>-</td>
</tr>
<tr>
<td><strong>Total Experience:</strong></td>
<td>4.5 Years</td>
</tr>
<tr>
<td><strong>Paper Published:</strong></td>
<td>04</td>
</tr>
<tr>
<td><strong>Workshops:</strong></td>
<td>03</td>
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</table>
### Faculty Profile

<table>
<thead>
<tr>
<th>Name of Faculty</th>
<th>Amol Thalu Kambale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Department</td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td>Date of Joining</td>
<td>02nd Jan 2017</td>
</tr>
<tr>
<td>Aadhar Card Number</td>
<td>6663 0290 8244</td>
</tr>
<tr>
<td>Qualification</td>
<td>M. Tech. In Machine Design</td>
</tr>
</tbody>
</table>

**Courses Taught**
- Control Engineering,
- Noise and Vibrations
- Analysis of Mechanical Elements
- Metallurgy
- Electric Vehicles

**Experience**
6 Years of Teaching Experience

**Paper Published**

**Workshops/FDP/Seminars Attended**
- Two Days Workshop on “Solid Works” held on 16th & 17th February 2017 at Sant Gajanan Maharaj College of Engineering
- One Day Faculty Development Workshop on “Computer Aided Machining Using Edge cam Software”
- Thirteen Day Faculty Development Program under DST-NIMAT Project Sponsored by National Science and Technology Entrepreneurship Development Board (NSTEDB), Department of Science and Technology (DST), Govt. of India, New Delhi in collaboration with Sant Gajanan Maharaj Rural Polytechnic from 6th to 18th December 2016.
- One Day National Level Technical Symposium on “Paper Presentation” held on 20th March 2015 at Sant Gajanan Maharaj College of Engineering, Mahagaon.

**Conferences Participated**
<table>
<thead>
<tr>
<th><strong>Name of Faculty</strong></th>
<th>Mr. Deepak Jotiram More</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Designation</strong></td>
<td>Assistant Professor</td>
</tr>
<tr>
<td><strong>Department</strong></td>
<td>Mechanical Engineering</td>
</tr>
<tr>
<td><strong>Date of Joining</strong></td>
<td>01st Sept. 2021</td>
</tr>
<tr>
<td><strong>Aadhar Card Number</strong></td>
<td>949784991928</td>
</tr>
<tr>
<td><strong>Qualification</strong></td>
<td>M.E [Heat Power Engg]</td>
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<table>
<thead>
<tr>
<th><strong>Courses Taught</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Electrical Technology</td>
</tr>
<tr>
<td>• Thermal Engineering</td>
</tr>
<tr>
<td>• Refrigeration &amp; Air Conditioning</td>
</tr>
<tr>
<td>• Engineering Drawing</td>
</tr>
<tr>
<td>• Engineering Graphics</td>
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<tr>
<th><strong>Experience</strong></th>
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<tr>
<td>10 Years of Teaching Experience</td>
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<tr>
<td>01 Years of Industrial Experience</td>
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<th><strong>Paper Published</strong></th>
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<tr>
<td>• International Education and Research Journal “A Review on evaluation and comparison of performance of domestic refrigerator by using different refrigerants”</td>
</tr>
<tr>
<td>• National conference on recent trends in Thermal engineering by SVERI’S COE Pandharpur. [RTITE-15]</td>
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<tr>
<th><strong>Workshops/FDP/Seminars Attended</strong></th>
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<tbody>
<tr>
<td>Participated in workshop on “Capacity Building of polytechnic through NBA process” held during 29 Dec, 2018 organized by KIT’s College of Engineering, Kolhapur.</td>
</tr>
<tr>
<td>Participated in workshop on “Heat Transfer Equipments “held during 23th Mar to 25th Mar, 2015 organized by Thermax India Ltd., Pune</td>
</tr>
<tr>
<td>Participated in workshop on “NITTTR Student Evaluation (Module –III:IPD)” held during 07th to 11th Jan, 2019 organized by Dr. A.D.Shinde College of Engineering, Gadhinglaj.</td>
</tr>
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<td>Sr No.</td>
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</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>6</td>
</tr>
<tr>
<td>Name of the Faculty</td>
</tr>
<tr>
<td>---------------------</td>
</tr>
<tr>
<td>Designation</td>
</tr>
<tr>
<td>Department</td>
</tr>
<tr>
<td>Date of joining in the institute</td>
</tr>
<tr>
<td>Unique ID</td>
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<tr>
<td>Qualification</td>
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<tr>
<td>Courses taught at diploma level</td>
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<td>Total Experience</td>
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<thead>
<tr>
<th>Sr No.</th>
<th>Workshops/Seminars/Activities</th>
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<tbody>
<tr>
<td>1</td>
<td>Attended 4 day’s workshop at AISSMS, Pune.</td>
</tr>
<tr>
<td>2</td>
<td>Attended two day’s workshop on “MATLAB” at ADCET, Ashta</td>
</tr>
<tr>
<td>3</td>
<td>Participated in state level paper presentation and project presentation competitions during graduation studies.</td>
</tr>
<tr>
<td>4</td>
<td>Represented as departmental Academic Coordinator.</td>
</tr>
<tr>
<td>5</td>
<td>Represented as FC- Coordinator since last three years.</td>
</tr>
<tr>
<td>6</td>
<td>Working as Coordinator of syllabus setting for Second year engineering B.Tech(CBCS), sponsored SUK Kolhapur at DACOE, Karad.</td>
</tr>
<tr>
<td>7</td>
<td>Working as central NSS coordinator.</td>
</tr>
<tr>
<td>8</td>
<td>Represented as departmental EESA Committee coordinator.</td>
</tr>
<tr>
<td>Name of the Faculty</td>
<td>Prof. Mamata N Patil</td>
</tr>
<tr>
<td>--------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Designation</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Department</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Date of the joining in the institute</td>
<td>02 July 2018</td>
</tr>
<tr>
<td>Unique ID</td>
<td>3503 9902 6425</td>
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<tr>
<td>Qualification</td>
<td>B.E, M.E</td>
</tr>
<tr>
<td>Courses taught at diploma level</td>
<td>Basic Electrical Engineering, AC Machine, DC Machine, Industrial Electrical System, Management &amp; Entrepreneurship, Electrical Power Generation</td>
</tr>
<tr>
<td>Total Experience</td>
<td>2 Years 6 Months</td>
</tr>
<tr>
<td>Paper Published</td>
<td>High Static Gain for Solar Application Using Modified SEPIC Converter, International Journal of Advanced Engineering Research and Studies E-ISSN2249-8974</td>
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<td>Sr No.</td>
<td>Workshops/Seminars/Webinars/Quizes</td>
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<tr>
<td>1</td>
<td>Two Day Workshop on “Digital Image Processing Using MATLAB” from 28th to 29th December 2017</td>
</tr>
<tr>
<td>2</td>
<td>One Day Workshop on “New Revised Syllabus for T. Y. B. Tech Electrical Engineering Held by the Department of EE on 20th February 2021</td>
</tr>
<tr>
<td>Name of the Faculty</td>
<td>Prof. Yallappa S. Bhajantri</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td>Designation</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Department</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Date of the joining</td>
<td>22 August 2016</td>
</tr>
<tr>
<td>in the institute</td>
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<td>Courses taught at</td>
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<td>diploma level</td>
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<td>Workshops/Seminars/Webinars/Quizes</td>
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<tr>
<td>1</td>
<td>Online Quiz on “Control Systems”</td>
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<td>2</td>
<td>one week webinar on “AUTOCAD-2D BASIC”</td>
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<tr>
<td>3</td>
<td>One Week Faculty Development Programme on &quot;Optimization Techniques with application to Electrical Engineering&quot;</td>
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<tr>
<td>4</td>
<td>Webinar on &quot;Enterpreneurship Ecosystem&quot;</td>
</tr>
<tr>
<td>5</td>
<td>Webinar on &quot;Road safety and pedestrian safety awareness&quot;</td>
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<tr>
<td>6</td>
<td>National level Online Quiz on &quot;Power System Engineering&quot;</td>
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<tr>
<td>7</td>
<td>webinar on “Power Electronics in Industry”</td>
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<tr>
<td>8</td>
<td>National level Online Quiz on &quot;Electrical Machines&quot;</td>
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<tr>
<td>9</td>
<td>National Seminar(web) on &quot;Ancient Indian Science and Technology&quot;</td>
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<tr>
<td>10</td>
<td>Webinar on &quot;Basics of vector control in AC Machines&quot;</td>
</tr>
<tr>
<td>11</td>
<td>Webinar on &quot;Energy and Environment Problems Facing the Third World and their Probable Solutions for Sustainable Development and Poverty Alleviation&quot;</td>
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<tr>
<td>12</td>
<td>Webinar on &quot;Artificial Intelligence in Electrical Engineering&quot;</td>
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<tr>
<td>13</td>
<td>E-Quiz on &quot; Data Base Management System&quot;</td>
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<tr>
<td>14</td>
<td>E-Quiz on &quot; Data Structures&quot;</td>
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<tr>
<td>15</td>
<td>One Day Workshop on “ Recent Trends in Power system and Drives” Sponsored by TEQIP-II</td>
</tr>
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<td></td>
<td>Event Description</td>
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<td>-----------------------------------------------------------------------------------------------------------</td>
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<td>16</td>
<td>One Day Workshop on “Virtual Labs” Sponsored by National mission on Educational through information and communication Technology, MHRD, GOI.</td>
</tr>
<tr>
<td>17</td>
<td>One week short term training program on “Power Quality and Industrial Drives” Sponsored by ISTE, New Dheli</td>
</tr>
<tr>
<td>18</td>
<td>One Day Workshop on “ New Revised Syllabus for T. Y. B. Tech Electrical Engineering Held by the Department of EE on 20th February 2021</td>
</tr>
<tr>
<td>Name of the Faculty</td>
<td>Prof. Prasanna I Kanthi</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>Designation</td>
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<tr>
<td>Department</td>
<td>Electrical Engineering</td>
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<td>Paper Published</td>
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<tr>
<th>Sr No.</th>
<th>Workshops/Seminars/Webinars/Quizes</th>
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<tbody>
<tr>
<td>1</td>
<td>Webinar on Faculty Development Program on “use of LMS, Virtual Teaching and OBE Software for Engineering Colleges” Organized by vmedulife Software Services on September 3, 2020</td>
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<tr>
<td>2</td>
<td>Webinar on Faculty Development Program on “use of LMS, Virtual Teaching and OBE Software for Engineering Colleges” Organized by vmedulife Software Services on August 13, 2020</td>
</tr>
<tr>
<td>3</td>
<td>A Short course on “Learn to Design your own Home solar system” by Energy Swaraj Foundation on 20 August 2020</td>
</tr>
<tr>
<td>4</td>
<td>One Day Workshop on “Training for Training and Placement Coordinators” at DKTE Society’s Textile and Engineering Institute Ichalkarnji on March 26, 2021</td>
</tr>
<tr>
<td>Name of Faculty: Mr. Mahadev Appasaheb Bandi</td>
<td></td>
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<tr>
<td>---------------------------------------------</td>
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<tr>
<td><strong>Designation:</strong> Assistant Professor.</td>
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<tr>
<td><strong>Department:</strong> Electrical Engineering</td>
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<td><strong>Date of Joining the Institute</strong></td>
<td>01/06/2020</td>
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<tr>
<td><strong>Qualification:</strong> ME (Electronics)</td>
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<tr>
<td><strong>Courses taught at Diploma Level</strong></td>
<td>Electrical Measurement, Electrical Technology, Basic Electrical Engineering, Elements of Electronics, Elements of Electrical Engg, Instrumentation, Measurement &amp; Control, Electrical &amp; Electronics Measurement.</td>
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<tr>
<td><strong>Total Experience:</strong> 9 Years 10 Months</td>
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<tr>
<td><strong>Paper Published:</strong></td>
<td>1. Fire Detection by using Digital Image Processing Technique (IJSR Publication) 2. Video Processing for Flame Detection (IJIR Publication)</td>
</tr>
<tr>
<td>Name of the Faculty</td>
<td>Prof. Devanand Shivaji Patil</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------------</td>
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<tr>
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**Paper Published**

- **“Protocol analysis for mobile ad-hoc networks (MANET) using NS2”** at “Conference on Evolutionary trends in Information Technology” at VTU in May 2011.
- **“Analysis of Black Hole Attacks in Mobile Ad-Hoc Network (MANET) and Simulation”** at first national level conference on "Wireless control and communication technology "(NCWCT)-2011 at Ambedkar Institute of Technology, Bangalore.
- **“Diagnosis Of Black-Hole Attacks In Aodv Protocol In Ad-Hoc Networks Through Ns2 Simulation Using Udp Agent.”** This paper is published in International Journal for multidisciplinary research and advances in engineering (IJMRAE) in April 2012.
- **“Cope up with black hole attacks in AODV protocol in mobile ad-hoc networks (MANET) by end to end discovery.”** This paper is presented in 2<sup>nd</sup> International Conferences on Emerging Trends in Engineering (ICETE-1013) on 22<sup>nd</sup> & 23<sup>rd</sup> Feb 2013 at Dr.J.J Magdum College of Engineering, Jaysingpur. This paper is also published in IOSR journal of Electronics & Communication Engineering.

**Sr No. | Workshops/Seminars/Webinars/Quizzes(Attended)**
---|------------------
1 | “Embedded Systems Design-Principles and Practice” Faculty Development Workshop organized by BITES and BVBCET on 15<sup>th</sup> November 2010 at BVBCET, Hubli.
<table>
<thead>
<tr>
<th>Sr No.</th>
<th>Workshops/Seminars/Webinars/Quizzes (Conducted)</th>
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<tbody>
<tr>
<td>1</td>
<td>I have conducted one day workshop on &quot;Introduction to LaTeX&quot; organized by Electronics &amp; Communication Department at MMEC on 27-10-2013.</td>
</tr>
<tr>
<td>2</td>
<td>I have attended one day workshop on &quot;Introduction to LaTeX&quot; organized by Department of Electronic Engg K.I.T.’s College of Engineering Kolhapur on 5th May 2012.</td>
</tr>
<tr>
<td>3</td>
<td>I have participated in 3 days workshop on MATLAB &amp; SIMULINK organized by the department of electronics and Communication Engineering from 15th March to 17th March 2013 at MMEC, Belgaum.</td>
</tr>
<tr>
<td>4</td>
<td>I have attended two days’ workshop at KIT, Kolhapur on IoT Technology in 2017.</td>
</tr>
<tr>
<td>5</td>
<td>I have attended two days’ workshop on Amazon Web Services at SGMCOE, Mahagaon, in 2021.</td>
</tr>
<tr>
<td></td>
<td>Sr No.</td>
</tr>
<tr>
<td></td>
<td>I have conducted one day workshop on &quot;Introduction to LaTeX&quot; organized by Electronics &amp; Communication Department at MMEC on 27-10-2013.</td>
</tr>
<tr>
<td></td>
<td>I have conducted one day workshop on “NS2 for wired &amp; Wireless Network” On Windows platform at Sharad Institute of Technology, Polytechnic Yadrav on 19-10-2013.</td>
</tr>
<tr>
<td></td>
<td>I have conducted one day workshop on “Basics of C” at Sharad Institute of Technology, Polytechnic Yadrav in 2010.</td>
</tr>
<tr>
<td></td>
<td>I have conducted one day workshop on “Introduction to LaTeX” organized by Electronics Engineering Department at Dr JJMCOE in August 2014.</td>
</tr>
<tr>
<td></td>
<td>I have conducted TWO day workshop on &quot;Introduction to LaTeX&quot; at SGMCOE organized by Electrical Engineering Department at SGMCOE in Nov 2021.</td>
</tr>
<tr>
<td>Name of the Faculty</td>
<td>Prof. Shilpa Suryavanshi</td>
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<td>---------------------</td>
<td>--------------------------</td>
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<tr>
<td>Designation</td>
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<tr>
<td>Department</td>
<td>Electrical Engineering</td>
</tr>
<tr>
<td>Date of the joining in the institute</td>
<td>20 October 2021</td>
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<tr>
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<th>Workshops/Seminars/Webinars/Quizes</th>
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<tbody>
<tr>
<td>1</td>
<td>Attended one week online STTP (Short Term Training Program) on “Battery Management &amp; Control Techniques in Electrical Vehicles” organized by Hira Sugar Institute of Technology Nidasoshi, Belgaum.</td>
</tr>
<tr>
<td>2</td>
<td>Certified in Solar PV Designing course using Helioscope Software conducted by kwatt solution Pvt. Lmtd.</td>
</tr>
<tr>
<td>3</td>
<td>Certified in Advance Solar PV Syst designing course conducted by kWatt solution Pvt. Lmtd.</td>
</tr>
<tr>
<td>Name of the Faculty</td>
<td>Prof. Veeranna Melmuri</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------</td>
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<tr>
<td>Designation</td>
<td>Assistant Professor</td>
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<tr>
<td>Department</td>
<td>Electronics &amp; Telecommunication</td>
</tr>
<tr>
<td>Date of the joining in the institute</td>
<td>20 July 2016</td>
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<tbody>
<tr>
<td>1</td>
<td>“National Level Webinar on Simulation Driven Innovation for e-Mobility”</td>
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<tr>
<td>2</td>
<td>Webinar on “Manufacturing in Current Scenario : Industry 4.0”</td>
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<tr>
<td>3</td>
<td>“Webinar on Energy Conservation Technologies : present, past and Future”</td>
</tr>
<tr>
<td>4</td>
<td>“Webinar on Recent Trends in Nanotechnology”</td>
</tr>
<tr>
<td>5</td>
<td>“Design &amp; Implementation of Hardware Accelerators and Protocols on FPGA”</td>
</tr>
<tr>
<td>6</td>
<td>Participated in a two days national level workshop on “MATLAB and its Application” on 27th &amp; 28th August 2014 at CMR Engg College.</td>
</tr>
<tr>
<td>7</td>
<td>Participated in a five days national level workshop on “Embedded System” during August 2014 at GNEC.</td>
</tr>
<tr>
<td>8</td>
<td>Participated in one week faculty development programme on “Design and Implementation of hardware accelerators and protocols on FPGA” from 13th to 17th December 2018 at V.P.Dr.P.G Halkatti College of Engineering Vijayapur.</td>
</tr>
<tr>
<td>9</td>
<td>Participated in online NPTEL course on “signals and systems” and secured 60%.</td>
</tr>
<tr>
<td>10</td>
<td>Participated in online NPTEL course on “Digital Electronics” and secured 70%.</td>
</tr>
<tr>
<td>Name of the Faculty</td>
<td>Prof. Pradeep Chindhi</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----------------------</td>
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<tr>
<td>Designation</td>
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<td>Department</td>
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<td>Memberships</td>
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<td>Number of Research Project Completed</td>
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**Special Achievements**

- IICDC 2019-21 Conclave Winners - Top 30
- Award winning Team. IITB Task Based Training

**Subjects Familiar with**

**Name of Faculty**: Mr. Amarsinh Baburao Farakte  

**Designation**: HOD E&TC  

**Department**: E&TC  

**Date of Joining the Institute**: 01-08-2012  

**Unique ID**:  

**Qualification**: Diploma IE, BE(E&TC), ME(E&TC), Ph.D. Pursuing  

**Courses Taught at Diploma level**: Basic Electronics, Linear Integrated Circuits, Embedded Systems, Analog Communication.  


**Total Experience**: 10 Years  

**Paper Published**: 06  

**Workshops**

<table>
<thead>
<tr>
<th>Name of workshop</th>
<th>Duration</th>
<th>Organized By</th>
<th>DOI of Workshop</th>
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<tbody>
<tr>
<td>Analog Electronics</td>
<td>2 Week</td>
<td>IIT Kharagpur sponsored at Sanjay Ghodwat Institute, Atigare, Kolhapur</td>
<td>16th July 2014</td>
</tr>
<tr>
<td>Measurement Techniques in RF by Agilent Technologies</td>
<td>1 Day</td>
<td>PROCOM Enterprises, Technology Solution &amp; Bharati Vidyapeeth’s, Kolhapur</td>
<td>16th July 2014</td>
</tr>
<tr>
<td>Awareness of Internal Quality Assurance and NAAC Accreditation</td>
<td>2 Days</td>
<td>NAAC Sponsored at Shivaji University, Kolhapur</td>
<td>2nd Jan. 2015</td>
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<tr>
<td>Internet of Things</td>
<td>2 Days</td>
<td>ISTE Sponsored at Sant Gajanan Maharaj College of Engineering, Mahagaon</td>
<td>30th &amp; 31st Dec. 2016</td>
</tr>
<tr>
<td>NSS web Portal Avyukta</td>
<td>1 Day</td>
<td>Shivaji University, Kolhapur</td>
<td>12th July 2017</td>
</tr>
<tr>
<td>New Dimensions of Leadership &amp; Communication</td>
<td>1 Day</td>
<td>Mirror Systems Pvt. Ltd. Pune</td>
<td>24th July 2017</td>
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<tr>
<td>Short Term Training Program on Recent Trends in Advanced Comm. &amp; Embedded System</td>
<td>1 Week</td>
<td>ISTE Sponsored at Bharati Vidyapeeth’s, Kolhapur</td>
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<tr>
<td>Universal Human Values</td>
<td>1 Week</td>
<td>AICTE Sponsored at DYP CET, Kolhapur</td>
<td>19th July 2018</td>
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<tr>
<td>Implementation of CBCS</td>
<td>1 Day</td>
<td>Shivaji University Sponsored and Organized by Dr. J.J.M.C.O.E Jayasingpur</td>
<td>28th August 2018</td>
</tr>
</tbody>
</table>
Name of Faculty:- Matale Sachin Tukaram

| Designation:- | Assistant Professor, Academic coordinator |
| Department:- | Electronics & Telecommunication Engineering |
| Date of Joining the institute | 16 June 2014 |
| Unique ID:- | |
| Qualification:- | ME in ETC |

### Courses Taught at Diploma Level:-
- Advance Communication Systems
- Basic Electronics
- Computer Architecture & Maintenance
- Professional Practice, Development of Life skills

### Courses Taught at Degree Level:-
- Electrical Technology & Industrial Electronics
- Digital Design
- Basic Electrical Engineering
- Workshop Practice (Electronics)
- Satellite Communication
- Digital Image Processing
- Antenna and Wave Propagation
- Electromagnetic Engineering
- Digital Signal Processing
- Analog Electronics Engineering
- Communication Engineering
- Fundamentals of Electronics & Computers
- Programming Language – I
- Programming Language - II

### Total Experience:-
- Industrial – 7 Years
- Teaching – 11 Years

### Papers Published:-
- International – 4
- National - 2

### Workshops:-
- 22 Nos
<table>
<thead>
<tr>
<th>Name of Faculty:</th>
<th>Prof. Sushil R. Sankpal</th>
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<tr>
<td>Designation:</td>
<td>Asst. Professor</td>
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<td>Department:</td>
<td>Electronics and Tele-Communications</td>
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<tr>
<td>Qualifications:</td>
<td>M. Tech (VLSI Design Eng.), B. E (E&amp;TC)</td>
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<td>Workshops:</td>
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</table>
NAME OF FACULTY

Qualifications

Designation. SGMCOE, Mahagaon,
Tal: Gadchinglj, Dist: Kolhapur (MH)- 416503.

- Date of Birth: 11/01/1987
- Experience: Teaching 07, Industry-02, Total - 09 Years
- Papers Presented in National / International Conferences: 04
- Papers Published : 04
- Workshop/FDP/STTP’s attended: 15
- Participation in Course/Syllabus Material Developed : 02
- Book Published : no
- Expert Session /Guest Lectures Delivered : no
- Awards: 0
- Major Responsibilities : Teaching hours – 16/week
  NAAC Criteria 6 Head
  Dept. Project Coordinator
- Professional Membership: No
- Area of Expertise: VLSI & Embedded Systems

MOBLE: 9742106597
MAIL: sangamesh1187@gmail.com
Permanent Address: BELAGAVI
590006
<table>
<thead>
<tr>
<th>Name of Faculty</th>
<th>Mr. Jaysing Pandurang Haladkar</th>
</tr>
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<tbody>
<tr>
<td>Designation</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Date of Joining the Institute</td>
<td>Poly-12/07/2020 BE-02/01/2017</td>
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<td>Unique ID</td>
<td>ME (E&amp;T)</td>
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<td>Qualification</td>
<td>Video Engineering, Transducer and Measurement, Mobile Communication, Analog Communication, Mechatronics, Control System, Optical Communication,</td>
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<tr>
<td>Courses taught at diploma level</td>
<td>Mobile Communication, Analog Communication, Mechatronics, Control System, Optical Communication,</td>
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<td>Total Experienced</td>
<td>10Years 9 Month</td>
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<td>Paper Published</td>
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</table>

Mr. J.P. Haladkar and Prof. J.K. Patil published paper entitled on “Relay based Hand-off technology in dense MANET” in IJAIR international journal of “Wireless communication” of ISSN No. from 2278-7844. Volume 04, Issue 08 August 2015.


<table>
<thead>
<tr>
<th>Workshops</th>
<th>13</th>
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Attended 5 days STTP on “RECENT SOFTWARE USED FOR RESEARCH.” In association with ISTE, New Delhi. Dated -11 Jan 2013.

Attended 5 days industrial training at M/S Siemens LTD. Kalwa Mumbai on “BASIC COURSE ON AUTOMATION” in association with MSBTE, Mumbai. Dated-17 Feb.2014.

Participated 2 week Faculty Development Program (FDP) on “Entrepreneurship Development” in association with DST, Govt. of India, New Delhi in Collaboration with SGMRP Mahagaon. Dated from 6-02-2016 to 18/12/2016.

Attended 2 days National level workshop on “Internet of Things.” In association with ISTE New Delhi. Dated -30 December 2016


Participated and completed 1 Day orientation program on “Understanding CO PO PEO PSO in revised NAAC structure” organized by Department of E & TC SGMCOE Mahagaon, Dated 17 Feb.2018.

Attended 1 day seminar on “Intellectual Property Rights Patents and Technology Transfer.” In association with SGM Research Group and SGMCOE Mahagaon Dated -3 March 2018.


Attended 1 Day workshop on “Training and Placement” under lead college cluster scheme at DKTE Ichalkaranji dated 17th February 2019.


Attended 1 Day workshop on “Training and Placement” under lead college cluster scheme at DKTE Ichalkaranji dated 26 March 2021.
<table>
<thead>
<tr>
<th>Name of the Faculty</th>
<th>Prof. Geeta B Kalkhambkar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Designation</td>
<td>Assistant Professor</td>
</tr>
<tr>
<td>Department</td>
<td>Electronics and Telecommunication Engineering</td>
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<tr>
<td>Date of the joining in the institute</td>
<td>01 July 2015</td>
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<tr>
<td>Qualification</td>
<td>B.E, M Tech, (Ph.D)</td>
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<tr>
<td>Total Experience</td>
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<td>04</td>
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<tr>
<td>Awards/Recognition</td>
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</table>
| Special Achievements | - IICDC 2019-21 Conclave Winners - Top 30  
- Award winning Team. IITB Task based training winner  
| Subjects familiar with | Electromagnetics, Antennas and Wave Propagation, RF and Microwave, Wireless and Mobile Communication, Satellite Communication, Signals and Systems, DSP, Digital Electronics and Microcontrollers, Transducer and Sensors, Optical Communications |
MOHINI B. RASALE
BE Electronics, ME E&TC
Assistant Professor, E&TC Dept., SGMCOE, Mahagaon,
Tal: Gadningal, Dist: Kolhapur (MH)- 416503.

- Date of Birth: 21/05/1989

- Experience: Teaching-6Years, Industry -00Years, Total-06 Years

- Papers Presented in National / International Conferences : 02

- Papers Published :03

- Workshop/FDP/STTP’s Attended :03

- Expert Session /Guest Lectures Delivered :02

- Professional Membership:
  - ISTE Member

### Faculty Profile

<table>
<thead>
<tr>
<th>Name of Faculty</th>
<th>Mr. Shivalingayya Giramalayya Swami</th>
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<tbody>
<tr>
<td>Designation</td>
<td>Assistant Professor and Head of Department</td>
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<tr>
<td>Department</td>
<td>Computer Science and Engineering</td>
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<td>Date of Joining</td>
<td>22\textsuperscript{nd} June 2017</td>
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<tr>
<td>Aadhar Card Number</td>
<td>3471 4358 5897</td>
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<td>Qualification</td>
<td>M. E. Computer Engineering</td>
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<table>
<thead>
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<th>Courses Taught</th>
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<tbody>
<tr>
<td>- Discrete Mathematical Structures,</td>
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<tr>
<td>- Advanced Database System</td>
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<tr>
<td>- C Programming</td>
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<tr>
<td>- Data Structures</td>
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<tr>
<td>- Operating System</td>
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<td>- Database Engineering</td>
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<table>
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<th>Paper Published</th>
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| - Presented Paper in cPGCON 2016  
Post Graduate Conference of Computer Engineering  
Held at Pimpari Chinchawad College of Engineering, Pune.  
Title of Paper: Effective Web Searching using Crawler. |
| - Extracting web through deep web Interface: An Overview  
| - Efficient Web Searching using Crawler. Ignited Minds Journals  
(Journal of Advances in Science and Technology Vol. 12, Issue 25 (Special Issue) December 2016, ISSN 2230-9659) |

<table>
<thead>
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<th>Workshops/FDP Attended</th>
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</table>
| 5 Days FDP on “Information Security”  
Annasaheb Dange College of Engineering and technology, Ashta. |
| 2 Days Workshop on “Digital Image Processing”  
Sant Gajanan Maharaj College of Engineering, Mahagaon. |
<p>| 2 Days Workshop on “Data Analysis using Hadoop” |
| 3 Days Workshop on “Angular 2” |</p>
<table>
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<tr>
<th>Workshops/FDP/ Seminars Attended</th>
<th>2 Days Training Program on “Angular 7”</th>
<th>QuestIT Pvt. Ltd. Mumbai.</th>
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<tr>
<td></td>
<td>2 Days Training Program on “Microsoft Business Intelligence (MSBI)”</td>
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<td></td>
<td>1 Day National Seminar on “Angular”</td>
<td>Sant Gajanan Maharaj College of Engineering, Mahagaon.</td>
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<td></td>
<td>2 Days Workshop on “Block-Chain Technology”</td>
<td>D.K.T.E, Ichalkaranji.</td>
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<td></td>
<td>Syllabus Revision of Third Year B.Tech.</td>
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<td>Faculty Profile</td>
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<tr>
<td><strong>Name of Faculty</strong></td>
<td>Mr. Mahesh Shankar Bhandigare</td>
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<tr>
<td><strong>Designation</strong></td>
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<tr>
<td>- Java Programming</td>
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<td>- Object Oriented Programming</td>
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<td>- C Programming</td>
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<td>- Software Testing Quality Assurance</td>
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<td>- Information Security</td>
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<td>- Database Engineering</td>
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<td>- 01 Industrial Experience</td>
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<tr>
<td>- A survey on user search goal inferring system(IJCET )</td>
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<tr>
<td>- Intelligent Browser Technique for User Search Goal Interface Using Feedback Session(IJARCSMS)</td>
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<td>8 Days workshop on “Full stack android developer”</td>
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<td>2 Days Workshop on “Digital Image Processing”</td>
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<td>2 Days Workshop on “Data Analysis using Hadoop”</td>
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<tr>
<td>3 Days Workshop on “Angular 2”</td>
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<td>Workshops/FDP/Seminars Attended</td>
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## Faculty Profile

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<tr>
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<th>Miss. Achala Prakash Narayankar</th>
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<td><strong>Qualification</strong></td>
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### Courses Taught
- C programming
- C++ programming
- Data structure
- Software Engineering
- Computer Organization
- Computer Graphics
- Computer Graphics & Multimedia
- Operating System-II
- Advanced Computer Architecture
- Project Management
- Soft skills

### Experience
06 Years of Teaching Experience

### Paper Published
Presented Paper on Implementation and performance evaluation of channel reassignment algorithm for wireless mesh networks at

### Workshops/FDP Attended
- **One Day Preconference conference workshop on Advances in Computer and wireless Networks**
  - Hirasugar Institute of Technology
  - Nidasoshi
- **Two-days national level workshop on “INTERNET OF THINGS” under faculty development cell Approved by ISTE New Delhi**
  - Sant Gajanan Maharaj College Of Engineering
  - Mahagaon
- **One day seminar on “TRAINING PROGRAM ON SEXUAL HARRAEMENT OF WOMEN AT WORKPLACE”**
  - SHIVAJI UNIVERSITY
  - KOLHAPUR
<table>
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<tr>
<th>Three-days workshop on “<strong>BIG DATA &amp; HADOOP</strong>”</th>
<th>Sant Gajanan Maharaj College Of Engineering Mahagaon</th>
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<tbody>
<tr>
<td>Four Days Faculty Development Program on Machine Learning and Data Analytics</td>
<td>Hirasugar Institute of Technology Nidasoshi</td>
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<tr>
<td>One Day Workshop on Violence Against Children Challenges in Prevention</td>
<td>SHIVAJI UNIVERSITY KOLHAPUR</td>
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<tr>
<td>Syllabus Revision Workshops</td>
<td>Syllabus Revision of Second Year B.Tech.</td>
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<tr>
<td>Name of Faculty</td>
<td>Mr. Bhagwat B. Gutte</td>
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<td>-------------------------</td>
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<td>Computer Science and Engineering</td>
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<td>Date of Joining</td>
<td>02\textsuperscript{nd} Jan 2017</td>
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<td>9941 7977 9064</td>
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| Courses Taught          | Discrete Mathematical Structures, |
|                        | Advanced Database System         |
|                        | C Programming                    |
|                        | Data Structures                   |
|                        | Operating System                  |
|                        | Database Engineering              |

| Experience              | 02 Industrial and 08 Years of Teaching Experience |

| Paper Published         | ADVANCE TOWARDS SIMILARITY SEARCH SYSTEM IN SYNCHRONISED DATASET (IJARES, JULY 2014) |

| Workshops/FDP Attended  | Linux Operating System & Open Source | SVERI College of Engineering (Polytechnic), Pandharpur. |
|                        | Internet of Things                   | Sant Gajanan Maharaj College of Engineering, Mahagaon. |
|                        | Digital Image Processing             |                                                 |
|                        | Data Analysis using Hadoop           |                                                 |
|                        | Angular 2                            |                                                 |
|                        | Recent Trends in Science and Technology |                                               |

**Mr. Shrikant Shashikant Gurav**  
M. E. Computer Science and Engineering  
Asst. Prof. CSE Department  
Sant Gajanan Maharaj College of Engineering, Mahagaon.

<table>
<thead>
<tr>
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<th>+91 9209623553</th>
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<tbody>
<tr>
<td>Email ID:</td>
<td><a href="mailto:shri9297@gmail.com">shri9297@gmail.com</a></td>
</tr>
<tr>
<td>Permanent Address</td>
<td>A/P-Bhuvaneshwarwadi Bhilawadi, Tal-Palus, Dist-Sangli Pin code: 416 303</td>
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Date of birth  
25th Jun 1988

<table>
<thead>
<tr>
<th>Experience</th>
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<table>
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<tr>
<th>Paper Publish in National /International Conference</th>
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<tbody>
<tr>
<td>Inventi Journal 2016 Post Graduate Conference of Computer Engineering Held at Pimpri Chinchawad College of Engineering, Pune.</td>
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<tr>
<td>Title of Paper: feedback session strategy for interfering user search goals</td>
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<tr>
<td>“Storage cost minimization through enhanced lossless data compression in Cloud by using hybrid combination of Huffman Coding and Dynamic bit Reduction” in inventi journal 2016</td>
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<td>Computer Network</td>
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<td>Microsoft DOT NET</td>
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<td>SQL-Fundamental</td>
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<td>Understanding Biological aging: A Data Mining Approch</td>
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<td>PHP</td>
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<td>Big Data and Hadoop</td>
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<tr>
<td>Internet of Things</td>
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<tr>
<td>Data Analytics using Hadoop and R</td>
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<tr>
<td>Annsasaheb Dange College of Engineering and technology, Ashta.</td>
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<td>Sant Gajanan Maharaj College of Engineering, Mahagaon</td>
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<td>-----------------------------------------------------------------------------------------------</td>
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<tr>
<td></td>
<td>Delivered Expert Lecture on “Information Security” Dr. A. D. Shinde Institute of Technology, Bhadgaon Gadhinglaj.</td>
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<tr>
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<tr>
<td>Major Responsibilities</td>
<td>Departmental Project Coordinator</td>
</tr>
<tr>
<td></td>
<td>Departmental Academic Coordinator</td>
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<td>National Service Scheme Coordinator</td>
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<td>Professional Membership</td>
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<td>Area of Expertise</td>
<td>1. Ad-Hoc Wireless Network (B.E. CSE)</td>
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<td>2. Real Time Operating System (B.E. CSE)</td>
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<td>3. Object Oriented Modeling Design (T.E. CSE)</td>
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<td>5. Computer Network (S.E. CSE)</td>
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# Faculty Profile

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<tr>
<th>Name of Faculty</th>
<th>Mr. Uday Dhanaji Patil.</th>
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<tr>
<td>Department</td>
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<tr>
<td>Date of Joining</td>
<td>01\textsuperscript{st} December 2017</td>
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<tr>
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<td>Qualification</td>
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<td>Presented Paper in cPGCON 2014</td>
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<td></td>
<td>Post Graduate Conference of Computer Engineering</td>
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<td></td>
<td>Held at at Matoshri College of Engineering, Nashik</td>
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<td></td>
<td>Title of Paper: Effective Sentence level clustering to find novel data using FRECCA.</td>
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<td>Dhanajay Mahadik College of Engineering Kagal.</td>
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<tr>
<td>2 Days Workshop on &quot;Digital Image Processing&quot;</td>
<td>Sant Gajanan Maharaj College of Engineering, Mahagaon.</td>
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<tr>
<td>2 Days Workshop on &quot;Data Analysis using Hadoop&quot;</td>
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<td>2 Days Workshop on &quot;Digital Image Processing&quot;</td>
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<td>3 Days Workshop on “Angular 2”</td>
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<td>2 Week Training Program on “ASP.NET”</td>
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<td>Netsoft Technology, Kolhapur.</td>
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<td>1 Week Training Program on “C# Programming”</td>
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<tr>
<td>1 Day National Seminar on “Angular”</td>
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<td>Sant Gajanan Maharaj College of Engineering, Mahagaon.</td>
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<tr>
<td>2 Week Training Program on “WebTechnology”</td>
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<td>Sai Computer &amp; Technology, Gargoti.</td>
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<tr>
<td>Name of Faculty</td>
<td>Ms. Pramila Ravasaheb Gadyanavar</td>
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<td>Date of Joining</td>
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<tr>
<td></td>
<td>- Discrete Mathematical Structures,</td>
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<td>- Data Structures</td>
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<td>- Microprocessor</td>
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<td>Paper Published</td>
<td>“Temperature measurement using soft computing techniques based on computer vision” presented in 2017 International Conference on Energy, Communication, Data Analytics and Soft Computing (ICECDS)</td>
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<td>4-Days VGST, GoK , supported Faculty Development Programme (FDP) on “Machine Learning and Data Analytics”</td>
<td>Hirasugar Institute of Technology, Nidasoshi</td>
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<td>FDP on “Teaching Learning Methodology”</td>
<td>Bharati Vidyapeeth College of Engineering, Kolhapur.</td>
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<tr>
<td><strong>Name of Faculty</strong></td>
<td>Mrs Padmini Gautam Sanmane</td>
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<tr>
<td>Microprocessors</td>
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<td>Syllabus Revision Workshops</td>
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One Page CV

Personal Information:

Name of Faculty: Dr. Amol Adhikrao Mane
M. Sc., Ph. D, UGC-SET (Physics)

Designation: HOD & Assistant Professor,
Sant Gajanan Maharaj College of Engineering, Mahagaon

Department: General Science and Humanities

Date of Joining: 01/07/2012

Unique ID: ---

Qualification: M. Sc., Ph. D, UGC-SET (Physics)

Courses Taught: Basic Physics, Applied Science, Engineering Physics

Email ID: amolmaneamol@gmail.com

Mobile No.: 9766770268

Qualification & Experience:

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<tr>
<td>B.Sc (Physics)</td>
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<tr>
<td>with Distinction in 2005</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>M.Sc (Physics)</td>
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<td>Ph. D in Materials Science in 2017</td>
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Achievements:

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<td></td>
<td>“Studies on Spray Deposited (MoO₃)ₓ₋ₓ(V₂O₅)ₓ Thin Films for Gas Sensor Application” awarded in 2017</td>
<td>Dr. A. V. Moholkar, Thin Film Nanomaterials Laboratory, Department of Physics, Shivaji University, Kolhapur</td>
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<td>: Rs. 35,000/- through SGM Education Group, Mahagaon</td>
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# Faculty Profile

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<tr>
<th>Name of Faculty</th>
<th>Dr. Monica B Mohite</th>
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<td>Designation</td>
<td>Assistant Professor of Mathematics</td>
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<td>Department</td>
<td>GENERAL SCIENCE &amp; HUMANITIES</td>
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<td>7915 3805 5113</td>
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<tr>
<td>Qualification</td>
<td>DOCTORATE IN APPLIED MATHEMATICS</td>
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## Courses Taught
- ENGINEERING MATHEMATICS I
- ENGINEERING MATHEMATICS II
- ENGINEERING MATHEMATICS III FOR EE, ME, CE & CSE
- NUMERICAL METHODS

## Experience
- 9 Years of Teaching Experience

## Paper Published
- J.C. Umavathi and Monica B Mohite, “Convective transport in a porous medium layer saturated with a Maxwell nanofluid”, Journal of King Saud University – Engineering Sciences, DOI: 10.1016/j.jksues.2014.01.002
- J.C. Umavathi and Monica B Mohite, “Double-diffusive convective transport in a nanofluid-saturated porous layer

<table>
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<th>Workshops/FDP/Seminar Attended</th>
<th>Participated a national workshop on “Basic Matlab Programming and Simulink” held during May 6th – 8th, 2015, organized by department of Mathematics, Central University of Karnataka.</th>
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<tr>
<td></td>
<td>Participated in workshop on “Short Term Training Programme On Advanced Computational Mechanics” held during 14th-18th July, 2014 organized by department of mathematics, DIAT(DU), Pune.</td>
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# One Page CV

## Personal Information:

<table>
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<tr>
<th>Name of Faculty</th>
<th>Prof. Desai Nikita Rahul</th>
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<tr>
<th>Email ID</th>
<th><a href="mailto:desainikita035@gmail.com">desainikita035@gmail.com</a></th>
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## Qualification & Experience:

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# Faculty Profile

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<th>Mr. Santosh Baburao Powar</th>
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<td>Asst. Prof. Professional Communication</td>
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<td>Qualification</td>
<td>M. A. B. Ed. (English)</td>
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## Courses Taught
- Professional Communication-I
- Professional Communication-II
- Soft Skill
- Universal Human Values

## Experience
1. Worked as Asst. Teacher at Vidyamandir Saundale, Devgad, Sindhudurg from June 2005 to April 2006.
2. Worked as Asst. Teacher at Adarsh Vidyaniketan, Minche, Peth-wadgaon, Kolhapur from 1st July 2007 to 30th June 2009.
3. Worked as Lecturer at Sant Gajanan Maharaj Rural Polytechnic, Mahagaon, Tal.- Gadhinglaj (Kolhapur) from 1st July 2009 to 24th June 2012.
4. Working as Assistant Professor at Sant Gajanan Maharaj College of Engineering, Mahagaon, Tal.- Gadhinglaj (Kolhapur) from 25th June 2012 to till date.
<table>
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<tr>
<td>2.</td>
<td>Attended One day workshop conducted by Shivaji University, Kolhapur at Dr. J. J. Magdum College of Engineering, Jaysingpur ‘On Syllabus setting for Professional Communication of FE’ on 8th January 2013.</td>
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<tr>
<td>3.</td>
<td>Attended One day workshop conducted by Shivaji University, Kolhapur at Dr. J. J. Magdum College of Engineering, Jaysingpur On ‘Choice Based Credit System’ for FYBTECH on 28th August 2018.</td>
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<td>4.</td>
<td>Attended One day workshop conducted by Shivaji University, Kolhapur at Dr. J. J. Magdum College of Engineering, Jaysingpur On ‘Choice Based Credit System’ of FYB Tech. in the subject Professional Communication I &amp; II on 21th September, 2018.</td>
</tr>
<tr>
<td>5.</td>
<td>Attended One day National Conference jointly organised by Sant Gajanan Maharaj College of Engineering, Mahagaon, Gadhinglaj on 7th March 2019, title ‘Recent trends in Science and Technology’</td>
</tr>
<tr>
<td>6.</td>
<td>Attended One day National Conference jointly organised by Dr. Ghali College Gadhinglaj at Gadhinglaj on 9th March 2019, title Marathi language and culture of Peoples who lives on cross border area of states of Maharashtra, Goa and Karnataka.</td>
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<td>8.</td>
<td>Two time consecutively completed AICTE organized UHV-I Online five day FDP on Oct. 2020 &amp; 21.</td>
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<td><strong>Faculty Profile</strong></td>
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<tr>
<td><strong>Name</strong></td>
<td>Mrs. Pathan Nilofar Bulandshaha</td>
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<td><strong>Date of joining</strong></td>
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<tr>
<td><strong>Courses taught at</strong></td>
<td>Elementary chemistry(dmlt) Basic chemistry, Applied Chemistry, Environmental studies.</td>
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<th>Prof. Kalyani Suresh Kalage</th>
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<tr>
<td>Date of Joining</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; January 2021</td>
</tr>
<tr>
<td>Aadhar Card Number</td>
<td>5474 2308 9395</td>
</tr>
<tr>
<td>Qualification</td>
<td>M.SC. , M.Ed.</td>
</tr>
<tr>
<td>Courses Taught</td>
<td>• ENVIRONMENTAL STUDIES</td>
</tr>
<tr>
<td>Experience</td>
<td>7 Years of Teaching Experience</td>
</tr>
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</table>
8 FEES

<table>
<thead>
<tr>
<th>Details of Fee, as approved by State Fee Committee</th>
<th>60000/-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time schedule for payment of Fee for the entire Programme</td>
<td>Fee collected in 3 installment 1. Month of June 2. Month of November 3. Month of February</td>
</tr>
<tr>
<td>No. of Fee waivers granted with amount and name of students</td>
<td>--------</td>
</tr>
<tr>
<td>Number of scholarship offered by the Institution, duration and amount</td>
<td>--------</td>
</tr>
<tr>
<td>Criteria for Fee waivers/scholarship</td>
<td>As per DTE Norms</td>
</tr>
<tr>
<td>Estimated cost of Boarding and Lodging in Hostels</td>
<td>9000/- per student</td>
</tr>
<tr>
<td>Any other fee please specify</td>
<td>--------</td>
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9 ADMISSION

Number of seats sanctioned with the year of approval A.Y.2020-21

![Table 1](image1)

![Table 2](image2)
### Un-Aided

#### CAP Seats: 60

<table>
<thead>
<tr>
<th>Choice Code</th>
<th>Course Name</th>
<th>Sl</th>
<th>MS Seats</th>
<th>Minority Seats</th>
<th>All India</th>
<th>Institute Seats</th>
<th>Orphan</th>
</tr>
</thead>
<tbody>
<tr>
<td>680329310</td>
<td>Electrical Engineering</td>
<td>60</td>
<td>51</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
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#### Category

<table>
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<tr>
<th>General / Ladies</th>
<th>OPEN</th>
<th>SC</th>
<th>ST</th>
<th>VJ/DT</th>
<th>NBT</th>
<th>NTC</th>
<th>NTD</th>
<th>OBC</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
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<td>G</td>
<td>L</td>
<td>G</td>
<td>L</td>
<td>G</td>
<td>L</td>
<td>G</td>
<td>L</td>
<td>G + L</td>
</tr>
<tr>
<td>HU</td>
<td>10</td>
<td>5</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>42</td>
</tr>
<tr>
<td>ONU</td>
<td>4</td>
<td>1</td>
<td>2</td>
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<td>1</td>
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<td>0</td>
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#### PWD

- PWD Common Reserved Seats: 1
- Defence Common Reserved Seats: 1

---

### Economically Weaker Section (EWS)

- Seats: 6

### Tuition Fee Waiver Scheme Choice Code: 680329311T

- Seats: 3

---

### Un-Aided

#### CAP Seats: 60

<table>
<thead>
<tr>
<th>Choice Code</th>
<th>Course Name</th>
<th>Sl</th>
<th>MS Seats</th>
<th>Minority Seats</th>
<th>All India</th>
<th>Institute Seats</th>
<th>Orphan</th>
</tr>
</thead>
<tbody>
<tr>
<td>680361210</td>
<td>Mechanical Engineering</td>
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#### Category

<table>
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<th>OPEN</th>
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<th>ST</th>
<th>VJ/DT</th>
<th>NBT</th>
<th>NTC</th>
<th>NTD</th>
<th>OBC</th>
<th>Total</th>
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<td></td>
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<tr>
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#### PWD

- PWD Common Reserved Seats: 1
- Defence Common Reserved Seats: 1

---

### Economically Weaker Section (EWS)

- Seats: 6

### Tuition Fee Waiver Scheme Choice Code: 680361211T

- Seats: 3

---

### Un-Aided

#### CAP Seats: 60

<table>
<thead>
<tr>
<th>Choice Code</th>
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<th>MS Seats</th>
<th>Minority Seats</th>
<th>All India</th>
<th>Institute Seats</th>
<th>Orphan</th>
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<tbody>
<tr>
<td>680337210</td>
<td>Electronics and Telecommunication Engg</td>
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<td>1</td>
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#### Category

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<th>ST</th>
<th>VJ/DT</th>
<th>NBT</th>
<th>NTC</th>
<th>NTD</th>
<th>OBC</th>
<th>Total</th>
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<tbody>
<tr>
<td></td>
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<td>G</td>
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<td>G + L</td>
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<tr>
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<td>1</td>
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<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
</tbody>
</table>

#### PWD

- PWD Common Reserved Seats: 1
- Defence Common Reserved Seats: 1

---

### Economically Weaker Section (EWS)

- Seats: 6

### Tuition Fee Waiver Scheme Choice Code: 680337211T

- Seats: 3
- Number of seats sanctioned with the year of approval A.Y.202019-20
Students get admission into B. Tech. Course based on centralized Allotment Process (CAP). The entire admission process is carried out under the government of Maharashtra and Director Board of technical education.

**Course Duration 2 Years**

<table>
<thead>
<tr>
<th>Course Duration</th>
<th>4Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Intake</td>
<td>300</td>
</tr>
<tr>
<td>CAP Seats</td>
<td>288</td>
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<tr>
<td>Institute level Seats</td>
<td>12</td>
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</table>

<table>
<thead>
<tr>
<th>Number of applications received during last two years for</th>
<th>2020-21</th>
<th>2019-20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of applications received</td>
<td>35</td>
<td>27</td>
</tr>
<tr>
<td>Number of student admitted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of applications received</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of student admitted</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Eligibility:
The Candidate should be an Indian National;

(ii) Passed HSC or its equivalent examination with Physics and Mathematics as compulsory subjects along with one of the Chemistry or Biotechnology or Biology or Technical Vocational subject or Computer Science or Information Technology or Informatics Practices or Agriculture or Engineering Graphics or Business Studies, and obtained at least 45% marks (at least 40% marks, in case of Backward class categories, Economically Weaker Section and Persons with Disability candidates belonging to Maharashtra State only) in the above subjects taken together and The Candidate should have appeared in all the subjects in MHT-CET 2020 and should obtain non zero score in MHT-CET 2020. Or

(ii) Passed Diploma in Engineering and Technology and obtained at least 45% marks (at least 40% marks, in case of Backward class categories, Economically Weaker Section and Persons with Disability candidates belonging to Maharashtra State only); Other criterion declared from time to time by the Directorate of Technical Education, Maharashtra State, Mumbai.

Other than Maharashtra State Candidates shall be eligible for Institution quota only

For Maharashtra State Candidature Candidate and All India Candidature

Candidate, -

(i) The Candidate should be an Indian National;

(ii) Passed Diploma Course in Engineering and Technology with at least 45% marks (40% marks in case of candidates of backward class categories, Economically Weaker Section and Persons with Disability belonging to Maharashtra State only) in appropriate branch of Engineering and Technology from an All India Council for Technical Education or Central or State Government approved Institution or its equivalent;

Or
(ii) Passed B.Sc. Degree from a University Grants Commission (UGC) or Association of Indian Universities recognized University with at least 45% marks (40% in case of candidates of backward class categories, Economically Weaker Section and Persons with Disability belonging to Maharashtra State only) and passed HSC with Mathematics as a subject. Provided that students belonging to this category shall clear the subjects of Engineering Graphics/Engineering Drawing and Engineering Mechanics of the first year Engineering Program along with second year subjects.

Or

(ii) Passed D. Voc. Stream in the same/allied sector. (iii) In the above cases, a suitable bridge Courses, if required such as in Mathematics may be conducted.

(iv) Any other criterion declared from time to time by the appropriate authority as defined under the Act.


**Calendar for admission against Management/vacant seats:**

**ADMISSION PROCESS**

**A.CAP & INSTITUTE LEVEL SCHEDULE 2020-2021**

<table>
<thead>
<tr>
<th>No</th>
<th>Event</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>01</td>
<td>Sale of Admission Form &amp; Brochure</td>
<td>31.01.2021 To 03.02.2021 Up to 03.00 PM</td>
</tr>
<tr>
<td>02</td>
<td>Submission of Admission Form</td>
<td>03.02.2021 Up to 05.00 PM</td>
</tr>
<tr>
<td>03</td>
<td>Display of Provisional Merit List on Notice Board &amp; Webite</td>
<td>03.02.2021 Up to 06.00 PM</td>
</tr>
<tr>
<td>04</td>
<td>Last Date of receiving written Complaints Regarding Provisional Merit List</td>
<td>04.02.2021 Before 11.00 AM</td>
</tr>
<tr>
<td>05</td>
<td>Display of Final Merit List</td>
<td>04.02.2021 After 11.30 AM</td>
</tr>
<tr>
<td>06</td>
<td>Reporting to institute for confirmation of Admission</td>
<td>04.02.2021 to 05.02.2021 Up to 05.00 PM</td>
</tr>
<tr>
<td>07</td>
<td>Starting of Academic Session</td>
<td>05.02.2021.</td>
</tr>
<tr>
<td>08</td>
<td>The policy of refund of the Fee, in case of withdrawal, shall be clearly notified</td>
<td>Yes, as per DTE, ARA Norms</td>
</tr>
</tbody>
</table>
9. Criteria and Weight ages for Admission:

<table>
<thead>
<tr>
<th>CRITERIA FOR ADMISSION</th>
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</thead>
<tbody>
<tr>
<td>Candidate should pass Higher Secondary School Certificate (Standard XII) examination conducted by the Maharashtra State Board of Secondary and Higher Secondary Education or its equivalent certificate awarded by a recognized Board with Physics and Mathematics as compulsory subjects along with one of the subject Chemistry/Biology/Technical from a recognized institution. Candidate should be an Indian National. Other criterion declared from time to time by the Directorate of Technical Education, Maharashtra State, Mumbai. Other than Maharashtra State Candidates shall be eligible for Institution quota only.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MENTION THE MINIMUM LEVEL OF ACCEPTANCE</th>
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<tbody>
<tr>
<td>Passed 10+2 examination with Physics and Mathematics as compulsory subjects along with Chemistry/Biology/Technical subject.</td>
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</table>

<table>
<thead>
<tr>
<th>Mention the cut-off Levels of percentage for the last three years</th>
<th>2020-21</th>
<th>2019-2020</th>
<th>2018-2019</th>
</tr>
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<tbody>
<tr>
<td>Open</td>
<td>78.89</td>
<td>81.81</td>
<td>67.00</td>
</tr>
<tr>
<td>SC</td>
<td>40.28</td>
<td>37.82</td>
<td>58.00</td>
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<tr>
<td>ST</td>
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<td>67.51</td>
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<tr>
<td>OBC</td>
<td>50.15</td>
<td>17.26</td>
<td>44.00</td>
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<tr>
<td>VJNT</td>
<td>42.60</td>
<td>56.93</td>
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<td>SBC</td>
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<td>EWS</td>
<td>68.22</td>
<td>84.54</td>
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<td>TFWS</td>
<td>86.46</td>
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10. LIST OF APPLICANT:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Seat Type</th>
<th>Application ID</th>
<th>Candidate Name</th>
<th>Gender</th>
<th>Category</th>
<th>Merit Marks</th>
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<td>EN20217587</td>
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<td>Female</td>
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<td>2</td>
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<td>BHOSALE SHIVAJI SUSHANT</td>
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<td>54.1697881</td>
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<tr>
<td>3</td>
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<td>EN20248628</td>
<td>GURAV NINAD NITIN</td>
<td>Male</td>
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<td>4</td>
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<td>5</td>
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<td>6</td>
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<tr>
<td>12</td>
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<td>13</td>
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<td>EN21261253</td>
<td>CHAVAN SADA TANAJI</td>
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<td>EN20261708</td>
<td>KUMBHAR SUJIT SURESH</td>
<td>Male</td>
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<tr>
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<td>KUMBHAR JAYANAND NIWRUTTI</td>
<td>Male</td>
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<td>GOTE NILESH JAYSING</td>
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<tr>
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<td>EN20261253</td>
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<td>NAJK LAXMAN SUBHASH</td>
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<td>28</td>
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<td>29</td>
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<td>Open</td>
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<td>Male</td>
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</tr>
<tr>
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List of Applicant: DSE Year

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- Score of the individual candidate admitted arranged in order of merit

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Score of the individual candidate admitted arranged in order or merit: DSE Year

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<td>M</td>
<td>All India</td>
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- List of candidate who have been offered and final Merit List of admission
<table>
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<tr>
<th>Sr. No.</th>
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<th>Candidate Name</th>
<th>Category</th>
<th>Merit No.</th>
<th>Merit Marks</th>
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- List of candidate who have been offered Final Merit List of admission for DSE year

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<td>Number of Tutorial rooms and size of each</td>
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<td>Number of Laboratories and size of each</td>
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<td>Fire and Safety Certificate</td>
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<td>Hostel Facilities</td>
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F.No. Western/2012/1-773520091
Date: 10 May 2012

To,
The Secretary, 
Tech. & Higher Education Deptt. 
Govt. of Maharashtra, Mantralaya, 
Annexe Building, Mumbai-400032

Sub: Approval for New Institute / Technical campus / Conversion of Women Institute to Coeducation / Change of Site from academic year 2012-13

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2010 notified by the Council vide notification number F-No.37-3/Legal/2010 dated 10/12/2010 and amendment vide notification number F-No.37-3/Legal/2011 dated 30/09/2011 and other notifications, as applicable and published from time to time, I am directed to convey the approval to

<table>
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<th>Western Application Id</th>
<th>Permanent Id</th>
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<td>1-773520091</td>
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<table>
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<th>Name of the Institute</th>
<th>Institute Address</th>
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<tbody>
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<td>SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING</td>
<td>SITE - CHINCHEWADI, TAL- GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503</td>
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<table>
<thead>
<tr>
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<th>Organisation Address</th>
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<td>SANT GAJANAN MAHARAJ RURAL HOSPITAL &amp; RESEARCH CENTRE, MAHAGAON</td>
<td>A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR, MAHAGAON, KOLHAPUR, Maharashtra, 416503</td>
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<table>
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<th>Institute Type</th>
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Opted Women to Co-ed | No | Opted Change of Name | No | Opted Change of Site | No |
Approved for Women to Co-ed | Not Applicable | Approved Change of Name | Not Applicable | Approved Change of Site | Not Applicable |

Application Number: 1-773520091*  
Printed By: AIC006736  

Note: This is a Computer generated Letter of Approval. No signature is required.  
Letter Printed On: 24 May 2012
to conduct following courses with the intake indicated below for the academic year 2012-2013

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<th>Course</th>
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<th>Intake approved for 12-13</th>
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<th>NRI</th>
<th>Foreign Collaboration</th>
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<td>MECHANICAL ENGINEERING</td>
<td>FULL TIME</td>
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<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st</td>
<td>UNDER GRADUATE</td>
<td>CIVIL ENGINEERING</td>
<td>FULL TIME</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st</td>
<td>UNDER GRADUATE</td>
<td>ELECTRICAL ENGINEERING</td>
<td>FULL TIME</td>
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<td>ELECTRONICS &amp; TELECOMMUNICATION ENGINEERING</td>
<td>FULL TIME</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: The approval is valid for two years from the date of issue of this letter for getting affiliation with respective University and fulfilling State Govt. requirements for admission. If institution is unable to start in the academic session 2012-13 due to reason mentioned above, the institution will have to apply On-line on AICTE web portal in the next academic session for continuation of approval.

The Society/Trust/Institution shall obtain necessary affiliation / permission from the concerned affiliating University as per the prescribed schedule of the University/ Admission authority etc. The Applicant Society/Trust/Institution shall send information about commencement of the above courses to AICTE. In case the Institution is not in a position to commence the above mentioned courses for whatever reason during the two years period from the date of issue of this letter, the approval becomes invalid and the applicant Society/Trust/Institution shall make fresh application to AICTE for grant of approval as per the norms prevailing at that time.

All Institutions shall fulfill the following general conditions:

1. The management shall provide adequate funds for development of land and for providing related infrastructural, instructional and other facilities as per norms and standards laid down by the Council from time to time and for meeting recurring expenditure.

2. The admission shall be made only after adequate infrastructure and all other facilities, including the availability / recruitment of the required faculty are provided as per norms and guidelines of the AICTE.
3. The admissions shall be made in accordance with the regulations notified by the Council from time to time.

4. The curriculum of the course, the procedure for evaluation / assessment of students shall be in accordance with the norms prescribed by the AICTE and concerned affiliating university whereever applicable.

5. The management of the Institution shall not close the Institution or the institution shall not discontinue any course(s) or start any new course(s) or alter intake capacity of seats without the prior approval of the Council.

6. No excess admission shall be made by the Institution over and above the approved intake under any circumstances. In case any excess admission is reported to the Council, appropriate action as per the notified regulations shall be initiated against the Institution.

7. The institutions shall not have any collaborative arrangements with any Indian and / or Foreign Universities for conduct of technical courses other than those approved by AICTE without obtaining prior approval from AICTE. In case any violation is reported to the Council, appropriate action as per the notified regulations shall be initiated against the Institution.

8. The Institution shall not conduct any course(s) in the field of technical education in the same premises / campus and / or in the name of the Institution without prior permission / approval of AICTE. If found so, appropriate action as per the notified regulations shall be initiated against the Institution.

9. The institution shall not conduct any non-technical course (s) in the same premises / campus under any circumstances. In case any violation is reported to the Council, appropriate action as per the notified regulations shall be initiated against the Institution.

10. The institution shall operate only from the approved location, and that the institution shall not open any off campus study centers / extension centers directly or in collaboration with any other institution / university / organization for the purpose of imparting technical education without obtaining prior approval from the AICTE. If found so, appropriate action as per the notified regulations shall be initiated against the Institution.

11. The tuition and other fees shall be charged as prescribed by the Competent Authority within the overall criteria prescribed by the Council from time to time. No capitation fee shall be charged from the students / guardians of students in any form. If found so, appropriate action as per the notified regulations shall be initiated against the Institution.

12. The accounts of the Institution shall be audited annually by a certified Chartered Accountant and shall be open for inspection by the Council or any body or persons authorized by it.

13. The Director / Principal and the teaching and other staff shall be appointed in given time frame and selection shall be done according to procedures, qualifications and experience prescribed by the Council from time to time and pay scales are as per the norms prescribed by the Council from time to time.

14. The technical institution shall publish an information booklet before commencement of the academic year giving details regarding the institution and courses / programs being conducted and details of infrastructural
facilities including faculty etc. in the form of mandatory disclosure. The information booklet may be made available to the stakeholders of the technical education. The mandatory disclosure information, as per directions in the AICTE website / Approval Process Handbook, shall be put on the Institution Website. The information shall be revised every year with updated information about all aspects of the institution.

15. It shall be mandatory for the technical institution to maintain a Website providing the prescribed information. The Website information must be continuously updated as and when changes take place.

16. If a technical Institution fails to disclose the information or suppress and / or misrepresent the information, appropriate action as per the notified regulations shall be initiated against the Institution.

17. AICTE may carry out random inspections round the year for verifying the status of the Institutions to ensure maintenance of norms and standards.

18. AICTE may also conduct inspections with or without notifying the dates to verify specific complaints, to verify adherence to AICTE norms & standards, and to verify any mis-representation, violation of norms & standards, mal-practices etc.

19. The Institution by virtue of the approval given by Council shall not automatically become claimant to any grant-in-aid from the Central or State Government.

20. In the event of a student / candidate withdrawing before the starting of the course, the wait listed candidates should be given admission against the vacant seat. The entire fee collected from the student, after a deduction of the processing fee of not more than Rs. 1000/- (Rupees one thousand only) shall be refunded and returned by the Institution / University to the student / candidate withdrawing from the program. It would not be permissible for Institutions and Universities to retain the School / Institution Leaving Certificates in original to force retention of admitted students.

21. The Institute shall take appropriate measures for prevention of ragging in any form, in the light of AICTE regulation “Prevention and Prohibition of Ragging in Technical Institutions, Universities including Deemed to Universities imparting technical education” Regulation 2009 (F.No. 37-3/Legal/AICTE/2009 dated 01/07/2009). Incase of failure to prevent the instances of ragging by the Institutions, the Council shall take appropriate action as per the notified regulations.

The Management of the Institute shall strictly follow further conditions as may be specified by the Council from time to time. The Council may withdraw the approval, in case it observe any violation of the above conditions and / or non adherence to the norms and standards prescribed by the Council, mis-representation of facts and submitting factually in correct information to it.

( Dr. K.P.Isaac)
Member Secretary , AICTE

Copy to

Application Number: 1-773520091*

Note: This is a Computer generated Letter of Approval.No signature is required.
1. **The Regional Officer,**  
   All India Council for Technical Education  
   Industrial Assurance Building  
   2nd Floor, Nariman Road  
   Mumbai - 400 020, Maharashtra

2. **The Director Of Technical Education,**  
   Maharashtra

3. **The Registrar,**  
   Shivaji University, Kolhapur

4. **The Principal / Director,**  
   SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING  
   SITE - CHINCHEWADI, TAL- GADHINGLAJ,,  
   MAHAGAON,KOLHAPUR,  
   Maharashtra,416503

5. **The Secretary / Chairmen,**  
   SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE,  
   MAHAGAON  
   A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR,  
   MAHAGAON,KOLHAPUR,  
   Maharashtra,416503

6. **Guard File(AICTE)**
To,
The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of approval for the academic year 2013-14

Ref: Application of the Institution for Extension of approval for the academic year 2013-14

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2012 notified by the Council vide notification number F-No.37-3/Legal/2012 dated 27/09/2012 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

<table>
<thead>
<tr>
<th>Regional Office</th>
<th>Western</th>
<th>Application Id</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1-1443324893</td>
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<table>
<thead>
<tr>
<th>Name of the Institute</th>
<th>SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING</th>
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</thead>
<tbody>
<tr>
<td>Institute Address</td>
<td>SITE - CHINCHEWADI, TAL - GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of the Society/Trust</th>
<th>SANT GAJANAN MAHARAJ RURAL HOSPITAL &amp; RESEARCH CENTRE, MAHAGAON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Society/Trust Address</td>
<td>A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR, MAHAGAON, KOLHAPUR, Maharashtra, 416503</td>
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</tbody>
</table>

| Institute Type | Unaided - Private |

<table>
<thead>
<tr>
<th>Opted for change from Women to Co-ed</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opted for change of name</td>
<td>No</td>
</tr>
<tr>
<td>Opted for change of site</td>
<td>No</td>
</tr>
</tbody>
</table>

Change from Women to Co-ed approved: Not Applicable
Change of name Approved: Not Applicable
Change of site Approved: Not Applicable

The approval is granted for the following courses with the intake indicated below for the academic year 2013-14.
Application Id: 1-1443324893

<table>
<thead>
<tr>
<th>Program</th>
<th>Shift</th>
<th>Level</th>
<th>Course</th>
<th>Affiliating Body</th>
<th>Intake 2012-13</th>
<th>Intake Approved for 13-14</th>
<th>NRI</th>
<th>PIO</th>
<th>Foreign Collaboration</th>
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</thead>
<tbody>
<tr>
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<td>UNDER GRADUATE</td>
<td>CIVIL ENGINEERING</td>
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<td>60</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
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<td>UNDER GRADUATE</td>
<td>COMPUTER SCIENCE &amp; ENGINEERING</td>
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<td>No</td>
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<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>ELECTRICAL ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
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<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st Shift</td>
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<td>ELECTRONICS &amp; TELE-COMMUNICATION ENGINEERING</td>
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<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

- Validity of the course details may be verified at www.aicte-india.org>departments>approvals

The above mentioned approval is subject to the condition that SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.
Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

(Dr. Kuncheria P. Isaac)
Member Secretary, AICTE

Copy to:

1. The Regional Officer,
   All India Council for Technical Education
   Industrial Assurance Building
   2nd Floor, Nariman Road
   Mumbai - 400 020, Maharashtra

2. The Director Of Technical Education,
   Maharashtra

3. The Registrar,
   Shivaji University, Kolhapur

4. The Principal / Director,
   SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING
   SITE - CHINCEWADI, TAL - GADHINGLAJ,,
   MAHAGAON,KOLHAPUR,
   Maharashtra,416503

5. The Secretary / Chairman,
   SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON
   A/P MAHAGON, TALUKA -GADHINGLAJ, DIST. KOLHAPUR,
   MAHAGAON,KOLHAPUR,
   Maharashtra,416503

6. Guard File(AICTE)
To,
The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of approval for the academic year 2014-15

Ref: Application of the Institution for Extension of approval for the academic year 2014-15

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2012 notified by the Council vide notification number F-No.37-3/Legal/2012 dated 27/09/2012 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Regional Office | Western | Application Id | Permanent Id |
--- | --- | --- | --- |
|  |  | 1-201364557 | 1-773520091 |

Name of the Institute | Institute Address |
--- | --- |
SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING | SITE - CHINCHEWADI, TAL- GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503 |

Name of the Society/Trust | Society/Trust Address |
--- | --- |
SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON | A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR, MAHAGAON, KOLHAPUR, Maharashtra, 416503 |

Institute Type | Unaided - Private |
--- | --- |

Opted for change from Women to Co-ed | No |
Opted for change of name | No |
Opted for change of site | No |

Change from Women to Co-ed approved | Not Applicable |
Change of name Approved | Not Applicable |
Change of site Approved | Not Applicable |

to conduct following courses with the intake indicated below for the academic year 2014-15
<table>
<thead>
<tr>
<th>Application Id: 1-2013664557</th>
<th>Course</th>
<th>Affiliating Body</th>
<th>Intake 2013-14</th>
<th>Intake Approved for 14-15</th>
<th>NRI Approval status</th>
<th>PIO Approval status</th>
<th>Foreign Collaboration Approval status</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Program</strong></td>
<td><strong>Shift</strong></td>
<td><strong>Level</strong></td>
<td><strong>Full/Part Time</strong></td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
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<td>No</td>
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<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>CIVIL ENGINEERING</td>
<td>FULL TIME</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
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<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>COMPUTER SCIENCE &amp; ENGINEERING</td>
<td>FULL TIME</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
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<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>ELECTRICAL ENGINEERING</td>
<td>FULL TIME</td>
<td>Shivaji University, Kolhapur</td>
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<td>UNDER GRADUATE</td>
<td>ELECTRONICS &amp; TELE-COMMUNICATION ENGINEERING</td>
<td>FULL TIME</td>
<td>Shivaji University, Kolhapur</td>
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<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>MECHANICAL ENGINEERING</td>
<td>FULL TIME</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

- Validity of the course details may be verified at www.aicte-india.org>departments>approvals

The above mentioned approval is subject to the condition that SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal and subsequently upload and update the student/faculty/other data on portal as per the time schedule which will be intimated by AICTE.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.
Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

(Dr. Kuncheria P. Isaac)
Member Secretary, AICTE

Copy to:

1. The Regional Officer,
   All India Council for Technical Education
   Industrial Assurance Building
   2nd Floor, Nariman Road
   Mumbai - 400 020, Maharashtra

2. The Director Of Technical Education,
   Maharashtra

3. The Registrar,
   Shivaji University, Kolhapur

4. The Principal / Director,
   SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING
   SITE - CHINCHEWADI, TAL- GADHINGLAJ,
   MAHAGAON,KOLHAPUR,
   Maharashtra,416503

5. The Secretary / Chairman,
   SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON
   A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR,
   MAHAGAON,KOLHAPUR,
   Maharashtra,416503

6. Guard File(AICTE)
To,
The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of approval for the academic year 2015-16

Ref: Application of the Institution for Extension of approval for the academic year 2015-16

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2012 notified by the Council vide notification number F-No.37-3/Legal/2012 dated 27/09/2012 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

<table>
<thead>
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<th>Regional Office</th>
<th>Western</th>
<th>Application Id</th>
<th>1-2452203123</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the Institute</td>
<td>SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING</td>
<td>Institute Address</td>
<td>SITE - CHINCHEWADI, TAL-GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503</td>
</tr>
<tr>
<td>Name of the Society/Trust</td>
<td>SANT GAJANAN MAHARAJ RURAL HOSPITAL &amp; RESEARCH CENTRE, MAHAGAON</td>
<td>Society/Trust Address</td>
<td>A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR, MAHAGAON, KOLHAPUR, Maharashtra, 416503</td>
</tr>
<tr>
<td>Institute Type</td>
<td>Unaided - Private</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Opted for change from Women to Co-ed | No | Opted for change of name | No | Opted for change of site | No |
| Change from Women to Co-ed approved | Not Applicable | Change of name Approved | Not Applicable | Change of site Approved | Not Applicable |

To conduct following courses with the intake indicated below for the academic year 2015-16
<table>
<thead>
<tr>
<th>Program</th>
<th>Shift</th>
<th>Level</th>
<th>Course</th>
<th>Affiliating Body</th>
<th>Intake 2014-15</th>
<th>Intake Approved for 15-16</th>
<th>NRI Approval status</th>
<th>PIO Approval status</th>
<th>Foreign Collaboration Approval status</th>
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</thead>
<tbody>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>CIVIL ENGINEERING</td>
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<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>ENGG. AND TECHNOLOGY</td>
<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>COMPUTER SCIENCE &amp; ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
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<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>ELECTRICAL ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
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</tr>
<tr>
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<td>1st Shift</td>
<td>UNDER GRADUATE</td>
<td>ELECTRONICS &amp; TELE-COMMUNICATION ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
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<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
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Copy to:

1. **The Regional Officer,**
   All India Council for Technical Education
   Industrial Assurance Building
   2nd Floor, Nariman Road
   Mumbai - 400 020, Maharashtra

2. **The Director Of Technical Education,**
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3. **The Registrar,**
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   SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING
   SITE - CHINCHEWADI, TAL- GADHINGLAJ,,
   MAHAGAON,KOLHAPUR,
   Maharashtra,416503

5. **The Secretary / Chairman,**
   SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON
   A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR,
   MAHAGAON,KOLHAPUR,
   Maharashtra,416503

6. **Guard File(AICTE)**
To,
The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of approval for the academic year 2016-17

Ref: Application of the Institution for Extension of approval for the academic year 2016-17

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2012 notified by the Council vide notification number F-No.37-3/Legal/2012 dated 27/09/2012 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

<table>
<thead>
<tr>
<th>Regional Office</th>
<th>Western</th>
<th>Application Id</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1-2809508240</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of the Institute</th>
<th>SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permanent Id</td>
<td>1-773520091</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of the Society/Trust</th>
<th>SANT GAJANAN MAHARAJ RURAL HOSPITAL &amp; RESEARCH CENTRE, MAHAGAON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Institute Address</td>
<td>SITE - CHINCHEWADI, TAL- GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Institute Type</th>
<th>Unaided - Private</th>
</tr>
</thead>
<tbody>
<tr>
<td>Society/Trust Address</td>
<td>A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR,MAHAGAON,KOLHAPUR,Maharashtra,416503</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opted for change from Women to Co-ed and Vice versa</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opted for change of name</td>
<td>No</td>
</tr>
<tr>
<td>Opted for change of site</td>
<td>No</td>
</tr>
<tr>
<td>Change from Women to Co-ed approved and Vice versa</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Change of name Approved</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Change of site Approved</td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

To conduct following courses with the intake indicated below for the academic year 2016-17

<table>
<thead>
<tr>
<th>Application Id: 1-2809508240</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
</tr>
<tr>
<td>Full/Part Time</td>
</tr>
<tr>
<td>Affiliating Body</td>
</tr>
<tr>
<td>Intake Approved for 2015-16</td>
</tr>
<tr>
<td>Intake Approved for 2016-17</td>
</tr>
<tr>
<td>NRI Approval status</td>
</tr>
<tr>
<td>PIO / FN / Gulf quota Approval status</td>
</tr>
<tr>
<td>Foreign Collaboration/Twinning Branch Approval status</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Program</th>
<th>Shift</th>
<th>Level</th>
<th>Course</th>
<th>Affiliating Body</th>
<th>Intake Approval for 2016-17</th>
<th>Intake Approved for 2015-16</th>
<th>NRI Approval status</th>
<th>PIO / FN / Gulf quota Approval status</th>
<th>Foreign Collaboration/Twinning Branch Approval status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st</td>
<td>SHIFT</td>
<td>CIVIL ENGINEERING</td>
<td>FULL TIME</td>
<td>60</td>
<td>60</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
The above mentioned approval is subject to the condition that SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

Note: Validity of the course details may be verified at www.aicte-india.org

Prof. Alok Prakash Mittal  
Member Secretary, AICTE

Copy to:

1. **The Regional Officer,**  
   All India Council for Technical Education  
   Industrial Assurance Building  
   2nd Floor, Nariman Road  
   Mumbai - 400 020, Maharashtra

2. **The Director Of Technical Education,**  
   Maharashtra
3. The Registrar,
   Shivaji University, Kolhapur

4. The Principal / Director,
   SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING
   SITE - CHINCHWADI, TAL- GADHINGLAJ,,
   MAHAGAON,KOLhapUR,
   Maharashtra,416503

5. The Secretary / Chairman,
   SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON
   A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR,
   MAHAGAON,KOLhapUR,
   Maharashtra,416503

6. Guard File(AICTE)
To,
The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of approval for the academic year 2017-18

Ref: Application of the Institution for Extension of approval for the academic year 2017-18

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2016 notified by the Council vide notification number F.No.AB/AICTE/REG/2016 dated 30/11/2016 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

Permanent Id: 1-773520091
Application Id: 1-3323501351

Name of the Institute: SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING
Institute Address: SITE - CHINCHEWADI, TAL- GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503

Name of the Society/Trust: SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON
Society/Trust Address: A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR,MAHAGAON,KOLHAPUR,Maharashtra,416503

Institute Type: Unaided - Private
Region: Western

Opted for change from Women to Co-ed and Vice versa: No
Opted for change of name: No
Opted for change of site: No

Change from Women to Co-ed approved and Vice versa: Not Applicable
Change of name Approved: Not Applicable
Change of site Approved: Not Applicable

Opted for Conversion from degree to diploma: No
Opted for Conversion from diploma to degree: No
Conversion (degree to diploma or vice-versa) Approved: Not Applicable

To conduct following courses with the intake indicated below for the academic year 2017-18

<table>
<thead>
<tr>
<th>Application Id: 1-3323501351</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course</td>
</tr>
<tr>
<td>Full/Part Time</td>
</tr>
<tr>
<td>Affiliating Body</td>
</tr>
<tr>
<td>Intake Approved for 2016-17</td>
</tr>
<tr>
<td>Intake Approved for 2017-18</td>
</tr>
<tr>
<td>NRI Approval status</td>
</tr>
<tr>
<td>PIO / FN / Gulf Co-Op Approval status</td>
</tr>
<tr>
<td>Foreign Collaboration Program Approval status</td>
</tr>
</tbody>
</table>

Note: This is a Computer generated Report. No signature is required.
The above mentioned approval is subject to the condition that SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING shall follow and adhere to the Regulations, guidelines and directions issued by AICTE from time to time and the undertaking / affidavit given by the institution along with the application submitted by the institution on portal.

In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation:- Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

Note: Validity of the course details may be verified at www.aicte-india.org

Prof. A.P Mittal
Member Secretary, AICTE

Copy to:
1. The Regional Officer,
All India Council for Technical Education
Industrial Assurance Building
2nd Floor, Nariman Road
Mumbai - 400 020, Maharashtra
2. **The Director Of Technical Education**, 
   Maharashtra

3. **The Registrar**, 
   Shivaji University, Kolhapur

4. **The Principal / Director**, 
   SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING SITE - CHINCHEWADI, TAL- GADHINGLAJ, MAHAGAON,KOLHAPUR, Maharashtra,416503

5. **The Secretary / Chairman**, 
   SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR, MAHAGAON,KOLHAPUR, Maharashtra,416503

6. **Guard File(AICTE)**

   Note: ** - Approval letter copy will not be communicated through post/email. However, provision is made in the portal for downloading Approval letter through Authorized login credentials allotted to concerned DTE/Registrar.
F.No. Western/1-3508595408/2018/EOA Date: 04-Apr-2018

To,

The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of Approval for the Academic Year 2018-19

Ref: Application of the Institution for Extension of approval for the Academic Year 2018-19

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2016 notified by the Council vide notification number F.No.AB/AICTE/REG/2016 dated 30/11/2016 and amended on December 5, 2017 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

<table>
<thead>
<tr>
<th>Permanent Id</th>
<th>Application Id</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-773520091</td>
<td>1-3508595408</td>
</tr>
</tbody>
</table>

**Name of the Institute**: SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING

**Name of the Society/Trust**: SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON

**Institute Address**: SITE - CHINCHEWADI, TAL-GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503

**Society/Trust Address**: A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR, MAHAGAON, KOLHAPUR, Maharashtra, 416503

**Institute Type**: Unaided - Private

**Region**: Western

**Opted for Change from Women to Co-Ed and vice versa**: No

**Change from Women to Co-Ed and vice versa Approved or Not**: NA

**Opted for Change of Name**: No

**Change of Name Approved or Not**: NA

**Opted for Change of Site**: No

**Change of Site Approved or Not**: NA

**Opted for Conversion from Degree to Diploma or vice versa**: No

**Conversion for Degree to Diploma or vice versa Approved or Not**: NA

**Opted for Organization Name Change**: No

**Change of Organization Name Approved or Not**: NA

**To conduct following Courses with the Intake indicated below for the Academic Year 2018-19**

<table>
<thead>
<tr>
<th>Program</th>
<th>Shift</th>
<th>Level</th>
<th>Course</th>
<th>FT/PT+</th>
<th>Affiliating Body/Uni(S)</th>
<th>Intake Approved for 2018-19</th>
<th>NIR Approval Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st</td>
<td>UNDERGRADUATE</td>
<td>MECHANICAL ENGINEERING</td>
<td>FT</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>NA</td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st</td>
<td>UNDERGRADUATE</td>
<td>CIVIL ENGINEERING</td>
<td>FT</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>NA</td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>1st</td>
<td>UNDERGRADUATE</td>
<td>ELECTRICAL ENGINEERING</td>
<td>FT</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>NA</td>
</tr>
</tbody>
</table>

Notes:
- This is a Computer generated Report. No signature is required.
- Printed By: aic006736
- Letter Printed On: 8 May 2018
In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation: - Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

Prof. A.P Mittal
Member Secretary, AICTE

Copy to:

1. The Regional Officer, All India Council for Technical Education Industrial Assurance Building 2nd Floor, Nariman Road Mumbai - 400 020, Maharashtra

2. The Director Of Technical Education**, Maharashtra

3. The Registrar**, Shivaji University, Kolhapur

4. The Principal / Director, SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING SITE - CHINCHEWADI, TAL- GADHINGLAJ, MAHAGAON,KOLHAPUR, Maharashtra,416503

5. The Secretary / Chairman, SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR, MAHAGAON,KOLHAPUR, Maharashtra,416503

6. Guard File(AICTE)

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

** Individual Approval letter copy will not be communicated through Post/Email. However, consolidated list of Approved Institutions(bulk) will be shared through official Email Address to the concerned Authorities mentioned above.
To,
The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of Approval for the Academic Year 2019-20

Ref: Application of the Institution for Extension of approval for the Academic Year 2019-20

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2018 notified by the Council vide notification number F.No.AB/AICTE/REG/2018 dated 31/12/2018 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

<table>
<thead>
<tr>
<th>Permanent Id</th>
<th>Application Id</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-773520091</td>
<td>1-4259428442</td>
</tr>
</tbody>
</table>

Name of the Institute: SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING
Name of the Society/Trust: SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON

Institute Address: SITE - CHINCHEWADI, TAL- GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503
Society/Trust Address: A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR,MAHAGAON,KOLHAPUR, Maharashtra, 416503

Institute Type: Unaided - Private
Region: Western

Opted for Change from Women to Co-Ed and vice versa: No
Change from Women to Co-Ed and vice versa Approved or Not: NA

Opted for Change of Name: No
Change of Name Approved or Not: NA

Opted for Change of Site/Location: No
Change of Site/Location Approved or Not: NA

Opted for Conversion from Degree to Diploma or vice versa: No
Conversion for Degree to Diploma or vice versa Approved or Not: NA

Opted for Organization Name Change: No
Change of Organization Name Approved or Not: NA

Opted for Merger of Institution: No
Merger of Institution Approved or Not: NA

Opted for Introduction of New Program/Level: No
Introduction of Program/Level Approved or Not: NA

To conduct following Courses with the Intake indicated below for the Academic Year 2019-20

<table>
<thead>
<tr>
<th>Program</th>
<th>Shift</th>
<th>Level</th>
<th>Course</th>
<th>FT/PT+</th>
<th>Affiliating Body (Univ/Body)</th>
<th>Intake Approved for 2019-20</th>
<th>NRI Approval Status</th>
<th>PIO/FN/Gulf Quota/OCI Approval Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering And Technology</td>
<td>1st</td>
<td>UNDER GRADUATE</td>
<td>Mechanical Engineering</td>
<td>FT</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Engineering And Technology</td>
<td>1st</td>
<td>UNDER GRADUATE</td>
<td>Civil Engineering</td>
<td>FT</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>
In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Strict compliance of Anti-Ragging Regulation: - Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 37-3/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institution fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.

It is mandatory to comply all the essential requirements as given in APH 2019-20(appendix 6)

NOTE: If the State Government / UT / DTE / DME has a reservation policy for admission in Technical Education Institutes and the same is applicable to Private & Self-financing Technical Institutions, then the State Government / UT/ DTE / DME shall ensure that 10 % of Reservation for EWS would be operational from the Academic year 2019-20 without affecting the percentage reservations of SC/ST/OBC/General . However, this would not be applicable in the case of Minority Institutions referred to the clause (1) of Article 30 of Constitution of India.

Prof. A.P Mittal
Member Secretary, AICTE

Copy to:
1. The Director Of Technical Education**, Maharashtra
2. The Registrar**, Shivaji University, Kolhapur
3. The Principal / Director, Sant Gajanan Maharaj College Of Engineering
   Site - Chinchewadi, Tal- Gadhinglaj,, Mahagaon,Kolhapur, Maharashtra,416503
4. The Secretary / Chairman, Sant Gajanan Maharaj Rural Hospital & Research Centre, Mahagaon
   A/P Mahagaon, Taluka - Gadhinglaj, Dist. Kolhapur.
   Mahagaon,Kolhapur, Maharashtra,416503
5. The Regional Officer, All India Council for Technical Education
   Industrial Assurance Building
   2nd Floor, Nariman Road
   Mumbai - 400 020, Maharashtra
6. Guard File(AICTE)

Note: Validity of the Course details may be verified at http://www.aicte-india.org/
** Individual Approval letter copy will not be communicated through Post/Email. However, consolidated list of Approved Institutions(bulk) will be shared through official Email Address to the concerned Authorities mentioned above.
F.No. Western/1-7014458875/2020/EOA                                                                                        Date: 30-Apr-2020

To,

The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of Approval for the Academic Year 2020-21

Ref: Application of the Institution for Extension of Approval for the Academic Year 2020-21

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations 2020 notified by the Council vide notification number F.No. AB/AICTE/REG/2020 dated 4th February 2020 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to

<table>
<thead>
<tr>
<th>Permanent Id</th>
<th>Application Id</th>
<th>Name of the Institute</th>
<th>Name of the Society/Trust</th>
<th>Institute Address</th>
<th>Society/Trust Address</th>
<th>Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-773520091</td>
<td>1-7014458875</td>
<td>SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING</td>
<td>SANT GAJANAN MAHARAJ RURAL HOSPITAL &amp; RESEARCH CENTRE, MAHAGAON</td>
<td>SITE - CHINCHEWADI, TAL-GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503</td>
<td>A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR,MAHAGAON,KOLHAPUR,416503</td>
<td>Western</td>
</tr>
</tbody>
</table>

Institute Type: Private-Self Financing

To conduct following Courses with the Intake indicated below for the Academic Year 2020-21

<table>
<thead>
<tr>
<th>Program</th>
<th>Level</th>
<th>Course</th>
<th>Affiliating Body (University /Body)</th>
<th>Intake Approved for 2019-20</th>
<th>Intake Approved for 2020-21</th>
<th>NRI Approval Status</th>
<th>PIO / FN / Gulf quota / OCI Approval Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>UNDER GRADUATE</td>
<td>MECHANICAL ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>UNDER GRADUATE</td>
<td>CIVIL ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
<td>NA</td>
<td>No</td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>UNDER GRADUATE</td>
<td>ELECTRICAL ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
<td>NA</td>
<td>No</td>
</tr>
</tbody>
</table>
It is mandatory to comply with all the essential requirements as given in APH 2020-21 (Appendix 6)

The Institution/ University is having the following deficiencies as per the online application submitted to AICTE and the same shall be complied within Six Months from the date of issue of this EoA

<table>
<thead>
<tr>
<th>Deficiencies Noted based on Self Disclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Particulars</td>
</tr>
<tr>
<td>------------------------------------------------</td>
</tr>
<tr>
<td>1. Faculty Deficiency</td>
</tr>
<tr>
<td>2. Other Facilities III &amp; Faculty Questions</td>
</tr>
<tr>
<td>Fees to be charged, policies uploaded</td>
</tr>
<tr>
<td>Institute's Operation from: Permanent Site</td>
</tr>
</tbody>
</table>

*Please refer Deficiency Report for details

**Important Instructions**

1. The State Government/ UT/ Directorate of Technical Education/ Directorate of Medical Education shall ensure that 10% of reservation for Economically Weaker Section (EWS) as per the reservation policy for admission, operational from the Academic year 2020-21 is implemented without affecting the reservation percentages of SC/ ST/ OBC/ General. However, this would not be applicable in the case of Minority Institutions referred to the Clause (1) of Article 30 of Constitution of India. Such Institution shall be permitted to increase in annual permitted strength over a maximum period of two years beginning with the Academic Year 2020-21

2. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time now amalgamated as total intake shall have to fulfil all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2020-21 for the Total Approved Intake. Further, the Institutions Deemed to be Universities/ Institutions having Accreditation/ Autonomy status shall have to maintain the Faculty: Student ratio as specified in the Approval Process Handbook. All such Institutions/ Universities shall have to create the necessary Faculty, Infrastructure and other facilities WITHIN 2 YEARS to fulfil the norms based on the Affidavit submitted to AICTE.

3. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

4. Strict compliance of Anti-Ragging Regulation: - Approval is subject to strict compliance of provisions made in AICTE Regulation notified vide F. No. 373/Legal/AICTE/2009 dated July 1, 2009 for Prevention and Prohibition of Ragging in Technical Institutions. In case Institute fails to take adequate steps to Prevent Ragging or fails to act in accordance with AICTE Regulation or fails to punish perpetrators or incidents of Ragging, it will be liable to take any action as defined under clause 9(4) of the said Regulation.
1. The Director Of Technical Education**, Maharashtra

2. The Registrar**, Shivaji University, Kolhapur

3. The Principal / Director, SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING Site - Chinchewadi, Tal- Gadhinglaj, Mahagaon,Kolhapur, Maharashtra,416503

4. The Secretary / Chairman, A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR MAHAGAON,KOLHAPUR ,416503

5. The Regional Officer, All India Council for Technical Education Industrial Assurance Building 2nd Floor, Nariman Road Mumbai - 400 020, Maharashtra

6. Guard File(AICTE)

Note: Validity of the Course details may be verified at http://www.aicte-india.org/

** Individual Approval letter copy will not be communicated through Post/Email. However, consolidated list of Approved Institutions(bulk) will be shared through official Email Address to the concerned Authorities mentioned above.
To,
The Secretary,
Tech. & Higher Education Deptt.
Govt. of Maharashtra, Mantralaya,
Annexe Building, Mumbai-400032

Sub: Extension of Approval for the Academic Year 2021-22

Ref: Application of the Institution for Extension of Approval for the Academic Year 2021-22

Sir/Madam,

In terms of the provisions under the All India Council for Technical Education (Grant of Approvals for Technical Institutions) Regulations, Notified on 4th February, 2020 and amended on 24th February 2021 and norms standards, procedures and conditions prescribed by the Council from time to time, I am directed to convey the approval to:

<table>
<thead>
<tr>
<th>Permanent Id</th>
<th>Application Id</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-773520091</td>
<td>1-9318429971</td>
</tr>
</tbody>
</table>

Name of the Institution /University: SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING

Name of the Society/Trust: SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE, MAHAGAON

Institution /University Address: SITE - CHINCEWADI, TAL-GADHINGLAJ, MAHAGAON, KOLHAPUR, Maharashtra, 416503

Society/Trust Address: A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR, MAHAGAON, KOLHAPUR, MAHARASHTRA, 416503

Institution /University Type: Private-Self Financing

Region: Western

To conduct following Programs / Courses with the Intake indicated below for the Academic Year 2021-22:

<table>
<thead>
<tr>
<th>Program</th>
<th>Level</th>
<th>Course</th>
<th>Affiliating Body (University /Body)</th>
<th>Intake Approved for 2020-21</th>
<th>Intake Approved for 2021-22</th>
<th>NRI Approval Status</th>
<th>FN / Gulf quota / OCI/ Approval Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>UNDER GRADUATE</td>
<td>MECHANICAL</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ENGINEERING</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>UNDER GRADUATE</td>
<td>CIVIL ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
<td>Yes</td>
<td>NA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>UNDER GRADUATE</td>
<td>ELECTRICAL</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
<td>Yes</td>
<td>NA</td>
</tr>
</tbody>
</table>

Application No:1-9318429971
Note: This is a Computer generated Report. No signature is required.
Printed By : aic006736
<table>
<thead>
<tr>
<th>ENGINEERING AND TECHNOLOGY</th>
<th>UNDER GRADUATE</th>
<th>ELECTRONICS &amp; TELE-COMMUNICATON ENGINEERING</th>
<th>Shivaji University, Kolhapur</th>
<th>60</th>
<th>60</th>
<th>Yes</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGINEERING AND TECHNOLOGY</td>
<td>UNDER GRADUATE</td>
<td>COMPUTER SCIENCE &amp; ENGINEERING</td>
<td>Shivaji University, Kolhapur</td>
<td>60</td>
<td>60</td>
<td>Yes</td>
<td>NA</td>
</tr>
</tbody>
</table>

**Important Instructions**

1. The State Government/ UT/ Directorate of Technical Education/ Directorate of Medical Education shall ensure that 10% of reservation for Economically Weaker Section (EWS) as per the reservation policy for admission, operational from the Academic year 2019-20 is implemented without affecting the reservation percentages of SC/ ST/ OBC/ General. However, this would not be applicable in the case of Minority Institutions referred to the Clause (1) of Article 30 of Constitution of India. Such Institution shall be permitted to increase in annual permitted strength over a maximum period of two years.

2. The Institution offering courses earlier in the Regular Shift, First Shift, Second Shift/Part Time now amalgamated as total intake shall have to fulfill all facilities such as Infrastructure, Faculty and other requirements as per the norms specified in the Approval Process Handbook 2021-22 for the Total Approved Intake. Further, the Institutions Deemed to be Universities/ Institutions having Accreditation/ Autonomy status shall have to maintain the Faculty: Student ratio as specified in the Approval Process Handbook.

3. Strict compliance of Anti-Ragging Regulation, Establishment of Committee for SC/ ST, Establishment of Internal Complaint Committee (ICC), Establishment of Online Grievance Redressal Mechanism, Barrier Free Built Environment for disabled and elderly persons, Fire and Safety Certificate should be maintained as per the provisions made in Approval Process Handbook and AICTE Regulation notified from time to time.

4. In case of any differences in content in this Computer generated Extension of Approval Letter, the content/information as approved by the Executive Council / General Council as available on the record of AICTE shall be final and binding.

Prof. Rajive Kumar  
Member Secretary, AICTE

Copy ** to:  
1. The Director of Technical Education**, Maharashtra

2. The Registrar**,  
Shivaji University, Kolhapur

3. The Principal / Director,  
SANT GAJANAN MAHARAJ COLLEGE OF ENGINEERING  
Site - Chinchewadi, Tal- Gadhinglaj,  
Mahagaon,Kolhapur,  
Maharashtra,416503

4. The Secretary / Chairman,  
A/P MAHAGAON, TALUKA - GADHINGLAJ, DIST. KOLHAPUR  
MAHAGAON,KOLHAPUR
Maharashtra, 416503

5. **The Regional Officer,**
   All India Council for Technical Education
   Industrial Assurance Building
   2nd Floor, Nariman Road
   Mumbai - 400 020, Maharashtra

6. **Guard File (AICTE)**

Note: Validity of the Course details may be verified at [http://www.aicte-india.org/](http://www.aicte-india.org/).

**Individual Approval letter copy will not be communicated through Post/Email. However, consolidated list of Approved Institutions (bulk) will be shared through official Email Address to the concerned Authorities mentioned above.

*This is a computer generated Statement. No signature Required*
**M/S. PATIL GHEVADE MAHAPURKAR & ASSOCIATES**
Chartered Accountants
**K. S. PATIL**  
B.Sc. (Hons) F.C.A.
Partner

**Plat No. 2,**  
Station View Apartment  
Ghorpade Galli,  
Behind M/s. Rote  
Shahupuri,  
Kolhapur-416001  
Phone: - [0231] 2659392  
9822095270

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**REPORT OF AN AUDITOR RELATING TO ACCOUNTS AUDITED UNDER SUB-SECTION (2) OF SECTION 33 & 34 AND RULE 19 OF THE BOMBAY PUBLIC TRUSTS ACT, 1951**

<table>
<thead>
<tr>
<th>Registration No.:-</th>
<th>F-7911/Kolhapur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the Public Trust:-</td>
<td>Shri. Sant Gajanan Maharaj Rural Hospital &amp; Research Center, Mahagoan, Taluka: Gadhinglaj, District: Kolhapur-416502</td>
</tr>
</tbody>
</table>

For the year ended:-  

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars</th>
<th>Auditor's Report</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>Whether accounts are maintained regularly and in accordance with the provisions of the Act and the Rules:--</td>
<td>Yes</td>
</tr>
<tr>
<td>b.</td>
<td>Whether receipts and disbursements are properly and correctly shown in the accounts:--</td>
<td>Yes</td>
</tr>
<tr>
<td>c.</td>
<td>Whether the cash balance and vouchers in the custody of the manager or trustees on the date of audit were in agreement with the accounts:--</td>
<td>Yes</td>
</tr>
<tr>
<td>d.</td>
<td>Whether all books, deeds, accounts, vouchers or other documents or records required by the auditor were produced before him:--</td>
<td>Yes</td>
</tr>
<tr>
<td>e. i</td>
<td>Whether a register of movable or immovable properties is properly maintained:--</td>
<td>Immovable &amp; movable property register, was maintained.</td>
</tr>
<tr>
<td>e. ii</td>
<td>Whether the changes therein are communicated from time to time to the regional office:--</td>
<td>No</td>
</tr>
<tr>
<td>e. iii</td>
<td>Whether the defects and inaccuracies mentioned in the previous audit report have been duly complied with:--</td>
<td>No.</td>
</tr>
<tr>
<td>f.</td>
<td>Whether the manager or trustees or any other person required by the auditor to appear before him did so and furnished the necessary information required by him:--</td>
<td>Yes</td>
</tr>
<tr>
<td>g.</td>
<td>Whether any property or funds of the trust were applied for any object or purpose other than the object or purpose of the Trust:--</td>
<td>No.</td>
</tr>
<tr>
<td>h. i</td>
<td>The amounts of outstanding for more than one year,</td>
<td>Rs. NIL</td>
</tr>
<tr>
<td>h. ii</td>
<td>Amounts written off, if any</td>
<td>Amount written off Rs. NIL</td>
</tr>
</tbody>
</table>
i. Whether tenders were invited for repairs or construction involving expenditure exceeding Rs.5000/- No

J. Whether any money of the public trust has been invested contrary to the provision of Section 35; No.

k. Alienations ,if any ,of the immovable property contrary to the provisions of Section 36 which have come to the notice of the auditor; No such cases were noticed.

l. All cases of irregular, illegal or improper expenditure or failure or omission to recover monies or other property belonging to the public trust or of loss or waste of money or other property thereof and whether such expenditure, failure, omission, loss or waste was caused in consequence of breach of trust or misapplication or any other misconduct on the part of the trustee or any other person while in the management of the trust. No such cases were noticed

m. Whether the budget has been filed in the form provided by Rule 16A; No

n. Whether the minimum and maximum number of the trustees is maintained ; Yes

o. Whether the meeting are held regularly as provided in such instrument; Yes

p. Whether the minutes books of the proceeding of the meeting is maintained. Yes

q. Whether any of the trustees has any interest in the investment of the trust No.

r. Whether any of the trustees is a debtor or creditor of the trust : Yes, Trustees has provided interest free advances to Trust

s. Whether the irregularities pointed out by the auditors in the accounts of the previous year have been duly complied with by the trustees during the period of audit. No. Refer point No. m

t. Any special matter which the Auditor may think fit or necessary to bring to the notice of the Deputy or Assistant Charity Commissioner. The interest accrued on fixed deposit will be accounted as a when the fixed deposit matured or renewed.
Whether tenders were invited for repairs or Construction involving expenditure exceeding Rs.5000/-

No.

Whether any money of the public trust has been invested contrary to the provision of Section 35;

No.

Alienations, if any, of the immovable property contrary to the provisions of Section 36 which have come to the notice of the auditor;

No such cases were noticed.

All cases of irregular, illegal or improper expenditure or failure or omission to recover monies or other property belonging to the public trust or of loss or waste of money or other property thereof and whether such expenditure, failure, omission, loss or waste was caused in consequence of breach of trust or misapplication or any other misconduct on the part of the trustee or any other person while in the management of the trust.

No such cases were noticed.

Whether the budget has been filed in the form provided by Rule 16A;

No.

Whether the minimum and maximum number of the trustees is maintained;

Yes.

Whether the meeting are held regularly as provided in such instrument;

Yes.

Whether the minutes books of the proceeding of the meeting is maintained.

Yes.

Whether any of the trustees has any interest in the investment of the trust.

No.

Whether any of the trustees is a debtor or creditor of the trust:

Yes, Trustee has provided interest free advances to Trust.

Whether the irregularities pointed out by the auditors in the accounts of the previous year have been duly complied with by the trustees during the period of audit.

No. Refer point No. m

The interest accrued on fixed deposit will be accounted as a when the fixed deposit matured or renewed.

PLACE: KOLHAPUR
DATE: 01/09/2019

For M/s. Patil Ghevade Mahapurkar & Associates
Chartered Accountants

(CA. Kashinath S. Patil)
Partner
M.No. 118103
UDIN - 19118103AAAAFP3156
THE BOMBAY PUBLIC TRUSTS ACT 1951
SCHEDULE IXC. (Vide Rule 32)

Statement of Income liable to Contribution for the year ended 31-03-2019.

Registration No. : F-7911/Kolhapur
Name of the Public Trust :- Shri. Sant Gajanan Maharaj Rural Hospital & Research Centre, Mahagaon, Taluka- Gadchinglaj, District- Kolhapur
For the year ended : 31st March, 2019.

<table>
<thead>
<tr>
<th>PARTICULARS</th>
<th>Amount Rs.</th>
<th>Amount Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I) INCOME AS SHOWN IN THE INCOME AND EXPENDITURE ACCOUNT</td>
<td>229,280,059.56</td>
<td></td>
</tr>
<tr>
<td>II) ITEMS NOT CHARGABLE TO CONTRIBUTION UNDER SECTION 58 AND RULE 32 :</td>
<td></td>
<td></td>
</tr>
<tr>
<td>i) Donations received from other Public Trusts and Dharmadas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii) Grants received from Government and local authorities</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii) Interest on sinking or depreciation fund</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv) Amount spent for the purpose of secular Education.</td>
<td>190,266,671.87</td>
<td></td>
</tr>
<tr>
<td>v) Amount spent for the purpose of medical relief.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vi) Amount spent for the purpose of veterinary treatment of animals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vii) Expenditure incurred from donations for relief of distress caused by scarcity, drought, flood, fire or other natural calamity.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>viii) Deductions out of income from lands used for agriculture Purposes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Land Revenue and Local Fund Cess</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Rent payable to superior landlord</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Cost of production, if lands are cultivated by trust.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ix) Deductions out of income from lands used for non-agricultural purposes:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Assessment cesses and other Government or Municipal Taxes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) Ground rent payable to the superior landlord.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) Insurance premium.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) Repairs at 10% of gross rent of building.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e) Cost of collection at 4% of gross rent of building let out.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>x) Cost of collections of income or receipts from securities, stocks, etc. at 1% of such income.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>xi) Deductions on account of repairs in respect of building not rented and yielding no income at 10% of the estimated gross annual rent.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Gross Annual Income chargeable to contribution

TOTAL: NIL

Certified that while claiming deductions admissible under the above schedule, the Trust has not claimed any amount twice, either wholly or partly, against any of the items mentioned in the Schedule which have the effect of double deduction. **Educational Trust are not liable for Contribution.**

[Signature]

(K. S. Patil)
Chartered Accountant
UDIN - 19118103AAAAPFP3156

PLACE: - KOLHAPUR
DATE: - 01/09/2019

TRUSTEE
THE BOMBAY PUBLIC TRUST ACT, 1951
SCHEDULE VIII (VIDE RULE 17 [II])

NAME OF THE PUBLIC TRUST: Shri. Sant Gajanan Maharaj Rural Hospital & Research Center
Mahagaon, TAL: Gadinglaj Dist: Kolhapur

BALANCE SHEET AS ON 31ST MARCH, 2019

<table>
<thead>
<tr>
<th>FUNDS &amp; LIABILITIES</th>
<th>AMOUNT Rs.</th>
<th>PROPERTY &amp; ASSETS</th>
<th>AMOUNT Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Trust Fund or Corpus</td>
<td>984,857.00</td>
<td>1 Immovable Property</td>
<td>123,797,317.42</td>
</tr>
<tr>
<td>2 Other Earmarked Funds</td>
<td></td>
<td>(Annexure No. VIII)</td>
<td></td>
</tr>
<tr>
<td>2.1 Building Fund</td>
<td>72,506,500.00</td>
<td>2 Furniture &amp; Fixture</td>
<td>68,210,131.24</td>
</tr>
<tr>
<td>2.2 Grant</td>
<td>446,000.00</td>
<td>(Annexure No. VII)</td>
<td></td>
</tr>
<tr>
<td>2.3 Student Aid Fund</td>
<td>336,910.00</td>
<td>3 Investments</td>
<td>37,236,551.86</td>
</tr>
<tr>
<td>2.4 Herbal Garden Fund</td>
<td>2,833.00</td>
<td>(Annexure No. IX)</td>
<td></td>
</tr>
<tr>
<td>3 Loans (Secured)</td>
<td>26,314,474.36</td>
<td>4 Loans</td>
<td></td>
</tr>
<tr>
<td>(Annexure No. XIV)</td>
<td></td>
<td>(Secured or Unsecured)</td>
<td></td>
</tr>
<tr>
<td>4 Liabilities</td>
<td>73,834,851.07</td>
<td>5 Deposits</td>
<td>470,400.00</td>
</tr>
<tr>
<td>(Annexure No. V)</td>
<td></td>
<td>(Annexure No. X)</td>
<td></td>
</tr>
<tr>
<td>5 Income &amp; Expenditure Account</td>
<td>158,956,078.69</td>
<td>6 Advances Receivables</td>
<td>82,732,812.20</td>
</tr>
<tr>
<td>(Annexure No. VI)</td>
<td></td>
<td>(Annexure No. XI)</td>
<td></td>
</tr>
<tr>
<td>7 Cash &amp; Bank Balance</td>
<td></td>
<td>7 Cash in hand</td>
<td>488,791.84</td>
</tr>
<tr>
<td>a) Cash in hand</td>
<td></td>
<td>(Annexure No. XII)</td>
<td></td>
</tr>
<tr>
<td>b) Cash at Bank</td>
<td></td>
<td>(Annexure No. XIII)</td>
<td>20,446,499.55</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>333,382,504.12</td>
<td>TOTAL:</td>
<td>333,382,504.12</td>
</tr>
</tbody>
</table>

Subject to our separate report of even date

Place: Kolhapur
Date: 01-09-2019
For M/s. Patil Ghevade Mahapurkar & Associates
Chartered Accountants

(CA. Kashinath S. Patil)
Partner
M.No. 118103
UDIN - 19118103AAAAFP3156

The above Balance Sheet, to the best our belief contains a true account of the funds & liabilities of the Property & Assets of the Trust.

Place: Mahagaon
Date: 20-08-2019

TRUSTEE
**THE BOMBAY PUBLIC TRUST ACT, 1951**

**SCHEDULE VIII (VIDE RULE 17 [I])**

Registration No. F/7911/KOP

**NAME OF THE PUBLIC TRUST :- Shri. Sant Gajanan Maharaj Rural Hospital & Research Center**

**Mahagaon, Tal:- Gadhinglaj Dist:- Kolhapur**

**INCOME & EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31st MARCH 2019**

<table>
<thead>
<tr>
<th>EXPENDITURE</th>
<th>AMOUNT Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>To EXPENDITURE IN RESPECT OF PROPERTIES:</td>
<td></td>
</tr>
<tr>
<td>a) Rates, Taxes, Cesses</td>
<td></td>
</tr>
<tr>
<td>b) Repairs &amp; Maintenance</td>
<td></td>
</tr>
<tr>
<td>c) Salaries</td>
<td></td>
</tr>
<tr>
<td>d) Insurance</td>
<td></td>
</tr>
<tr>
<td>e) Depreciation</td>
<td></td>
</tr>
<tr>
<td>To OTHER EXPENSES</td>
<td></td>
</tr>
<tr>
<td>To ESTABLISHMENT EXPENSES</td>
<td></td>
</tr>
<tr>
<td>To REMUNERATION TO TRUSTEES</td>
<td></td>
</tr>
<tr>
<td>To REMUNERATION (in the case of Math to the head of the Math, including his household expenditure, if any.)</td>
<td></td>
</tr>
<tr>
<td>To LEGAL EXPENSES</td>
<td></td>
</tr>
<tr>
<td>To AUDIT FEES</td>
<td>676,701.00</td>
</tr>
<tr>
<td>To CONTRIBUTION &amp; FEES</td>
<td></td>
</tr>
<tr>
<td>To AMOUNT WRITTEN OFF</td>
<td></td>
</tr>
<tr>
<td>a) Bad Debts</td>
<td></td>
</tr>
<tr>
<td>b) Loan Scholarships</td>
<td></td>
</tr>
<tr>
<td>c) Irrecoverable rents</td>
<td></td>
</tr>
<tr>
<td>d) Other items</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INCOME</th>
<th>AMOUNT Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>By RENT</td>
<td>1,876,000.00</td>
</tr>
<tr>
<td>By INTEREST</td>
<td></td>
</tr>
<tr>
<td>a) Bank Account</td>
<td>23,923.89</td>
</tr>
<tr>
<td>b) On Fixed Deposits</td>
<td>9,736,542.25</td>
</tr>
<tr>
<td>By DIVIDEND</td>
<td></td>
</tr>
<tr>
<td>By DONATIONS IN CASH OR KIND</td>
<td></td>
</tr>
<tr>
<td>By GRANTS</td>
<td></td>
</tr>
<tr>
<td>By INCOME FROM OTHER SOURCES :-</td>
<td></td>
</tr>
<tr>
<td>a) Education Fee</td>
<td>172,192,163.22</td>
</tr>
<tr>
<td>(Refer Annexure No. II)</td>
<td></td>
</tr>
<tr>
<td>b) Other Receipts</td>
<td>45,436,430.20</td>
</tr>
<tr>
<td>(Refer Annexure No. III)</td>
<td></td>
</tr>
<tr>
<td>c) Member Contribution</td>
<td>15,000.00</td>
</tr>
<tr>
<td>To</td>
<td>Amount</td>
</tr>
<tr>
<td>-------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>MISCELLANEOUS EXPENSES</td>
<td>7,686,054.52</td>
</tr>
<tr>
<td>(Refer Annexure No. IV)</td>
<td></td>
</tr>
<tr>
<td>DEPRECIATION</td>
<td>10,100,655.19</td>
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<tr>
<td>(Refer Annexure No. VIII)</td>
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</tr>
<tr>
<td>AMOUNT TRANSFERRED TO</td>
<td></td>
</tr>
<tr>
<td>RESERVE OR SPECIFIED</td>
<td></td>
</tr>
<tr>
<td>FUNDS</td>
<td></td>
</tr>
<tr>
<td>EXPENDITURE ON OBJECTS</td>
<td></td>
</tr>
<tr>
<td>OF THE TRUST</td>
<td></td>
</tr>
<tr>
<td>a) Religious</td>
<td>190,266,671.87</td>
</tr>
<tr>
<td>b) Educational</td>
<td></td>
</tr>
<tr>
<td>(Refer Annexure No. I)</td>
<td></td>
</tr>
<tr>
<td>c) Medical Relief</td>
<td></td>
</tr>
<tr>
<td>d) Relief to Poverty</td>
<td></td>
</tr>
<tr>
<td>e) Other Charitable</td>
<td>20,549,976.98</td>
</tr>
<tr>
<td>Objects</td>
<td></td>
</tr>
<tr>
<td>SURPLUS CARRIED OVER TO</td>
<td></td>
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<tr>
<td>BALANCE SHEET</td>
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</tr>
<tr>
<td>TOTAL</td>
<td>229,280,059.56</td>
</tr>
</tbody>
</table>

Subject to our separate report of even date

Place :- Kolhapur
Date :- 01-09-2019

For M/s. Patil Ghevade Mahapurkar & Associates
Chartered Accountants

(CA. Kashinath S. Patil)
Partner
M.No. 118103
UDIN - 19118103AAAAFP3156

Place :- Mahagaon
Date :- 20-08-2019

TRUSTEE
### SHRI. SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE
MAHAGOAN, TALUKA: GADHINGLAJ DIST: KOLHAPUR

**ANNEXURE No.VII - FURNITURE AND FIXTURE AS ON 31-03-2019**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars</th>
<th>As on 01.04.20.0</th>
<th>Additional During the year</th>
<th>Total</th>
<th>Depreciation @ 5%</th>
<th>Written Down Value as on 31.03.2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Furniture</td>
<td>11,658,773.58</td>
<td>3,349,593.00</td>
<td>15,008,366.58</td>
<td>750,418.33</td>
<td>14,257,948.25</td>
</tr>
<tr>
<td>2</td>
<td>Library Books</td>
<td>4,946,879.14</td>
<td>1,073,816.00</td>
<td>6,020,695.14</td>
<td>301,034.76</td>
<td>5,719,660.39</td>
</tr>
<tr>
<td>3</td>
<td>Laboratory Equip.</td>
<td>14,961,030.76</td>
<td>1,998,789.00</td>
<td>16,959,819.76</td>
<td>847,990.99</td>
<td>16,111,828.78</td>
</tr>
<tr>
<td>4</td>
<td>Computers</td>
<td>9,766,290.77</td>
<td>958,381.00</td>
<td>10,724,671.77</td>
<td>536,233.59</td>
<td>10,188,438.18</td>
</tr>
<tr>
<td>5</td>
<td>Tools &amp; Equip.</td>
<td>1,005,013.43</td>
<td>383,744.00</td>
<td>1,388,757.43</td>
<td>69,437.87</td>
<td>1,319,319.56</td>
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<tr>
<td>6</td>
<td>Sports &amp; Equipment</td>
<td>245,235.86</td>
<td>4,910.00</td>
<td>250,145.86</td>
<td>12,507.29</td>
<td>237,638.56</td>
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<tr>
<td>7</td>
<td>Machinery</td>
<td>4,174,188.82</td>
<td>2,256,500.00</td>
<td>6,430,688.82</td>
<td>321,534.44</td>
<td>6,109,154.38</td>
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<tr>
<td>8</td>
<td>Vehicle</td>
<td>10,004,023.95</td>
<td></td>
<td>10,004,023.95</td>
<td>500,201.20</td>
<td>9,503,822.75</td>
</tr>
<tr>
<td>9</td>
<td>Air Conditioner</td>
<td>42,690.09</td>
<td>83,800.00</td>
<td>126,490.09</td>
<td>6,324.50</td>
<td>120,165.59</td>
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<tr>
<td>10</td>
<td>Washing Machine</td>
<td>24,790.97</td>
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<td>24,790.97</td>
<td>1,239.55</td>
<td>23,551.42</td>
</tr>
<tr>
<td>11</td>
<td>Bio Matric Machine</td>
<td>45,427.13</td>
<td>16,500.00</td>
<td>61,927.13</td>
<td>3,096.36</td>
<td>58,830.77</td>
</tr>
<tr>
<td>12</td>
<td>Water Solar &amp; Water Trough</td>
<td>93,368.46</td>
<td>1,072,000.00</td>
<td>1,165,368.46</td>
<td>58,268.42</td>
<td>1,107,100.04</td>
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<tr>
<td>13</td>
<td>Fridge</td>
<td>19,167.12</td>
<td></td>
<td>19,167.12</td>
<td>958.36</td>
<td>18,208.76</td>
</tr>
<tr>
<td>14</td>
<td>Pipeline</td>
<td>74,880.13</td>
<td></td>
<td>74,880.13</td>
<td>3,744.01</td>
<td>71,136.13</td>
</tr>
<tr>
<td>15</td>
<td>Samsung TV</td>
<td>21,421.51</td>
<td></td>
<td>21,421.51</td>
<td>1,071.08</td>
<td>20,350.44</td>
</tr>
<tr>
<td>16</td>
<td>Sonography Machine</td>
<td>2,091,995.00</td>
<td></td>
<td>2,091,995.00</td>
<td>104,599.75</td>
<td>1,987,395.25</td>
</tr>
<tr>
<td>17</td>
<td>CC TV Camera</td>
<td>62,614.98</td>
<td></td>
<td>62,614.98</td>
<td>3,130.75</td>
<td>59,484.23</td>
</tr>
<tr>
<td>18</td>
<td>Lift</td>
<td>784,225.95</td>
<td>75,000.00</td>
<td>859,225.95</td>
<td>42,961.30</td>
<td>816,264.65</td>
</tr>
<tr>
<td>19</td>
<td>Software</td>
<td>88,986.50</td>
<td>345,001.00</td>
<td>433,987.50</td>
<td>21,699.38</td>
<td>412,288.13</td>
</tr>
<tr>
<td>20</td>
<td>Battery</td>
<td>68,500.00</td>
<td></td>
<td>68,500.00</td>
<td>3,425.00</td>
<td>65,075.00</td>
</tr>
<tr>
<td>21</td>
<td>Telephone</td>
<td>2,600.00</td>
<td></td>
<td>2,600.00</td>
<td>130.00</td>
<td>2,470.00</td>
</tr>
</tbody>
</table>

**Total:** 60,111,004.15  11,689,134.00  71,800,138.15  3,590,006.91  68,210,131.24
**SHRI. SANT GAJANAN MAHARAJ RURAL HOSPITAL & RESEARCH CENTRE**  
**MAHAGOAN, TALUKA: GADHINGLAJ DIST: KOLHAPUR**  

**ANNEXURE No. VIII - Immovable Properties AS ON 31-03-2019**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Particulars</th>
<th>As on 01.04.2018</th>
<th>Additional During the year</th>
<th>Total</th>
<th>Depreciation @5%</th>
<th>Written Down Value as on 31.3.2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Building</td>
<td>107,560,668.57</td>
<td>-</td>
<td>107,560,668.57</td>
<td>5,378,033.43</td>
<td>102,182,635.14</td>
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<tr>
<td>2</td>
<td>Building- Pharmacy</td>
<td>2,172,787.92</td>
<td>-</td>
<td>2,172,787.92</td>
<td>108,639.40</td>
<td>2,064,148.53</td>
</tr>
<tr>
<td>3</td>
<td>Building - Amboli Nachrop</td>
<td>5,096,398.18</td>
<td>-</td>
<td>5,096,398.18</td>
<td>254,819.91</td>
<td>4,841,578.27</td>
</tr>
<tr>
<td>4</td>
<td>Building - BAMS</td>
<td>8,532,337.89</td>
<td>2,228,524.00</td>
<td>10,760,861.89</td>
<td>538,043.09</td>
<td>10,222,818.79</td>
</tr>
<tr>
<td>5</td>
<td>Land &amp; Development</td>
<td>95,000.00</td>
<td>-</td>
<td>95,000.00</td>
<td>-</td>
<td>95,000.00</td>
</tr>
<tr>
<td>6</td>
<td>Hospital Building</td>
<td>721,475.00</td>
<td>-</td>
<td>721,475.00</td>
<td>36,073.75</td>
<td>685,401.25</td>
</tr>
<tr>
<td>7</td>
<td>Anundravoji Patil Chuyeka</td>
<td>103,828.00</td>
<td>-</td>
<td>103,828.00</td>
<td>5,191.40</td>
<td>98,636.60</td>
</tr>
<tr>
<td>8</td>
<td>B.E. College Building</td>
<td>3,796,946.16</td>
<td>-</td>
<td>3,796,946.16</td>
<td>189,847.31</td>
<td>3,607,098.85</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>123,457,192.55</strong></td>
<td><strong>6,850,773.16</strong></td>
<td><strong>130,307,965.71</strong></td>
<td><strong>6,510,648.29</strong></td>
<td><strong>123,797,317.42</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Depreciation as on 31-3-2019**

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Amount Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building</td>
<td>6,510,648.29</td>
</tr>
<tr>
<td>Furniture &amp; Dead Stock</td>
<td>3,590,006.91</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td><strong>10,100,655.19</strong></td>
</tr>
</tbody>
</table>

Place : Kolhapur  
Date : 01-09-2019  
For M/s. Patil Ghevade Mahapurkar & Associates  
Chartered Accountants  

(CA. Kashinath S. Patil)  
Partner  
M.No. 118103  
UDIN - 19118103AAAAPP3156
To,

The Principal/ Director,
All affiliated Engineering Colleges/ Institute,
Shivaji University, Kolhapur.

Subject: Regarding Guidelines, structure, of CBCS B. Tech. Program and syllabus of First Year B. Tech. Program under Faculty of Science and Technology.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the University Authorities have accepted and granted approval to Guidelines, structure of CBCS B. Tech. Program and syllabus of First Year B. Tech. Program to following branches under Faculty of Science and Technology:

**B. Tech. Programme (Branch)**

1. Civil Engineering & Technology
2. Mechanical Engineering & Technology
3. Production Engineering & Technology
4. Automobile Engineering & Technology
5. Electrical Engineering & Technology
6. Chemical Engineering & Technology
7. Electronics Engineering & Technology
8. Electronics and Telecommunication Engineering & Technology
9. Biotechnology Engineering & Technology
10. Information Technology Engineering & Technology
11. Environmental Engineering & Technology
12. Computer Science Engineering & Technology

The revised syllabi shall be implemented from the academic year 2018-19 (i.e. from July 2018) onwards. A soft copy containing CBCS Guidelines, structure, and syllabus of First Year B. Tech. is enclosed herewith. The syllabus is also made available on university website www.unishivaji.ac.in.

Further, it is hereby informed that the question papers on the pre-revised syllabi shall be set for the examination to be held in October/November 2018 and April/May 2019. These chances are available for repeater students, if any.

You are therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

[Signature]

Dy. Registrar

---

Encl.: as above.

Copy to-
1) H.O. Dean, Faculty of Science & Technology
2) Director, Examination and Evaluation
3) The Chairman, respective BOS / Co-ordinating Committee
4) O.E. 4 Section
5) Appointment Section
6) Eligibility Section
7) Meeting Section

For information & necessary action.
SHIVAJI UNIVERSITY, KOLHAPUR

Accredited by NAAC ‘A’ Grade

Syllabus for
Bachelor of Technology
(B. Tech.) Program
(To be implemented from June, 2018 onwards)
INSTRUCTIONS:

There are two groups in each semester:

1. Physics Group and
2. Chemistry Group

Allotment of groups to students:

a) Semester I: 50% students from each college will be admitted to Physics Group and remaining 50% will be admitted to Chemistry Group. The concerned College will decide the number and names of the students to be admitted in physics and chemistry groups and inform the same to the University.

b) Semester II: The students for Physics group in semester-I will be admitted to Chemistry Group in semester-II. The students for Chemistry Group in semester-I will be admitted to Physics Group in semester-II.
### SEMESTER - I

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Course Code</th>
<th>Theory Credits</th>
<th>Theory No. of Lecture</th>
<th>Theory Hours</th>
<th>Tutorial Credits</th>
<th>Tutorial No. of Lecture</th>
<th>Tutorial Hours</th>
<th>Practical Credits</th>
<th>Practical No. of Lecture</th>
<th>Practical Hours</th>
<th>Examination Scheme</th>
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<td>CIE 30, ESE 70</td>
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<tr>
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<td>BSC-C-101</td>
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<td>CIE 30, ESE 70</td>
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<td>CIE 30, ESE 70</td>
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<tr>
<td>7</td>
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<td>1</td>
<td>-</td>
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<td>-</td>
<td></td>
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<td></td>
<td>40%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>17</td>
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<td>1</td>
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<td>1</td>
<td>6</td>
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</table>

### SEMESTER - II

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Course Code</th>
<th>Theory Credits</th>
<th>Theory No. of Lecture</th>
<th>Theory Hours</th>
<th>Tutorial Credits</th>
<th>Tutorial No. of Lecture</th>
<th>Tutorial Hours</th>
<th>Practical Credits</th>
<th>Practical No. of Lecture</th>
<th>Practical Hours</th>
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</tr>
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<tbody>
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<td>2</td>
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<td>CIE 30, ESE 70</td>
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<tr>
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<td>BSC-C-201</td>
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<td></td>
<td></td>
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<td></td>
<td>40%</td>
</tr>
<tr>
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<td>BSC-M-II-202</td>
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<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td>CIE 30, ESE 70</td>
</tr>
<tr>
<td>3</td>
<td>ESC-203</td>
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<td>3</td>
<td>3</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>CIE 30, ESE 70</td>
</tr>
<tr>
<td>5</td>
<td>ESC-205</td>
<td>3</td>
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<td>CIE 30, ESE 70</td>
</tr>
<tr>
<td>6</td>
<td>HM-II-206</td>
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<td>-</td>
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</tr>
<tr>
<td>7</td>
<td>ESC-W-II-207</td>
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<td>1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td>40%</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>17</td>
<td>17</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
<td>12</td>
<td>12</td>
<td>500</td>
</tr>
</tbody>
</table>

CIE – Continuous Internal Evaluation  
ESE – End Semester Examination
Candidate contact hours per week: 30 Hours (Minimum)

Total Marks for B.Tech I. Sem I & II: **1400**

Theory and Practical Lectures: 60 Minutes Each

Total Credits for B.Tech. I (Semester I & II): **48**

In the theory examination, there will be separate passing based on separate heads of passing for examination of CIE and ESE.

There shall be separate passing for theory and practical (term work) courses.

**Non-Credit Self Study Course: Compulsory Civic Courses (CCC)**

For Sem I: CCC – I: Democracy, Elections and Good Governance

**Non-Credit Self Study Course: Skill Development Courses (SDC)**

For Sem II: SDC – I: Any one from following (i) to (v)

i) Business Communication & Presentation

ii) Event management

iii) Personality Development,

iv) Yoga & Physical Management

v) Resume, Report & proposal writing

Note:

1. **BSC**: Basic Science Course are compulsory.

2. **HM**: Humanities and Management are compulsory.

3. **ESC**: Engineering Science Course: ESC-P for courses (subjects) are mandatory Physics group, while ESC-C courses (subjects) are mandatory for Chemistry group.

4. There will be two groups for Sem I & II Physics and Chemistry. The Candidate’s those opting Physics group in Sem I shall appear for Chemistry group in Sem II and Vice-versa.

5. **ESC-W**: Engineering Science Course-Workshop are compulsory.
# Course List

## Semester – I

### Physics Group

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Code No.</th>
<th>Subject</th>
<th>Credits</th>
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<tbody>
<tr>
<td>1.</td>
<td>BSC-P-101</td>
<td>Engineering Physics</td>
<td>4</td>
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<tr>
<td>2.</td>
<td>BSC-M-I-102</td>
<td>Engineering Mathematics-I</td>
<td>4</td>
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<tr>
<td>3.</td>
<td>ESC-P-103</td>
<td>Basic Electrical Engineering</td>
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<td>ESC-P-104</td>
<td>Basic Civil Engineering</td>
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<tr>
<td>5.</td>
<td>ESC-P-105</td>
<td>Engineering Graphics</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>HM-I-106</td>
<td>Professional Communication-I</td>
<td>2</td>
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<td>7.</td>
<td>ESC-W-I-107</td>
<td>Workshop Practice-I</td>
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<td><strong>Total</strong></td>
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### Chemistry Group

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<td>1.</td>
<td>BSC-C-101</td>
<td>Engineering Chemistry</td>
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<td>2.</td>
<td>BSC-M-I-102</td>
<td>Engineering Mathematics-I</td>
<td>4</td>
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<td>3.</td>
<td>ESC-C-103</td>
<td>Fundamentals of Electronics and Computer Programming</td>
<td>4</td>
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<tr>
<td>4.</td>
<td>ESC-C-104</td>
<td>Applied Mechanics</td>
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<td>5.</td>
<td>ESC-C-105</td>
<td>Basic Mechanical Engineering</td>
<td>4</td>
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<td>HM-I-106</td>
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<td>BSC-C-201</td>
<td>Engineering Chemistry</td>
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<tr>
<td>2.</td>
<td>BSC-M-II-202</td>
<td>Engineering Mathematics-II</td>
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<td>ESC-C203</td>
<td>Fundamentals of Electronics and Computer Programming</td>
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<td>ESC-C204</td>
<td>Applied Mechanics</td>
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<td>ESC-C205</td>
<td>Basic Mechanical Engineering</td>
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<td>HM-II-206</td>
<td>Professional Communication-II</td>
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<td>Workshop Practice-II</td>
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<td>Basic Civil Engineering</td>
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FIRST YEAR ENGINEERING AND TECHNOLOGY  
Semester I and II  
EngineeringPhysics

SECTION – I
Unit 1. Diffraction and Polarization of Light : (12 Marks)(7)
Diffraction : Diffraction- Concept and types (Fresnel and Fraunhofer diffraction), Diffraction grating – construction and theory, resolving power of planetransmission grating.
Polarization:  
Introduction, double refraction, Huygens’ theory (positive and negative crystals), Optical Activity, Specific Rotation, Laurent’s half shade polarimeter.

Unit 2. Laser and FibreOptics:(12 Marks)(7)
LASER :  
Absorption, spontaneous emission, stimulated emission, pumping, population inversion, Ruby laser, characteristics of laser, Holography (construction and reconstruction)
Fibre Optics:  
Total Internal Reflection, structure of optical fibre, acceptance angle, acceptance cone, numerical aperture and fractional refractive index change (noderivation), fibre optic communication system, advantages of optical fibres.

Unit 3. Sound: (11 Marks)(7)
Conditions for good acoustics, Reverberation, Reverberation time, Sabine’s formula for reverberation time (no derivation), Absorption coefficient, Factors affecting architectural acoustics and their remedy.
SECTION – II

Unit 4. Crystal Physics: (12 Marks)(7)
Space Lattice, Basis and Crystal structure, Unit cell, Seven crystal system, number of atoms per unit cell, coordination number, atomic radius, packing fraction, relation between density and lattice constant, Miller indices - procedure, features and sketches for different planes, symmetry elements of cubic crystal, Bragg's law for X-ray diffraction.

Unit 5. Physics of Nano-materials: (12 Marks)(7)
Concept- Nanomaterial, Nanoscience and Nanotechnology, production techniques (Top down and bottom up), Ball milling and Colloidal technique for synthesis of nano particles, Types of Nanomaterial, Tools- Scanning Tunneling Microscope and Atomic Force Microscope, properties and applications of nano-materials.

Unit 6. Quantum Mechanics (11 Marks)(7)

List of Experiments;
**Minimum 8 experiments should be performed from the following list.**

01. Bi-prism experiment
02. Diffraction at Cylindrical obstacle.
03. Calculation of divergence of LASER beam.
04. Determination of wavelength of LASER using diffraction grating.
05 Wavelength of different spectral lines of mercury using grating.
06. Polarimeter.
07. Verification of inverse square law of intensity of light.
08. Resolving power of Telescope
09. Measurement of band gap energy.
10. Study of crystal structure.
11. Study of symmetry elements of cubic crystal.
12. Determination of ‘d’ (interplaner distance) using XRD pattern.
13. Study of Planes with the help of models related Miller Indices.
14. Determination of e/m of an electron
15. R. P. of grating
References:
10. Vijay Kumari- Engineering Physics, Vikas Publications
FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester -I

Engineering Mathematics-I

SECTION I

Unit 1: Matrices and Solution of Linear System Equations (8)
(Weightage 15 Marks in Shivaji Uni Exam of 70 marks)
1. Rank of matrix: definition, normal form and echelon form
2. Consistency of linear system equations
3. System of linear homogeneous equations
4. System of linear Non-homogeneous equations

Unit 2: Eigen Values and Eigen vectors (7)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1. Eigen Values
2. Properties of Eigen Values
3. Eigen vectors
4. Properties of Eigen vectors
5. Cayley-Hamilton's theorem (Without proof)

Unit 3: Complex Numbers (6)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1. De Moivre's Theorem (Without proof)
2. Roots of complex numbers by using De Moivre's Theorem
3. Expansion of \( \sin^n \theta \) and \( \cos^n \theta \) in powers of \( \sin \theta \) and /or \( \cos \theta \).
4. Circular functions of a complex variable - definitions
5. Hyperbolic and Inverse Hyperbolic Functions - definitions.
SECTION II
Unit 4: Numerical Solution of Linear Simultaneous Equations: (6) (Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1. Gauss elimination method
2. Gauss-Jordan method
3. Jacobi’s iteration method
4. Gauss-Seidel iteration method

Unit 5: Expansion of Functions and Indeterminate forms: (7) (Weightage 10 Marks in Shivaji Uni Exam of 70 marks)
1. Maclaurin's theorem
2. Standard expansions
3. Taylor's theorem
4. Indeterminate forms and L’ Hospital's rule

Unit 6: Partial Differentiation: (8) (Weightage 15 Marks in Shivaji Uni Exam of 70 marks)
1. Partial derivatives: Introduction
2. Total derivatives
3. Differentiation of implicit function
4. Euler's theorem on homogeneous function of two variables
5. Jacobian and its Properties
6. Maxima and Minima of functions of two variables

General Instructions:
1. Batch wise tutorials are to be conducted. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

Recommended Books:

Reference Books:
1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester - I and II
Basic Electrical Engineering

SECTION I

Unit 1: Analysis of D.C. circuits: (8)
(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)
Concept of E.M.F, Potential Difference, Current, Resistance, Ohm’s Law Kirchhoff’s laws, mesh and node analysis
(Numerical on Mesh and Nodal Analysis of Two loops)

Unit 2: Magnetic circuits: (8)
(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)
Concept of mmf, reluctance, magnetic flux, Magnetic Flux density, Magnetic field strength, BH curve, magnetic leakage, fringing, Comparison of Electric and Magnetic circuit, series magnetic circuits (Theoretical Concepts only).

Unit 3: Single phase AC Circuits: (8) (Weightage 12 Marks in Shivaji Uni Exam of 70 marks)
(Numerical Treatment on Series R-L, R-C, R-L-C circuits)
SECTION II

Unit 4: Three phase A.C. Circuits (7) (Weightage 12 Marks in Shivaji Uni Exam of 70 marks )

Advantages of 3 phase system, Generation of 3 phase AC supply, balanced 3 phase load, relation between line and phase quantities for star connected circuit and delta connected circuit.

Unit 5: Earthing and lamps: (7) (Weightage 11 Marks in Shivaji Uni Exam of 70 marks )

Necessity of Earthing, Earthing methods, Fuse (reewireble and HRC). MCB, Incandescent Lamp, Fluorescent tube, CFL, LED lamp, Mercury vapour lamp, single line diagram of electrical systems.

Unit 6: Single phase Transformer: (8) (Weightage 12 Marks in Shivaji Uni Exam of 70 marks )

Construction, operating principle, Types, emf equation, Ratios of voltage and current, operation on no load and with load, power losses, efficiency, voltage regulation, applications.
(Numerical Treatment on E.M.F Equations & Transformer losses and Efficiency)

List of Experiments
Minimum 8 experiments should be performed from the following list.
1. Laboratory Sessions covering, General Introduction to Electrical Engineering laboratory, Experimental Set ups, Instruments etc. Electrical Symbols.
2. Electric Shocks and precautions against shocks (Do’s and Don’ts).
5. B-H curve of magnetic material.
10. Study of different luminaries including Incandescent lamp, Mercury vapor lamps, fluorescent tube, CFL, and LED lamps.
11. Polarity and Ratio Test for single Phase Transformer.
12. Pre-determination of efficiency and regulation by Open Circuit and Short circuit tests on single phase transformer.
13. Determine the Efficiency of single Phase Transformer by Direct Loading Test

Reference books:
2. B.L.Theraja – Electrical Technology vol.1. – S.Chand.
FIRST YEAR ENGINEERING AND TECHNOLOGY

Semester -I and II

Basic Civil Engineering

SECTION I

Unit 1: Relevance of Civil Engineering and Building Planning (7)
Introduction, branches of civil engineering, application of civil engineering in other allied fields. Principles of planning, introduction to Bye-Laws regarding building line, height of building, open space requirements, F.S.I., setbacks, ventilation, sanitation as per municipal corporation area requirement.

Unit 2: Components of Building (7)
A) Sub-structure: Types of soil and rocks as foundation strata, concept of bearing capacity, types of foundations i.e. shallow and deep and their suitability. Shallow foundation such as wall foundation, isolated foundation, deep foundation such as pile foundation.
B) Super-structure: Elements of super-structures and their functions

Unit 3: Building Materials and Design (7)
Use and properties of the following materials—Concrete – ingredients and grades, plain and reinforced cement concrete and ready mix concrete, bricks, steel, timber, roofing materials etc.
Introduction to types of loads, load bearing and framed structures.

SECTION II

Unit 4: Linear and Angular Measurements (7)
Principles of surveying, Classification of surveys, Chain Surveying, Introduction to metric chain and tapes, error in chaining, nominal scale and R.F., ranging, chaining and offsetting, index plan, location sketch and recording of field book, Chain and compass survey, Meridian, bearing and its types, system of bearing, Types of compass: prismatic and surveyor's compass. Calculation of included angles, correction for local attraction.

Unit 5: Leveling (7)
Terms used in leveling, use of Dumpy level and Auto Level, temporary adjustments. Methods of reduction of levels, types of leveling, Contours, characteristics of contours, use of contour maps. Introduction and use of EDM's with special reference to Total Station. Measurement of area by planimeter – mechanical and digital.

Unit 6: Introduction to Transportation, Environmental and Irrigation Engineering (7)
Components of rigid and flexible pavement, components of railway track (Broad Gauge) Components of water supply scheme (flow diagram), Necessity of Irrigation, Types of Dams (Earthen and Gravity Dam)

Term work:
Student can choose either Model A or Model B for performing practical
Model A
List of Experiments: Minimum 8 experiments should be performed from the following list—Practical exercises given be carried out and drawing sheets be plotted wherever necessary.
1. Introduction to Measurement of Distances.
2. Plotting the outlines of building by chaining, ranging and offsetting.
3. Plotting of closed traverse by prismatic compass.
4. Reduction of levels by rise and fall method.
5. Finding out gradient of line by rise and fall method
6. Measurement of area by mechanical
7. Study of total station for various measurements.
8. Site visit to study various construction processes and principles of planning.
9. Drawing sheet showing various building elements.
10. Drawing sheet showing various sign conventions

Model B

List of Experiments: Minimum 8 experiments should be performed from the following list-
Practicalexercises given be carried out and drawing sheets be plotted wherever necessary.
1. Introduction to Measurement of Distances.
2. Plotting the outlines of building by chaining, ranging and offsetting.
3. Plotting of closed traverse by surveyor’s compass.
4. Reduction of levels by collimation plane method.
5. Finding out gradient of line by collimation plane method.
6. Measurement of area by digital planimeter
7. Study of total station for various measurements.
8. Site visit to study various construction processes and principles of planning.
9. Drawing sheet showing various building elements.
10. Drawing sheet showing various sign conventions

Reference Books:
1. Basic Civil Engineering by S. S. Bhavikatti, New Age International Publications.
2. Civil Engineering Materials - Technical Teacher's Training Institute, Chandigarh
4. Basic Civil Engineering by G. K. Hiraskar, DhanpatRai Publication.
FIRST YEAR ENGINEERING AND TECHNOLOGY  
Semester -I and II  
Engineering Graphics

SECTION I  
A) Fundamentals of Engineering Graphics:  Introduction to Drawing instruments and their uses. Layout of drawing sheets, different types of lines used in drawing practice, Dimensioning system as per BIS (Theoretical treatment only)  
B) Engineering curves:  Construction of regular polygons (up to hexagon). Construction of Ellipse – (Directrix-Focus & Arcs of circle Method) Parabola-(Directrix-Focus & Rectangle Method) , Hyperbola-( Directrix-Focus & Rectangular Method), Involute, Archimedian spiral and Cycloid only. (10 marks)

Unit 2: Projections of lines & Planes (9)  
B) Projections of planes:  Projections on regular and on auxiliary reference planes. Types of planes (horizontal, frontal, oblique and Profile planes). Edge view and True shape of a Plane. Angles made by the plane with Principle reference planes. Projections of plane figures inclined to both the planes. (Circle and regular polygon) (15 marks)

Unit 3: Projections of solids (5)  
Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes (Excluding frustum and sphere) (10 marks)

SECTION II  
Unit 4: Orthographic Projections (7)  
Orthographic views:  lines used, Selection of views, spacing of views, dimensioning and sections. Drawing required views (any two views) from given pictorial views (Conversion of pictorial view into orthographic view) including sectional orthographic view. (15 marks)

Unit 5: Isometric projections (6)  
Isometric projections:  Introduction to isometric, Isometric scale, Isometric projections and Isometric views / drawings. Circles in isometric view. Isometric views of simple solids and objects. (10 marks)

Unit 6: Development of plane and curved surfaces (7)  
Development of plane and curved surfaces:  of the solids, Prisms, Pyramids, Cylinders and Cones along with cutting planes (Solids in simple position only). (10 marks)

Note: The above syllabus is to be covered according to the first angle method of projection.  
Self-Study: Geometrical constructions and free hand sketches, Missing Views
Term work:
The following six sheets are to be drawn based on the above topics. All these sheets should be drawn on half imperial (A3 size) drawing sheets only.
1. Engineering curves 01
2. Projections of lines and planes 01
3. Projections of solids 01
4. Orthographic projections 01
5. Isometric projections 01
6. Sections of solids and development of surfaces 01

Reference Books:
1. Engineering Drawing by N. D. Bhatt, Charotor Publication House, Bombay
3. Engineering Design and Visualization by Jon M. Duff, William A. Ross, CENGAGE Learning
11. Engineering Drawing by Prof. Amar Pathak, WIELY India Publication.
FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester -I
Professional Communication-I

Unit 1: Understanding Communication (3)
1. Introduction, nature and importance
2. Process of communication
3. Basic types of communication- Verbal and Non- verbal
4. Barriers and filters of communication

Unit 2: Grammar and Vocabulary (2)
1. Forms of Tenses
2. LSRW skills
3. Developing vocabulary (synonyms, antonyms, confused words etc.)

Unit 3: Phonetics (2)
1. Understanding Phonetics and its alphabets
2. Transcription practices

Unit 4: Developing Oral Skills (3)
1. Importance and techniques of spoken language.
2. Techniques of formal speech, meetings, Elocution, Extempore etc.

Unit 5: Professional Correspondence (4)
1. Importance, language and style, formats (British & American)
2. Letter Writing – Simple letter (seeking permission regarding absence etc.),
3. Preparation of technical events information brochure and manuals.

Term Work: Minimum 8 should be performed from the following list.
1. Elocution
2. Vocabulary building
3. Phonetic Alphabets (Listen & repeat)
4. Pronunciation
5. Fluency Tips
6. Extempore
7. Teamwork-story making
8. Effective reading (newspaper articles)
9. Active listening (memorizing)
10. Letter writing
11. Situational conversation

Instructions:
1. Minimum 7 assignments should be covered.
2. Use of language lab is mandatory for both the semesters.
Reference Books:
2. A Course in English by J.D. O’Connor.
6. Soft Skills for Managers by Dr. T. KalyanaChakravarthi, Dr. T. LathaChakravarthi, Biztantra.
7. Soft Skills for every one by Jeff Butterfield, Cengage.
8. Behavioural Science by Dr.Aba Singh, Wiley India Pvt.Ltd.
15. Decision Making Skills by Khanka S.S.
17. Write Right by Syed AbdurRaheem.

FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester -I and II

Workshop Practice-I

Unit 1: Safety (3)
Concept of accidents, causes of accidents, safety precautions while working in shop, safety equipments and their use.

Unit 2: Measuring Instruments (3)
Brief introduction to instruments like – Steel rule, Calipers, Vernier Caliper, Micrometer, DialGauge, Vernier height Gauge etc. Least counts, common errors and care while using them, Use of markinggauge, ‘V’ block and surface plate.

Unit 3: Smithy (4)
Introduction to smithy operations like- bending, forming, upsetting, drawing. Smithy toolshammer, hot & cold chisel flatters, tongs, anvil etc.

Unit 4: Fitting (4)
Study of various tools like- files, drills, taps, dies. Fitting operations.

Term work:
The term work consists of assignment on safety, measuring instruments, Smithy and fitting. Every student should perform,

1. **Smithy**
   One job in smithy involving upsetting, Drawing, bending such as- Hook, peg, square headedbolt etc.

2. **Fitting**
   One job Male/Female fitting with operations- Marking, cutting, drilling, tapping filing etc.

**Reference Books:**
Unit 1: Water (7)
Introduction, impurities in natural water, water quality parameters total solids, acidity, alkalinity, chlorides, and dissolved oxygen (definition, causes, significance), hardness of water types of hardness, units of hardness, ill effects of hard water in steam generation in boilers (scale & sludge formation), numerical on hardness, treatment of hard water (ion exchange and reverse osmosis).

Unit 2: Instrumental methods of chemical analysis (7)
Introduction, advantages and disadvantages of instrumental methods-----
A) Spectroscopy: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert’s law), Single beam spectrophotometer (schematic, working and applications).
B) Chromatography: Introduction, types, gas-liquid chromatography (GLC), basic principle, instrumentation and applications.

Unit 3: Advanced materials (7)
A) Polymers: Introduction, plastics, thermo softening and thermosetting plastics, industrially important plastics like phenol formaldehyde, urea formaldehyde and epoxy resins, Conducting polymers and Biopolymers (Introduction, examples and applications.)
B) Composite materials: Introduction, Composition, properties and uses of fiber reinforced plastics (FRP) and glass reinforced plastic (GRP).

SECTION II

Unit 4: Fuels (7)
Introduction, classification, calorific value, definition, units (calorie, kcal, joules, kilojoules), characteristics of good fuels, comparison between solid, liquid and gaseous fuels, types of calorific value (higher and lower), Bomb calorimeter and Boy’s calorimeter. Numerical problems on Bomb and Boy’s calorimeter.

Unit 5: Corrosion: (7)
Introduction, causes, classification, atmospheric corrosion (oxidation corrosion), electrochemical corrosion (hydrogen evolution and oxygen absorption mechanism), factors affecting rate of corrosion. Prevention of corrosion by proper design and material selection, cathodic protection, Protective coatings—hot dipping (galvanizing and tinning,), electroplating.

Unit 6: Metallic materials & Green Chemistry (7)
B) Green Chemistry: Definition, Twelve principles of Green Chemistry.

Term work:
List of Experiments:
Minimum 8 experiments should be performed from the following list out of which two experiments should be demonstrative on instrumental methods.

1. Determination of acidity of water.
2. Determination of alkalinity of water.
3. Determination of chloride content of water by Mohr’s method.
4. Determination of total hardness of water by EDTA method.
5. Determination of moisture, volatile and ash content in a given coal sample by proximate analysis.
6. Preparation of urea-formaldehyde resin.
7. Preparation of phenol-formaldehyde resin.
8. Determination of percentage of copper in brass.
10. Determination of rate of corrosion of aluminium in acidic and basic medium.
11. Demonstration of pH meter.

**Reference books:**
5. Engineering Chemistry by Dr. A. K. Pahari and Dr. B. S. Chauhan, Laxmi Publications (P) Ltd, New Delhi.
7. Engineering Chemistry by Wiley India.
FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester -I and II
Fundamentals of Electronics and Computer

Unit 1: Semiconductor Devices and Applications (7)
(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)

Unit 2: Digital Electronics (7)
(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)

Unit 3: Applications (7)
(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)
A) Transducers: for Displacement (LVDT), Temperature (RTD), Pressure (Strain Gauge), Speed (Shaft Encoder), Range, Specifications and Limitations.

SECTION II

Unit 4: Computer Basics and Hardware (5)
(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)
A) Generations & Classification of Computers.
B) Computer System Architecture– CPU, Input Unit, Output Unit, Storage Unit.
C) Applications of Computers.

Unit 5: Data Representation and Computer Software (8)
(Weightage 11 Marks in Shivaji Uni Exam of 70 marks)
A) Data Representation In Computer: Types Of Number System – Binary, Octal, Decimal, Hexadecimal & Their Conversions, Coding Schemes – ASCII, Unicode.

B) Computer Software:
A) Operating System: Types Of Operating System, Functions, Unix/Linux Commands: Listing, Changing, Copying, And Moving Files & Directories (ls, cd, cat, mkdir, rmdir)
B) System Software: Assembler, Interpreter, Compiler.
C) Application Software’s: Word Processor, Spreadsheets, Presentation and their Applications.

Unit 6: Computer Programming and Networks
(Weightage 12 Marks in Shivaji Uni Exam of 70 marks)


Term work: FUNDAMENTAL OF ELECTRONICS
List of Experiments: Minimum 4 experiments should be performed from the following list.
1. Testing of Electronic components- resistors, capacitors, inductor, diode, transistor, LED and Switches using multi-meter & C.R.O.
2. V-I Characteristics of PN junction diode and Zener diode.
3. Study of Half and Full wave rectifiers and their comparison.
5. Study of truth tables of logic Gates: OR, AND, NOT, NAND, NOR, EXOR.
6. Study of MUX/DEMUX.
8. Measurement of Temperature using any transducer.

Self-Learning Activities: Different types of Communication systems & Communication Media.

Term work: FUNDAMENTAL OF COMPUTER
List of Experiments: Minimum 4 experiments should be performed from the following list.
1. Study of computer system – Internal Components & peripherals.
2. Use of Unix/Linux commands & create a file using any editor in Linux.
3. Create a document using any word processor (In Linux (open office) /Windows (Microsoft office).
4. Use any spreadsheet application to manipulate numbers, formulae and graphs (In Linux/Windows).
5. Use any power point presentation application and create a professional power point presentation using text, image, animation etc. (In Linux/Windows).
6. An assignment based on use of Internet and Web for searching and downloading Technical information.
7. Study of Tablet and Android Operating System Features and applications.

**Text Books:**
1. A Text Book of Applied Electronics by R S Sedha, S. Chand
2. Basic Electronics Engineering by Vijay Baru, RajendraKaduskar, S T Gaikwad (Wiley/DREAMTECH)
3. Digital Principles & Applications by Albert Malvino, Donald Leach, TMGH Publication.
4. Principle of Electronics by V.K. Mehata, S. Chand
5. Electronic Instrumentation by H. S. Kalasi, Tata McGraw Hills Publication

**Reference Books:**
1) Electronics Devices and Circuit Theory by Robert L. Boylestad and Louis Nashelsky (Pearson Education Publication)
2) Fundamental of Digital Circuits by A. Anand Kumar (PHI- Publication)
3) Fundamental of Electronics Engineering by R.Prasad( CENGAGE- Learning)
4) Introduction to Information Technology, ITL Education Solutions LTD. Pearson Education
5) Fundamentals of Computers by V. Rajaram, PHI Publications.
6) UNIX concepts and applications by Sunitabha Das, TMGH.
FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester -I and II
Applied Mechanics

Unit 1: Fundamentals of Statics (7)

Unit 2: Equilibrium (7)
Lami s’ Theorem, Free Body Diagram, Equilibrium of Forces, Equilibrium conditions, Surface friction for bodies on horizontal and inclined planes.
Beams: Types of Loads, Types of supports, Analysis of Simple beams, Virtual work method for support reactions.

Unit 3: Centroid and Moment of Inertia (7)
Centroid and Center of Gravity, Moment of Inertia of Standard shapes from first principle, Parallel and perpendicular axis theorem, Moment of Inertia of plain and composite figures, Radius of Gyration.

SECTION II

Unit 4: Kinetics of Linear (8)
Introduction to Kinematics of Linear motion (no numerical on kinematics), Kinetics of linear motion, Newton’s Laws, D’Alembert’s Principle, Work- Energy Principle, Impulse Momentum Principal

Unit 5: Kinetics of Circular Motion (8)
Introduction to Kinematics of Circular motion (no numerical on kinematics), Rotation with constant and variable angular acceleration, centripetal and centrifugal force, condition of skidding and overturning.

Unit 6: Impact and Collision (5)
Term work:
Student can choose either Model 1 or Model 2 for performing practical

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
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<tbody>
<tr>
<td><strong>A) Experiments:</strong></td>
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<tr>
<td>1. Law of polygon of forces</td>
<td>1. Law of polygon of forces</td>
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<td>3. Bell crank lever</td>
<td>3. Bell crank lever</td>
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<td>5. Fleture’s Trolley</td>
<td>5. Centrifugal force</td>
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<tr>
<td><strong>B) Graphics Statics: (To be solved on A3 sheet)</strong></td>
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<tr>
<td>1. To find Resultant - 3 problems</td>
<td>1. To find Resultant - 3 problems</td>
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<tr>
<td>2. To find support reactions - 3 problems</td>
<td>2. To find support reactions - 3 problems</td>
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<td><strong>C) Home Assignments</strong></td>
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<tr>
<td>At least one assignment on each unit with minimum 5 numericals</td>
<td>At least one assignment on each unit with minimum 5 numericals</td>
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</tbody>
</table>

**Reference Books:**
12. “Applied Mechanics- Dynamics & Statics” by I.B. Prasad, Khanna Publisher, Delhi
FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester -I and II

Basic Mechanical Engineering

Unit 1: Thermodynamics (7)

Unit 2: Introduction to I C Engine (7)
Carnot Engine, Construction and Working of C.I. and S.I., Two stroke, Four Stroke Cycles, Air standard cycles- Carnot Cycle, Joule Cycle, Otto Cycle, Air Standard efficiency (Descriptive Treatment only) (12 marks)

Unit 3: Introduction to Refrigeration and Air Conditioning (6)
Carnot refrigerator, Refrigerant types and properties, Vapour compression and vapourabsorption system, solar refrigeration, Window Air Conditioning, Psychometric properties of moistair, Applications of refrigeration and air conditioning (Descriptive Treatment only). (11 marks)

Unit 4: Energy Sources and power plants (7)
Renewable and nonrenewable, Solar-flat plate collector, concentric collector–Parabolic and cylindrical, Photovoltaic cell, Wind, Hydropower plant, Steam Power plant, Bio-gas, Bio-Diesel (Descriptive Treatment only). (12 marks)

Unit 5: Mechanical Power Transmission and Energy conversion devices (7)
Type of Belt and belt drives, chain drive, Types of gears and gear Trains, (Numerical Treatment on belt drive), Construction, working and applications of centrifugal Pump, Reciprocating compressor and Peloton wheel Turbine. (12 marks)

Unit 6: Manufacturing Processes (6)
Introduction to manufacturing processes - Casting Process, Steps involved in casting processes, and their applications, Metal removing processes (Lathe, milling & drilling operations) Metal Joining Processes – Arc welding, soldering and brazing and their applications. (11 marks)

Term Work:

List of experiments: Minimum 8 experiments should be performed from the following list--
1. Demonstration of I.C. engine
2. Demonstration of Two stroke and four stroke engine
3. Demonstration of vapor compression refrigeration system and window air conditioner.
4. Demonstration of Solar water heating system.
5. Demonstration of Steam or Hydroelectric Power Plant
6. Demonstration of Diesel power plant
7. Demonstration of types of Gears and gear trains.
8. Demonstration of pumps and compressor.
9. Demonstration of hydraulic turbine
10. Demonstration of metal joining processes.
11. Demonstration of metal removal processes
12. Industrial visit based on syllabus.
**Reference Books:**
1. Solar Energy by Dr. S. P. Sukathame, Tata Mc-Graw Hill Publication
2. Non-Conventional Sources of Energy by G.D. Rai, Khanna Publication
7. Power Plant Engineering by Arora and Domkunwar, Dhanpat Rai and Sons.
10. Basic Mechanical Engineering by Basant Agrawal & C. M. Agrwal, Wiley India Pvt. Ltd.
11. Energy Technology by S. Rao and Dr. B. B. Parulekar, Khanna Publication.
FIRST YEAR ENGINEERING AND TECHNOLOGY

Semester -II

Engineering Mathematics-II

SECTION-I

Unit 1: Ordinary Differential Equations of First Order and First Degree (7)
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks )

1. Linear differential equations
2. Reducible to Linear differential equations
3. Exact differential equations
4. Reducible to Exact differential equations

Unit 2: Applications of Ordinary Differential Equations of First Order and First Degree
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks )

1. Applications to Orthogonal trajectories (Cartesian and Polar equations)
2. Applications to Simple Electrical Circuits
3. Newton’s law of cooling

Unit 3: Numerical Solution of Ordinary Differential Equations of First Order and First Degree
(Weightage 15 Marks in Shivaji Uni Exam of 70 marks )

1. Taylor’s series method
2. Euler's method
3. Modified Euler's method
4. Runge-Kutta fourth order formula

SECTION-II

Unit 4: Numerical Solutions Of Algebraic and Transcendental Equations
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks )

1. Bisection Method
2. Secant Method
3. Newton Raphson Method

Unit 5: Special Functions
(Weightage 10 Marks in Shivaji Uni Exam of 70 marks )

1. Gamma function and its properties
2. Beta function and its properties
3. Error function and its properties

Unit 6: Multiple Integration and its applications:
(Weightage 15 Marks in Shivaji Uni Exam of 70 marks )

1. Double Integrals and evaluation
2. Change of order of integration
3. Change into Polar Coordinates
4. Area enclosed by plane curves
5. Mass of a plane lamina

General Instructions:
1. Batch wise tutorials are to be conducted. The number of students per batch should be as per the University pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

**Recommended Books:**
3. Dr. B. S. Grewal - Higher Engineering Mathematics by Dr. B. S. Grewal, Khanna Publishers, Delhi.

**Reference Books:**
2. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester - I and II

**Workshop Practice-II**

**Unit 1: Welding (4)**
Types of welding – gas welding, arc welding, resistance welding, Welding equipment’s, welding of various metals, electrode classification and coding, welding joints.

**Unit 2: Carpentry (4)**
Introduction, Classifications of wood, common varieties of Indian timber, carpentry tools like Marking tools, cutting tools, planes, striking tools, holding tools. Carpentry operations- marking, sawing, chiseling, grooving etc. carpentry joints.

**Unit 3: Sheet metal work (4)**
Specifications of metal sheets, working tools, sheet metal operations like-cutting, bending, folding, punching, reverting and joining by brazing and soldering.

**Unit 4: Air pollution: (2)**
Air pollution due to automobiles, causes, PUC testing.

**Term work:**
The term work consists of assignment on Welding, Carpentry, Sheet metal work, Airpollution. Every student should perform---

1. **Welding:** One job on Arc welding- Lap / Butt Joint etc. (For individual student)
   OR
   Table, Shoe stand, Bag stand etc. (For 4-6 students)

2. **Carpentry:** One composite job involving dovetail joint, T joint, cross halving joint, pen stand etc. (For individual student)
   OR
   Table, Teapot, Stool etc. (For 4-6 students)

3. **Sheet metal Work:**
   One job on commercial items such as Dust bin, funnel, tray etc.

**Reference Books:**
FIRST YEAR ENGINEERING AND TECHNOLOGY
Semester -II
Professional Communication-II

Unit 1: Developing Writing Skills (3)
1. Importance of technical writing
2. Report Writing:
   a) Techniques of Report Writing
   b) Methods of data collection
   c) Types of Report Writing - Survey, Inspection and Investigation

Unit 2: Behavioral Skills (5)
1. Understanding Self (SWOT analysis)
2. Attitude Building/ Developing Positive attitude
3. Decision Making Skills
4. Leadership Skills
5. Stress Management
6. Time Management
7. Team Work

Unit 3: Presentation Skills (2)
1. Importance & techniques
2. Presenting yourself professionally

Unit 4: Career skills (4)
1. Corporate Manners and Etiquettes
2. Planning and Managing Career
3. Job Application and Resume
4. Interview: Techniques & skills
5. Group Discussion
6. Debate

Term Work: Any 8 out of the following should be conducted
1. Group Discussion (lab session/class room activity)
2. Mock Interview
3. Report writing (lab session/class room activity)
4. Paragraph writing on current technical writing
5. Presentation on current affairs
6. Developing Professional Telephonic skills
7. Exercise of Application writing and Resume writing
8. Practice of Case Study
9. Team building activities
10. Report writing (3 types)
11. Introduction and use of modern communication techniques
12. Computer aided presentation of a project report (PPT)

Instructions:
1. Minimum 7 assignments should be covered.
2. Use of language lab is mandatory for both the semesters.
Reference Books:
2. A Course in English by J.D. O’Connor.
6. Soft Skills for Managers by Dr. T. KalyanaChakravarthi, Dr. T. LathaChakravarthi, Biztantra.
7. Soft Skills for every one by Jeff Butterfield, Cengage.
8. Behavioural Science by Dr. Abha Singh, Wiley India Pvt.Ltd.
15. Decision Making Skills by Khanka S.S.
17. Write Right by Syed Abdur Raheem.
SHIVAJI UNIVERSITY, KOLHAPUR

REVISED SYLLABUS

SECOND YEAR (B. Tech) CBCS

CIVIL ENGINEERING

To be introduced from the academic year 2019-20
(i.e. from June 2019) onwards
SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B. TECH. (CIVIL) SEMESTER –III

ENGINEERING MATHEMATICS-III

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<th>Teaching Scheme</th>
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<td>Engineering Mathematics-III</td>
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<td>ESE</td>
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ISE: In semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To introduce the concept of linear differential equations of higher and their applications.
2. To introduce concept of vector calculus.
3. To learn the concept of Probability.
4. To familiarize the students with concepts and applications of Laplace Transforms.
5. To understand the concept of Complex variable.

Course Outcomes:
After completion of this course students will be able to:
1. Solve linear differential equations and problems related to applications of differential equation.
2. Perform vector differentiation.
3. Find probabilities by using probability distributions.
4. Find Laplace transform, Inverse Laplace transform of various functions and applications.
5. Find analytic function.

SECTION I

Unit 1: Linear Differential equations with constant coefficients: (7)
1.1 Linear Differential equations with constants coefficients and their methods of solutions
1.2 Applications of Linear Differential equations with constants coefficients to Civil engineering problems (Beam, Cantiliver and strut)

Unit 2: Vector differential calculus: (5)
2.1 Differentiation of vectors Consistency of linear system equations
2.2 Gradient of scalar point function and directional derivative
2.3 Divergence of vector point function and solenoidal vector fields
2.4 Curl of a vector point function and irrotational vector field
Unit 3: Probability Distribution:  
\[\text{(6)}\]  
3.1 Random Variable  
3.2 Binomial Distribution  
3.3 Poisson distribution.  
3.4 Normal distribution  

SECTION II  

Unit 4: Laplace Transform:  
\[\text{(7)}\]  
4.1 Definition and transforms of elementary functions.  
4.2 Properties of Laplace transform.  

Unit 5: Inverse Laplace Transform:  
\[\text{(6)}\]  
5.1 Inverse Laplace Transform Formulae.  
5.2 Inverse Laplace Transform by using partial fraction and convolution theorem.  
5.3 Solution of Linear Differential equations with constants coefficients.  

Unit 6: Complex Variable:  
\[\text{(5)}\]  
6.1 Functions of complex variable.  
6.2 Analytic function.  
6.3 Necessary and sufficient condition for f(z) to be analytic.  
6.4 Cauchy –Riemann equations in Cartesian and polar coordinates.  
6.5 Harmonic function.  

Term work:  
1. Batch wise tutorials are to be conducted. The number of students per batch should be as per the university pattern for practical batches.  
2. Minimum number of assignments should be 6 covering all topics.  

Text Books:  

Reference Books:  
1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.  
Guidelines regarding the question paper setting

It will be two sections. Each will include four questions having weight age 12, 11, 11, and 12. Out of four questions of each section attempt any three.

First three questions should be on each unit separately and question no. 4 should be on all the three units (out of three solve any two)

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Unit Number</th>
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SURVEYING-I

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<th>Course</th>
<th>Teaching Scheme</th>
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<td>Surveying-I (PCC-CV302)</td>
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ISE: In semester Evaluation      CIE: Continuous Internal Evaluation      ESE: End Semester Examination

Course Objectives:
1. To obtain a full understanding of the methods of measurement, errors to be expected, and their control.
2. To know the basics of levelling and theodolite survey in elevation and angular measurements.
3. To find out area and volumes using various instruments.
4. To study the significance of plane table surveying in plan making.
5. To be able to use minor instruments with efficiency.
6. To understand the importance of surveying in the field of civil engineering.

Course Outcomes: After completing of this course, student will be able to:
1. Determine linear and angular measurements.
2. Record various measurements in the field book.
3. Find areas of irregular figures.
4. Prepare plans and sections required for civil engineering projects.

SECTION I

Unit 1: Levelling and Contouring: (8)

a) Introduction to levelling.
b) Permanent Adjustments of dumpy level.
c) Reciprocal levelling, Sensitivity of bubble tube, Corrections – curvature and refraction.
d) Contouring – methods and applications.
Unit 2: Areas and volumes:  
   a) Planimeter – Area of Zero Circle and Numerical.  
   b) Area- Trapezoidal, Simpsons rule, Mid - ordinate rule, Average ordinate.  
   c) Volume- Trapezoidal and Simpsons Rule, Capacity contouring.

Unit 3: Plane Table Surveying:  
   a) Principles, accessories, significance and adjustments.  
   b) Methods and applications of plane table survey.

SECTION - II

Unit 4: Theodolite:  
   a) Vernier theodolite – components, uses and adjustments.  
   b) Applications – Trigonometrical levelling.

Unit 5: Theodolite Traversing:  
   a) Objectives, traverse table, plotting.  
   b) Omitted measurements.

Unit 6: Applications:  
   a) Usage of minor instruments- Hand Level, Abney Level, Ghat Tracer and Box Sextant.  
   b) Hydrographic survey.  
   c) Tunnel survey.

Term Work:
   1. Differential and reciprocal levelling, by Auto or Dumpy Level.  
   2. Two Peg Method.  
   5. Measurement of horizontal angles by any two methods.  
   6. Trigonometrical levelling- when base is accessible.  
   7. Project drawings

Survey Projects:
   1. Block contouring project for at least 100m x 100m- By Auto Level.  
   2. Theodolite traverse – Pentagon.

Textbooks:
   2. Surveying and Levelling by Subramanian, Oxford University Press.  
   4. Publications.  
   5. Surveying and Levelling by N. N. Basak, Tata McGraw Hill.  
Reference Books:

Guidelines for Question Paper Setting:
1. It will include two sections. Each section will include 4 questions having weightage 12, 11, 11 and 12. **Attempt any three out of 4 Questions from each section.**
2. First three questions should be on each unit separately and Question No.4 should be on all the three units. **Question No.4 and 8 should be of short notes** (Attempt any three out of five)

End Semester Examination

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Unit No.</th>
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SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B. TECH. (CIVIL) SEMESTER -III

STRENGTH OF MATERIALS

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<th>Course</th>
<th>Teaching Scheme</th>
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<td>Strength of Materials</td>
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ISE: In Semester Evaluation  
CIE: Continuous Internal Evaluation  
ESE: End Semester Examination

Course Objectives:
1. To develop an understanding of the basic principles of Structural Analysis.
2. Study the internal effects and deformations caused by the applied loads.
3. Understand the analysis and design aspects of structural engineering.

Course Outcomes:
After completion of this course students will be able to:
1. Evaluate the response of elastic body for external actions and compute design forces.
2. Evaluate shear force and bending moment of statically determinate structure.
3. Analyze the stress, strain and deformation of elastic bodies under bending and shear actions.
4. Analyze the stress, strain and deformation of elastic bodies under external actions.

SECTION I

Unit 1: Stress & Strain: (6)

1.1 Engineering properties of different materials.
1.2 Simple stress and strain, Hooke’s law, elastic behavior of the body under external actions.
1.3 Composite sections under axial loading, temperature stresses, elastic constants.
1.4 Normal stresses and strains in three dimensions.

Unit 2: Shear force diagram & bending moment diagram for determinate beams: (6)

2.1 Concept and definition of SF & BM, relation between SFD, BMD & loading.
2.2 SFD & BMD due to point load, UDL, UVL & moments/couples.

Unit 3: Analysis of trusses: (6)

3.1 Introduction to truss.
3.2 Analysis of truss using method of joints & method of sections.
SECTION II

Unit 4: Bending stresses: (6)

4.1 Theory of pure bending.
4.2 Derivation of flexural formula.
4.3 Bending stress for symmetrical & unsymmetrical section.

Unit 5: Shear stresses in beam: (6)

5.1 Shear stress distribution for symmetrical & unsymmetrical section.

Unit 6: Strain Energy: (6)

6.1 Strain energy due to different types of actions, suddenly applied load, gradually applied load & impact load, strain energy method for deflection of determinate beams.
6.2 Analysis of thin walled cylinder.

Term Work:

Term work shall comprise of –

A) Perform at least any Seven from following:
   ii. Tensile test on Mild steel and TMT steel.
   iii. Compression test on M.S. and C.I, cement bricks or paving blocks
   iv. Compression test on timber.
   v. Direct shear test on M.S. bar.
   vi. Charpy or Izod Impact test on different metals.
   viii. Water absorption and compression test on burnt bricks.
   ix. Hardness test on metals.

B) At least one assignment on each unit.

Text Books:


Reference Books:

2. “Mechanics of Material” - Beer and Johnston, M.
Guidelines regarding the Question Paper Setting:

It will include two sections. Each section will include 4 questions having weightage 11, 12, 12 and 12. **Question No. 1 & 5 is and solve any 2 out of remaining 3 in each section**

**Question No. 1 and 5 should compulsorily be on theory**

<table>
<thead>
<tr>
<th>Question No.</th>
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SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B. TECH. (CIVIL) SEMESTER -III

FLUID MECHANICS - I

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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To study processes and science of fluid and their properties.
2. To study pressure measuring devices and pressure diagram.
3. To apply basic principles in fluid flow problems.
4. To identify the losses in pipes.

Course Outcomes:
After successful completion of this course, student will be able to:
1. Study the basic properties of fluids and their behavior under application of various force systems.
2. Discuss the basic concepts and principles in fluid statics, fluid kinematics and fluid dynamics with their applications in fluid flow problems.
3. Recognize the principles of continuity, momentum and energy as applied to fluid in motion.
4. Apply the equations to analyze problems by making proper assumptions and learn systematic engineering methods to solve practical fluid mechanics problems.

SECTION-I

Unit-1: Properties of fluid: (6)

Unit-2: Fluid Statics: (7)
A. Pressure Measuring Devices, Pressure Head, Pressure Diagram, Total Pressure and Centre of Pressure, Forces on Plane and Curved Surfaces, Forces on vertical walls, gates and dams.
B. Buoyancy and Floatation: Archimedes’s Principle, Metacentre, Stability of Submerged and Floating Bodies.
Unit-3: Fluid Kinematics: (5)

SECTION-II

Unit-4: Fluid Kinetics: (7)
Forces Acting on Fluid in Motion, Euler’s Equation along a Streamline, Bernaulies equations, Bernoulli's Theorem assumptions, Limitations and modifications.

Bernoulli’s Applications: Venturimeter (Horizontal and Vertical), Orificemeter, Orifices, Time required for Emptying the Tank, Concept of HGL and TEL. Therotical and Experimental determination of hydraulic coefficients of orifice. Introduction of mouthpiece and Rotameter.

Unit-5: Laminar and Turbulent Flow: (6)

B. Boundary Layer Theory: Concept, Various Thicknesses (Nominal, Displacement, Momentum, Energy), Hydraulically Smooth and Rough Boundaries, Separation of Boundary Layer, Control of Separation.

Unit-6: Losses in Pipes: (5)
A. Major and Minor Losses, Darcy-Wiesbach Equation, Concept of Equivalent Pipe, Dupit’s Equation.

B. Pipes in Series, Parallel and Syphon, Two Reservoir Problems, Three Reservoir Problems Concept of Water hammer. Surge Tanks (Function, Location and Uses).

Term work:
Perform at least Eight Experiments from the Following:
1. Study of Pressure Measuring Devices.
3. Determination of Metacentric Height for Floating Bodies.
4. Verification of Bernoulli's Theorem.
5. Calibration of Venturimeter.
8. Reynold’s Experiment.
11. Study of Moody's Chart.
Text Books:
5. Fluid Mechanics – Arora.
6. Fluid Mechanics through Problems – Garde R. J.

Reference books:

Guidelines regarding the question paper setting:

It will include two sections. Each section will include 4 questions having weightage 11, 12, 11 and 12. Out of 4 Questions of each section attempt any three.

First three questions should be on each unit separately and Question No.4 should be on all the three units. Question No.4 and 8 should be of short notes.

End Semester Examination

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SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B. TECH. (CIVIL) SEMESTER -III
BUILDING CONSTRUCTION AND MATERIALS

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ISE: In Semester Evaluation   CIE: Continuous internal Evaluation   ESE: End Semester Examination

Course Objectives:
1. To understand the properties and suitability of building materials.
2. To understand the different building components.
3. To understand the masonry work by using stones, bricks, blocks.
4. To understand the various types of doors and windows with their components.
5. To understand the requirements of good stairs and design of stairs.
6. To understand different types of roofs and floors.

Course Outcomes:
After completion of this course students will be able to:
1. Know the building Materials.
2. Describe properties and suitability of various building materials.
3. State the different building components.
4. Demonstrate different bonds in brick masonry.
5. Produce drawings of different building components.
6. Explain different types of roof coverings & types of flooring.

SECTION I

Unit 1: Engineering properties and use of following materials: (9)
1.1 Stones – Requirements of good building stone, uses of building stones.
1.2 Bricks – Manufacturing, Types (clay bricks, fly ash, cellular light weight concrete brick, aerated cement concrete brick or autoclave brick) and Engineering Properties.
1.3 Timber – Natural and Artificial wood and their application in Civil Engineering.
1.4 Steel – Standard structural sections, steel as reinforcement.
1.5 Tiles - Ceramic, Vitrified, Natural Stone, Paving Blocks.
1.6 Miscellaneous – Aluminium, Glass, Plastic.
Unit 2: (9)
   a) **Basic requirements of a building as a whole**: Strength and stability, Dimensional stability, comfort and convenience, damp prevention, water-proofing techniques, heat insulation, day lighting and ventilation. Sound insulation and anti termite treatment.

   b) **Building components and their basic requirements**: Foundations, plinth, walls and columns in superstructure, floors, doors and windows, sills, lintels and weather sheds, roofs, steps and stairs, utility fixtures.

   c) **Formwork**: Materials (wooden, steel and aluminium).

   d) **Foundations**: Types and their suitability (Stepped, isolated, combined, strip, raft, strap or cantilever, pile.)

Unit 3: (6)
   a) **Stone Masonry** – Random Rubble, Uncoursed Rubble, Coursed Rubble and Ashlar Masonry.

   b) **Brickwork and Brick Bonds** - English, Flemish, Composite masonry.

**SECTION II**

Unit 4: (8)
   a) **Lintel**: Necessity, Materials: wood, stone, brick, steel, R.C.C. and reinforced brick lintels.

   b) **Doors** – Classification, T.W. Paneled Door, Flush Door, Aluminum Glazed Doors, Steel Doors, fixtures and fastening.

   c) **Windows** - Classification, T.W. Glazed Windows, Aluminum Glazed Windows, fixtures and fastening.

Unit 5: (8)
   **Stairs**: Technical terms, requirements of a good stair, uses, types, materials for construction. Design of stairs (Dog Legged, quarter turn and Open Well), Ramps, lifts and escalator.

Unit 6: (8)
   a) **Roofs and Roof coverings**: Terms used. Roof and their selection, pitched roofs and their types, Steel Trusses types and their suitability, roof covering, material, details, fixtures manglore tiles, A. C., G. I. and Precoated sheets, concept of proflex (truss less) roof and their selection.

   b) **Construction of floors**: Concrete Flooring, R.C.C. slabs, R.C.C. beams and slab. Flat slab floor.

   c) **Waterproofing**: Materials, methods and systems.

**Term Work:**

1. **Drawing to a Scale, Draw on Half Imperial Drawing Sheet**.
   a. Foundations: - Isolated, Combined Footing, Under Reamed Piles. (With reinforcement details)
   b. Stone Masonry: UCR, Course Rubble.
   d. Doors: T.W. Paneled Door.
   e. Windows: T.W., Glazed and aluminium Window.
   f. Stairs: Dog legged, quarter turn and Open well.
2. Sketch Book:
   a. Lettering, Symbols, Types of lines and dimensioning as per IS 962.
   b. Doors: Flush doors, Revolving door, Collapsible door and rolling shutter.
   c. Windows: Louvered window, Sliding Window, Bay window, Casement window, Dormer Window, Corner Window.
   d. Roofs: Line Sketches of steel trusses for different spans.
   e. Stairs: Quarter turn, bifurcated, Spiral, Geometrical.
   f. Lifts and Ramps.
   g. Formwork: footing, column and beam.

Text Book:
   5. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons)

References Book:

Codes of standards:
   1. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.

Guidelines for Question Paper Setting:

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SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B. TECH. (CIVIL) SEMESTER -III

NUMERICAL METHODS

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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To introduce the concept of Numerical differentiation.
2. To introduce Numerical methods for evaluating definite integrals.
3. To learn fitting of straight lines and parabola.
4. To introduce the concept of Linear Programming Problem.
5. To understand methods of solution of partial differential equations.
6. To solve problems in civil engineering.

Course Outcomes:
After completion of this course students will be able to:
1. Identify, classify and choose the most appropriate numerical method for solving a problem.
2. Illustrate basic theory of correlation and regression.
3. Form and solve Linear Programming Problem.
5. Deploy skills effectively in the solution of problems in civil engineering.

SECTION I
Unit 1: Numerical Differentiation: (6)
1.1 Finite differences and difference operators.
1.2 Newton’s forward and backward formulae.
1.3 Lagrange’s interpolation formula.
1.4 Sterling central difference formulas.

Unit 2: Numerical Integration: (6)
2.1 Trapezoidal Rule.
2.2 Simpson’s 1/3rd and 3/8th rules Gradient of scalar point function and directional derivative.
2.3 Romberg integration-recursive formula.

Unit 3: Curve Fitting: (6)
3.1 Correlation and regression.
3.2 Lines of regression of bivariate data.
3.3 Fitting of curves by methods of least squares (straight-line and parabola).
SECTION II

Unit 4: Linear Programming: (6)
4.1 Types of solutions to linear programming problems.  
4.2 Formation of L.P.P.  
4.3 Simplex method to solve Linear Programming Problem.

Unit 5: Partial Differential Equations: (6)
5.1 Elliptical equation.  
5.2 Laplace equation.  
5.3 Liebmen’s method.

Unit 6: Calculus of variation: (6)
6.1. Introduction and definition.  
6.2 Euler’s Equation, Extremal.  
6.3 Isoperimetric problem.

Term Work:
- Batch wise Practical’s are to be conducted. The number of students per batch should be as per University pattern for practical batches.
- Programs on applications to civil engineering problems using C and C++ Language
  1. Trapezoidal Rule  
  2. Simpson’s 1/3rd rule.  
  5. Least square method.  
  7. Solution of Laplace equation.  
  8. Lagrange’s interpolation formula.

Minimum number of practical should be 6 covering all topics.

Text Books:

Reference Books:
1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B. TECH. (CIVIL) SEMESTER -IV

STRUCTURAL MECHANICS

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ISE: In Semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

Course Objectives:
1. Introduction to structural systems, and to methods of analyzing these systems under various loading conditions.
2. To understand behavior of structure.
3. To analyze the structures subjected to moving loads.

Course Outcomes:
After completion of this course students will be able to:
1. Identify the response of elastic body for external actions.
2. Distinguish engineering properties of the materials are understood.
3. Compute the design forces in the structures.
4. Analyze the stress, strain and deformation of elastic bodies under external forces.

SECTION I

Unit 1: Principal planes & stresses: (6)

1.1 Normal and shear stresses on any oblique plane.
1.2 Concept of principal planes and stresses by analytical & graphical methods (Mohr's circle of stress 2-D).
1.3 Theories of failure: Maximum normal stress, maximum shear stress and maximum strain energy theory.

Unit 2: Combined direct and bending stresses: (6)

2.1 Combined direct and bending stresses, eccentric load, core /kernel of section.
2.2 Stability analysis of gravity dam, retaining wall & chimney.

Unit 3: Influence line diagrams: (6)

3.1 Muller's Breslau's principle & its applications to statically determinate simple and compound beam.
3.2 ILD for member forces in statically determinate truss.
SECTION II

Unit 4: Buckling of long columns: (6)
4.1 Effective length for various end conditions.
4.2 Slenderness ratio.
4.3 Euler's theory & Rankine's theory.

Unit 5: Slope and deflection of determinate beams: (6)
5.1 Double integration method.
5.2 Macaulay's method.
5.3 Moment-Area method & Conjugate beam method.

Unit 6: Torsion of circular shaft: (6)
6.1 Analysis of circular shaft subjected to torsion.
6.2 Power transmitted to circular shaft.
6.3 Shafts subjected to combined bending, torsion & axial thrust.

Term work:
1. One assignment per unit (minimum 4 problems per assignment)

Recommended Books:

Reference Books:
2. “Mechanics of Material” - Beer and Johnston, M.

Discussion regarding the question paper setting:

It will include two sections. Each section will include 4 questions having weight age 11, 12, 12 and 12. Question No. 1 & 5 is compulsory and solve any 2 out of remaining 3 in each section Question No. 1 and 5 should be on theory

End Semester Examination

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SECOND YEAR B. TECH. (CIVIL) SEMESTER –IV

SURVEYING - II

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ISE: In Semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

Course Objectives:
1. To understand tacheometric surveying in distance and height measurements.
2. To get introduced to different geodetic methods of survey such as triangulation.
3. To get introduced to modern advanced surveying techniques involved such as Remote sensing, Total station, GPS, Photogrammetry etc.
4. To understand the elements of different types of curves and preliminary survey for road.

Course Outcomes:
After successful completion of this course students will be able to:
1. Adopt the principles of advanced surveying instruments.
2. Formulate triangulation stations, Flight planning and Ground control points (GCPs).
3. Apply GIS and GPS concepts to civil engineering problems.
4. Design and setout curves by different methods.

SECTION- I

Unit 1-Measurement of distances and elevations: (7)
a) Tachometry – Principles, Suitability, Methods
b) Stadia diaphragm, Stadia formulae.
c) Tachometric contouring.

Unit 2 – Geodetic Surveying: (7)
a) Triangulation Principle and Classification, system, Selection of station, Base line,
b) Measurement, Correction and use of sub tense bar.
c) Signals, satellite station, Reduction to center, Trilateration.

Unit 3 – Modern Surveying Equipment’s and Project Surveys (4)
a) Principle of EDM, Use and applications of Total Station.
b) Reconnaissance, Preliminary and Detailed survey for road project.
SECTION- II

Unit 4 – Curves:  (7)
   a) Significance of curves and curve setting.
   b) Type of horizontal curve, elements of Simple, Compound curve, Transition curve introduction only, setting out of simple curve by linear and angular methods.
   c) Vertical curves – types, lengths of vertical curves.

Unit 5 – Photogrammetry: (5)
   a) Types of photogrammetry, Terrestrial Photogrammetry- introduction only.
   b) Aerial photogrammetry – Scale of vertical photographs, Flight planning.

Unit 6 – Modern methods of surveying: (6)
   a) Remote sensing – Definition, relevance, types, electromagnetic radiation and energy sources and its characteristics, applications to civil engineering.
   b) GPS – basic principles, GPS segments, receivers, applications in survey.
   c) GIS – Terminology, advantages, basic components of GIS, data types, GIS analysis, applications of GIS software.

Term work:
   1. Tacheometry-
      a. Determination of tacheometric constants.
      b. Determination of grade of a given line.
      c. Determination of area of polygon.
      d. Measurement of horizontal distance by Substance Bar.
   2. Experiments using total station – any two.
   3. Setting out of simple curve- one linear and one angular method
   4. Use of GPS.
   5. Project drawings.

Survey Projects:
   1. Road project – at least 1000m.
   2. Radial contouring.

Textbooks:
   2. Surveying and Levelling by Subramanian, Oxford University Press.
Reference Books:


Guidelines for Question paper setting:

1. It will include two sections. Each section will include 4 questions having weightage 12, 11, 11 and 12. Attempt any three out of 4 Questions from each section.
2. First three questions should be on each unit separately and Question No.4 should be on all the three units. Question No.4 and 8 should be of short notes (Attempt any three out of five)

End Semester Examination

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SECOND YEAR B. TECH. (CIVIL) SEMESTER -IV

CONCRETE TECHNOLOGY

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ISE: In Semester Evaluation    CIE: Continuous Internal Evaluation    ESE: End Semester Examination

Course Objectives:
1. To study materials used in concrete production.
2. To understand process of concrete manufacturing and to study properties of fresh concrete.
3. To study relationship between compressive strength and tensile strength.
4. To study mix design of concrete by using IS code method and ACI method
5. To study different Non Destructive Tests (NDT).
6. To study different types of special concrete and their manufacturing.

Course Outcomes:
After completion of this course students will be able to:
1. Impart knowledge of physical properties of ingredients of concrete and their effect on strength and durability.
2. Explain the fundamentals of process of making good quality concrete and its elastic properties.
3. Understand the factors affecting properties of concrete.
4. Design the concrete mix proportion as per Indian standard code of practice.
5. Demonstrate Non Destructive Testing (NDT) and evaluate quality of existing concrete.
6. Understand different types of concrete and their applications.

SECTION I

Unit 1 (7)
Ingredients of Concrete:


Water: general requirements, quality of water.
Unit 2
Fresh Concrete:  

Unit 3
Hardened concrete:  

SECTION II
Unit 4
Concrete Mix Design:  

Unit 5
Admixtures in concrete:  
a) Chemical Admixtures: Plasticizers, Super plasticizers, Retarders, Air entraining agents, IS 9103Specifications  
b) Mineral Admixtures: Fly ash, Silica Fume, GGBS, Rice husk ash, metakaolin

Unit 6
Special Concretes and Durability of concrete:  

Term work:  
Perform At least any 12 experiments from following:  
1. To determine fineness of cement by Sieve analysis and/or Blaine’s air permeability method.  
2. To determine the standard consistency of cement using Vicat’s apparatus.  
3. To determine initial and final setting time of cement.  
4. Determination of soundness of cement by Le-Chatelier’s apparatus and/or Auto Clave test.  
5. To determine compressive strength of cement.
6. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate).
7. Determination of specific gravity of fine aggregates.
8. Determination of specific gravity and water absorption of coarse aggregates.
9. To determine flakiness and elongation index of coarse aggregates.
10. To determine workability of fresh concrete by using slump cone.
11. To determine compaction factor for workability of fresh concrete.
12. To determine workability of fresh concrete by using Vee Bee Consitometer.

Text books:
1. Shetty, M.S., Concrete Technology, S. Chand Publication.

Reference books:
1. A. M. Neville, J. J. Brooks, “Concrete Technology” Pearson Education India
2. A. M. Neville, “Properties of Concrete”, Pearson Education India.
3. R.S. Varshney, “Concrete Technology”, Oxford and IBH.

IS codes:
1. IS: 10262 - 2009, Recommended guidelines for Concrete Mix Design.

Guidelines for Paper Setting:
1. One question on each unit.
2. Optional question should be given on Unit 3 and 6. (Weightage of optional question should not be more than 30% of total marks ie. 21 marks out of 70 marks).
3. Compulsory Numerical on mix design should be asked with required table and chart in question paper (ACI 211.1-91, IS 10262 - 2009).

End Semester Examination

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SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B. TECH. (CIVIL) SEMESTER –IV

FLUID MECHANICS - II

<table>
<thead>
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<th>Course</th>
<th>Teaching Scheme</th>
<th>Evaluation Scheme</th>
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<tr>
<td>Fluid Mechanics-II (ESC-CV404)</td>
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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To study uniform and non-uniform flow in open channel.
2. To apply basic principles in fluid flow problems.
3. To study velocity and discharge measurement devices.
4. To study impact of jet, Pumps and turbines.

Course Outcomes:
After successful completion of this course, student will be able to:
1. Provide students with basic knowledge of fluid properties and utilizing principles developed in fluid mechanics.
2. Develop the principle and equation for pressure flow and momentum analysis.
3. Provide the students with the analytical knowledge of pressure and velocity distribution in an open channel in order to solve practical problems.
4. Illustrate and develop the equations and design principles for open channel flows, including sanitary and storm sewer design and flood control hydraulics.

SECTION I

Unit-1: Uniform Flow in Open Channel:

B. Steady and Uniform Flow: Characteristics of uniform flow, Chezy's and Manning's Formula, Uniform Flow Computations, Hydraulically Efficient Section (Rectangular, Triangular, Trapezoidal)

Unit -2: Gradually Varied Flow (GVF):

A. Depth Energy Relationship in Open Channel Flow: Specific Energy (Definition and Diagram, Critical, Sub-Critical, Super-Critical Flow), Specific Force (Definition and Diagram)
B. Gradually Varied Flow (GVF): Definition, Classification of Channel Slopes, Dynamic Equation of GVF (Assumption and Derivation), Classification of GVF Profiles- Practical Examples, Direct Step Method of Computation of GVF Profiles.

Unit-3: Rapidly Varied Flow (RVF): (6)
B. Spatially Varied Flow: Introduction, Basic Principles and Assumptions.

SECTION II

Unit-4: Notches and Weirs: (7)

Unit-5: Impact of Jet: (6)
Impulse Momentum Principle, Impact of Jet on Vanes- Flat, Curved (Stationary and Moving), Inlet and Outlet Velocity Triangles, Series of Flat, Curved Vanes Mounted on Wheel.

Unit-6: Pumps and Turbines: (5)
A. Hydraulic Turbines: Importance of Hydro-Power, Classification of Turbines- Pelton,Francis and Kaplan Turbine (Detailed Design Need Not To Be Dealt With), Unit Quantities, Specific Speed, Performance Characteristics, Selection of Type of Turbine, Concept of Draft Tube.

Term Work:
A. Perform at least three experiments from the Following:
   1. Study of Specific Energy Curve for Different Discharges.
   2. Calibration of V-Notch / Rectangular Notch.
   5. Impact of Jet.
B. Study of Turbines (Demonstration).
C. Test on Centrifugal Pump.
D. Visit report of Hydropower Plant.
E. Assignments on GVF and SVF.
Text Books:

Reference Books:

Guidelines regarding the question paper setting:
It will include two sections. Each section will include 4 questions having weightage 11, 12, 11 and 12. Out of 4 Questions of each section attempt any three. First three questions should be on each unit separately and Question No.4 should be on all the three units. Question No.4 and 8 should be of short notes.

End Semester Examination

<table>
<thead>
<tr>
<th>Question No.</th>
<th>Unit No.</th>
<th>Marks</th>
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<tbody>
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<td>4.</td>
<td>1,2 and 3</td>
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<td>4,5 and 6</td>
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SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B. TECH. (CIVIL) SEMESTER –IV

BUILDING DESIGN AND DRAWING

<table>
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<th>Course</th>
<th>Teaching Scheme</th>
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<tr>
<td>Building Design and Drawing</td>
<td>03</td>
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<tr>
<td>(PCC-CV405)</td>
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</table>

ISE: In Semester Evaluation        CIE: Continuous internal   ESE: End Semester Examination

Course Objectives:
1. To understand Principles of Building planning and building planning bye laws.
2. To understand planning of residential buildings with procedure.
3. To understand Low cost housing and Maintenance, Repairs, Rehabilitation of Structures Per IS 1893.
4. To understand various systems such as plumbing, electrification, Air conditioning, fire resistance, thermal insulation Per IS 13920.
5. To understand various building finishes.

Course Outcomes:
After completion of this course students will be able to:
1. Know principles of building planning.
2. Describe Building Bye-Laws and regulations.
3. Plan and draw residential building considering principle of planning and Building Bye-Laws and regulations.
4. Explain techniques of maintenance, repair and rehabilitation of structure.
5. Draw the working drawing of foundation detail, plumbing and electrification of building.
6. Illustrate the concept of ventilation, air conditioning and thermal insulation.
7. Describe different types of building finishes.

SECTION I

Unit: 1 (4)

Site Selection criteria: Principles of Building planning, Significance Sun path diagram, Wind Diagram, Orientation, Factors affecting, criteria under Indian condition.

Unit: 2 (9)

Building Planning Byelaws and regulations: As per SP-7, 1983 National Building code of India group 1 to 5.
Planning of Residential Building: (Bungalows, Row Bungalows, Apartments and Twin Bungalows) Procedure of Building Permission, significance of commencement, plinth completion or occupancy certificate.

Unit: 3

Low cost Housing: Materials and Methods (conceptual introduction only)
Maintenance, Repairs, Rehabilitation of Structures: (Conceptual introduction only)
Green building: Concept and rating.

SECTION II

Unit: 4

Plumbing system: Various Materials for system like A-PVC, C-PVC, GI, and HDPE. Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing and Drainage plan, introduction to rainwater harvesting.

Electrification: Concealed and Open Wiring, Requirements and Location of various points, Concept of Earthing.

Fire resistance in building: Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.

Unit: 5

Ventilation: Definition and necessity of Ventilation, functional requirement, various system and selection criteria.

Air conditioning: Purpose, Classification, Principles, Systems and Various Components of the same.

Thermal Insulation: General concept, Materials, Methods.

Introduction to Acoustics: Absorption of sound, various materials, conditions for good acoustics.

Sound Insulation: Methods of noise control.

Unit: 6

Paints: Different types and application methods.
Plastering: Pointing and various techniques.
Wall cladding: Skirting, dado work with various materials.
Miscellaneous finishes: POP, Gypsum plaster.

Term Work:
1. Imperial size sheet based on actual measurement of existing residential building consisting of plan, elevation, section passing through staircase, Site plan, Area statement and brief Specifications (G+1 building and minimum 5 rooms, Measurement drawing should be done in group of maximum 5 students).

Note: The center line plan drawn expected to be transferred on ground as an exercise.

2. Planning and design of residential building (G+1).
3. Full set of drawings for the building planned in 2- (a) Municipal Submission drawing. 
   (b) Working Drawings (Max. 2 student group).
   • Foundation / Center Line Drawing.
   • Furniture layout plan.
   • Electrification plan.
   • Water supply and drainage plan.
4. Project report giving details of following systems
   • Stair Case
   • Drainage System
   • Water Supply System
   • Water Tank
   • Septic Tank
   • Design of terrace Drainage System.
5. Site visit along with report.

Text Book:
5. A Course in Civil Engineering Drawing – V.B.Sikka (S.K.Kataria and Sons).

References Books:
2. Handbook of Building Construction- M. M. Goyal (Amrindra Consultancy (P. Ltd.).
3. Form follows feelings, the Architectural Pramod Beri, Anjali Prakashan.

Code of Standards:
1. SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi.

Guidelines regarding the question paper setting:

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<th>Unit No.</th>
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End Semester Examination

Solve any 2 from Q. 1,3,4. Q2 Compulsory

Solve any 3
SHIVAJI UNIVERSITY
KOLHAPUR

REVISED SYLLABUS AND STRUCTURE
SECOND YEAR (B. Tech) CBCS

Computer Science and Engineering

To be introduced from the academic year 2019-20
(i.e. from June 2019) onwards

(Subject to the modifications will be made from time to time)
<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Course Subject / Title</th>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
<th>TERMWORK</th>
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<td>Mini Project</td>
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CIE - Continuous Internal Evaluation
ESE – End Semester Examination
• Candidate contact hours per week : 30 Hours(Minimum)
• Total Marks for S.E. Sem III & IV : 800 + 900 =1700
• Theory and Practical Lectures : 60 MinutesEach
• Total Credits for S.E. Sem III & IV : 50 (SEM-III: 25 + SEM -IV:25)
• In theory examination there will be a passing based on separate head of passing for examination of CIE andESE.
• There shall be separate passing for theory and practical (term work)courses.

Note:

1. **BSC-CS**: Basic Science Course – Computer Science and Engineering are compulsory.
2. **ESC-CS**: Engineering Science Course - Computer Science and Engineering are compulsory.
3. **PCC-CS**: Professional Core Course – Computer Science and Engineering are compulsory.
4. **HM-CS**: Humanities and Management- Computer Science and Engineering are compulsory.
5. **PW-CS**: Project Work— Computer Science and Engineering are compulsory.
6. **MC-CS**: Mandatory Course -Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.
1. Applied Mathematics (BSC-CS301)

### TEACHING SCHEME

<table>
<thead>
<tr>
<th>Theory</th>
<th>EXAMINATION SCHEME</th>
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<td>3 Hrs/Week</td>
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<td>Tutorial : 1 Hrs/Week</td>
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<td>Practical: ---</td>
<td>Term work: 25 marks</td>
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<td>Credits:- 4</td>
<td>Practical :---</td>
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### Prerequisite:
Basic probability theory, Statistics

### Course Objectives:
1. To develop mathematical skills and enhance thinking power of students.
2. To give the knowledge to the students of fuzzy set theory, numerical methods probability and statistics with an emphasis on the application of solving engineering problems.
3. To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

### Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Describe the statistical data numerically by using Lines of regression and Curve fittings.
2. Solve basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions.
3. Calculate numerical integration.
4. Define fuzzy sets using linguistic words and represent these sets by membership functions, convexity, normality, support, etc.
5. Solve examples on the principle in performing fuzzy number arithmetic operations such as Addition, Multiplication & fuzzy equation.
6. Solve assignment problems by using different techniques of operations research.

### Unit No. Contents No.of Lectures

1. **Correlation, Regression & Curve Fitting:**
   - Introduction, Karl Pearson’s Coefficient of Correlation, Lines of regression of bivariate data, Fitting of Curves by method of Least-squares, Fitting of Straight lines. Fitting of exponential curves. Fitting of second degree Parabolic curves. 06

2. **Probability Distribution:**
   - Random variables, Discrete Probability distribution, Continuous probability distribution, Binomial Distribution, Poisson Distribution, Normal Distribution. 06
3. **Numerical Integration:**

4. **Introduction to Fuzzy sets:**
   Crisp set and Fuzzy set, Basic concepts of fuzzy sets, Basic operations on fuzzy sets, Properties of fuzzy sets.

5. **Fuzzy Arithmetic:**
   Fuzzy numbers, Fuzzy cardinality, Arithmetic Operations on Fuzzy numbers, Solutions of Fuzzy equations of type \( A + X = B \) & \( A \cdot X \).

6. **Assignment Problem:**

**TEXTBOOKS:**

1. Advance Engineering Mathematics by Erwin Kreyszig (Wiley India).

**General Instructions:**

1. For the term work of 25 marks, batch wise tutorials are to be conducted.
2. Number of assignments should be at least six (All units should be covered).
2. Discrete Mathematics & Structures (PCC-CS302)

Prerequisite: Basic Mathematics

Course Objectives:
1. To expose the students to the mathematical logic related to computer science areas.
2. To enhance the problem solving skills in the areas of theoretical computer science.
3. To use mathematical concepts in the development of computer applications.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Apply logic concepts in designing a program.
2. Illustrate basic set concepts & apply operations on set.
3. Minimize the Boolean Function.
4. Apply basic concepts of probability to solve real-world problems.
5. Represent data structures using graph concepts.

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Contents</th>
<th>No. of Lectures</th>
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<tbody>
<tr>
<td>1</td>
<td>Mathematical Logic: Statements &amp; Notations, Connectives, Statement Formulas &amp; truth table, Well formed formulas, Tautologies, Equivalence of formulas, Duality law, Tautological Implications, Functionally complete set of connectives, Other connectives, Normal Forms, Theory of Inference for statement calculus.</td>
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<tr>
<td>2</td>
<td>Set Theory: Basic concepts of set theory, Operations on Sets, Ordered pairs &amp; n-tuples, Cartesian product</td>
<td>04</td>
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<tr>
<td>3</td>
<td>Relations &amp; Functions: Relations. Properties of binary relations. Matrix &amp; Graph Representation of Relation., Partition &amp; covering of Set, Equivalence Relations., Composition of Binary Relation., POSET&amp;Hasse Diagram, Functions, Types of Functions, Composition of functions.</td>
<td>06</td>
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</tbody>
</table>
4 **Algebraic Systems:**
Algebraic Systems: Examples & general Properties, Semi groups & Monoids, Groups: Definitions & Examples, Subgroup & Homomorphism.

5 **Lattice and Boolean Algebra:**
Lattice as partially ordered sets, Lattice as Algebraic Systems., Special Lattices., Boolean Algebra: Definitions & examples, Boolean Functions., Representation & Minimization of Boolean Functions.

6 **Graph Theory:**

**Text Books:**

**Reference Books:**
1. Discrete Mathematics – Seymour Lipschutz, Marc Lipson (MGH), Schaum’s outlines.
2. Discrete Mathematics and its Applications – Kenneth H. Rosen (AT&T Bell Labs) (mhhe.com/rosen)

**TERM WORK:**
4. It should consist of minimum 10 to 12 assignments based on topics of syllabus & Exercise problems mentioned in text books out of which 4 to 5 implementations of above assignments must be using ‘C’ programming language.
S. Y. B. Tech (Computer Science and Engineering) Sem – III

3. Data Structures (PCC-CS303)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
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<tbody>
<tr>
<td>Theory : 3 Hrs. / Week.</td>
<td>Theory : ESE 70Marks</td>
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<td>Tutorial : ---</td>
<td>Term work: ---</td>
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<tr>
<td>Practical : ---</td>
<td>Practical : ---</td>
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<td>Credit: -3</td>
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**Prerequisite:** C programming

**Course Objectives:**
1. To make the students familiar with basic data structures.
2. To provide students with foundation in computer programming/problem.
3. To teach the students to select appropriate data structures in computer applications.
4. To provide the students with the details of implementation of various data structures.

**Course Outcomes:**
Upon successful completion of this course, the student will be able to –
1. Identify the appropriate data structure for specific application.
2. Design and analyze programming problem statements.
3. Choose appropriate sorting and searching algorithms.
4. Outline the solution to the given software problem with appropriate data structure.

**Unit No.**
**Contents**
**No. of Lectures**

1. **Basic of Data Structures**
   Data structure- Definition, Types of data structures, Data Structure Operations, Algorithms: Complexity, Time and Space complexity.
   03

2. **Searching and Sorting Techniques**
   Linear search, Binary search, Hashing – Definition, hash functions, Collision, 07
   Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Radix sort, Complexity and analysis.

3. **Stacks and Queues**
   Stack: Definition, operations, Array representation of stack, applications Queue: Definition, operations, Array representation of queue, applications, Circular queue, Priority queue, Deque.
   07
4 **Linked Lists**  
Definition, representation, operations, implementation and applications of singly, doubly and circular linked lists. Linked representation of stack and Queue.

5 **Trees**  
Terminology, representation, binary tree, traversal methods, binary search tree, AVL search tree, B tree, B+ tree, Heaps- Operations and their applications, Heap sort.

6 **Graphs:**
Basic concept of graph theory, storage representation, graph traversal techniques- BFS and DFS, Graph representation using sparse matrix.

**TEXT BOOKS:**

1. Schaum’s Outlines Data Structures – Seymour Lipschutz (MGH)

**REFERENCE BOOKS:**

### Course Objectives:
To perceive fundamental concepts of Computer Networks
1. To understand layered architecture and basic networking protocols
2. To illustrate the TCP/IP protocol internal details

### Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Demonstrate concepts of Computer Networks.
2. Explain OSI and TCP/IP layered architecture
3. Implement network and data link layer.
4. Demonstrate TCP protocol in detail.
5. To analyze the protocol structure using network analyzing tools.
6. Apply the principals of socket programming in the networks.

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Contents</th>
<th>No. of Lectures</th>
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<tbody>
<tr>
<td>1</td>
<td><strong>Introduction to Computer Network:</strong></td>
<td>05</td>
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<tr>
<td></td>
<td>Overview of OSI layer Model and TCP/IP protocol model, Addressing, Underlying technologies for LANs, WANs, and Switched WANs.</td>
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<td>2</td>
<td><strong>Data Link Layer</strong></td>
<td>06</td>
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<tr>
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<td>Design issues for Data Link Layers, Framing methods, Error control: detection and correction, Flow control, Elementary Data Link protocols, Sliding window Protocols, Go back n, Selective repeat.</td>
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<tr>
<td>3</td>
<td><strong>Medium Access Control Sub layer:</strong></td>
<td>06</td>
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<td></td>
<td>Static and Dynamic channel allocation, Multiple Access protocols ALHOA, CSMA, Collision Free Protocols, Ethernet: IEEE 802.3, IEEE 802.4, IEEE 802.5 standards, Wireless LANS 802.11 standards</td>
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</tr>
<tr>
<td>4</td>
<td><strong>Network Layer:</strong></td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>IPv4 Addresses: Classful Addressing Other Issues, Sub-netting and Super netting, Class less Addressing, Delivery, Forwarding and routing; Routing methods: Shortest path, Link state, Distance vector routing and broadcast routing.</td>
<td></td>
</tr>
</tbody>
</table>
Congestion control algorithms: Principles, Congestion prevention policies, congestion control in datagram subnet, Load Shedding, Jitter Control.

5 Internet Protocol:
IP Datagram format, Fragmentation and reassembly models, ARP, RARP, ICMP, IGMP

6 Transport Layer:
The Transport service primitives,
UDP: Process to Process communication, User Datagram Format, Operation and uses of UDP.
TCP: TCP Services and Features, TCP segment format, TCP Connections, Flow and error control in TCP, TCP Timers; Berkeley Sockets: Socket Addresses, Elementary Socket system calls byte ordering and address conversion routines, connectionless iterative server, connection oriented concurrent server, TCP and UDP Client server Programs.

TEXT BOOKS:
1. TCP/IP protocol suite 4th Ed. – Behrouz A. Forouzen (Tata Mag.Hill)
2. Computer Networks – Andrew S. Tanenbaum (PHI)

REFERENCE BOOKS:

TERM WORK
1. Study and demo of LAN, WAN and various connecting devices and components
   - List out component and devices required for a std. LAN, WAN
2. Study, design and configuration of IEEE 802.3 Ethernet and IEEE 802.11 Wireless
   - LANs (Referring RFCs)
3. Study of following connectivity test tools with all its options –
   4. ifconfig, arp, route, traceroute
   5. nmap, netstat, finger
   6. Implementing Framing methods
   7. Implementing Elementary data link protocol (Stop & wait protocol)
   8. Implementation of Error detection (CRC) code
   9. Implementation of Error detection codes (Hamming)
10. Programs to understand IP addressing, classful & classless addressing
12. Implement shortest path routing algorithm.

13. Programs for connection oriented (TCP) client-server using socket programming
14. Programs for connection less (UDP) client-server using socket programming
15. Study of network protocol analyzer (Ethereal or Wire-Shark) and understanding packet formats for UDP, TCP, ARP, ICMP protocols.

INSTRUCTIONS FOR PRACTICAL EXAMINATIONS AND TERMWORK:
Term Work: It should consist of 10-12 experiments based on the syllabus and should be implemented by using Socket Programming. The study experiments should consist of some practical work and observations.
Prerequisite: Fundamental of Electronics and Basic Computer

Course Objectives:
1. To learn the Architecture and Basic Programming model.
2. To give the hands on experience of Assembly language programming for 8085 and 8086 microprocessors.
3. Differentiate between Microprocessors and Microcontrollers.
4. To differentiate the microprocessor family.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Describe the Architecture of 8085 microprocessors and microcontroller.
2. Classify the 8086 Assembly Instructions set and use in Assembly language Programs.
3. Explain Programming model’s of 8086 microprocessors.
4. Classify the 8086 Assembly Instructions set and use in Assembly language Programs.
5. Understand the higher processor architecture.
6. Understand the need for other Microprocessors.

Unit No. Contents No. of Lectures
1 Architecture of 8085 06
Classification of Instructions, Instruction set of 8085
Introduction to 8051 Micro controllers
2 The Microprocessor and its Architecture:
a) Internal Microprocessor Architecture b) Real Mode Addressing Addressing Mode:
a) data Addressing Mode b) Program Memory Addressing Mode
c) Stack memory Addressing mode..
2 06
3 Data movement Instruction, PUSH and POP, Load Effective Address 06
String Data Transfer Arithmetic Instruction:
a) Addition b) Subtraction c) Comparison d) Multiplication e) Division
BCD & ASCII Arithmetic, Assembler Details.

4 Logic & Program Control Instruction:
   a) Basic Logic Instruction
   Shift & Rotate, Jump Group and Procedures
   Machine Control & Miscellaneous Instructions
   Basic Interrupt Processing, Hardware Interrupts

5 80386 Microprocessor:
   Introduction to 80386 Microprocessor, The Memory System
   Special 80386 Registers
   80386 Memory Management, Virtual 8086 Mode
   Introduction to Protected Mode memory Addressing, Memory Paging
   Mechanism

6 Pentium Pro Microprocessor
   Introduction to Pentium Pro Microprocessor,
   Internal Structure of the Pentium Pro, The Memory System
   Multiple Core technology.

TEXT BOOKS:
1. The INTEL Microprocessors; Architecture, Programming and Interfacing By Barry B Brey (8th Edition)
2. Microprocessors and Microcontrollers- N.Senthi Kumar, M, Saravanam and SJeevananthan
   (Oxford University Press)
REFERENCE BOOKS:
7. Microprocessors Architecture, Programming and Application with 8085 by Ramesh Gaonkar
   2 The Microcomputer Systems: the 8086.8088 Family By Yu Chenn A. Gibson
   PHI Ltd

List of Laboratory Experiments:
1. To convert different number from decimal to binary, octal to hexadecimal & vice versa & also study of logic gates.
2. Perform hands on experiment using 8085 kit.
3. Storing and displaying the content stored at different registers and memory location
4. Implementation of 8085 programs involving data transfer and arithmetic instruction set.
5. Implementation of 8085 Programs involving logical and bit manipulation instruction set.
6. Implementation of 8086 programs involving branch instruction and machine control instruction set.
7. Implementation of 8086 Programs involving debugs utility.
8. Use of assembler directive and find the count and the sum of even, odd numbers from the given array.
9. Implementation of string data transfer instructions and use of Db directive for declaration of 2-D array
10. Implementation of Dos interrupts to read char from keyboard and display on the screen.
11. Implementation of basic logic instruction, shift and rotate instruction and BCD and ASCII arithmetic instructions.
12. To study memory management unit of 80386 processor which include address calculation, descriptor and paging mechanisms.
S. Y. B. Tech (Computer Science and Engineering) Sem – III

6. C Programming (PCC-CS306)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
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<tbody>
<tr>
<td>Theory : 3 Hrs / Week</td>
<td>Theory :---</td>
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<tr>
<td>Tutorial : ---</td>
<td>Term work: 50 marks</td>
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<tr>
<td>Practical: 4 Hrs. / Week</td>
<td>Practical : 50 marks</td>
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<td>Credits:- 5</td>
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</tbody>
</table>

**Prerequisite:** Digital Electronics, Computer Fundamentals

**Course Objectives:**
1. To learn concepts of arrays and pointers in C
2. To learn file handling in C
3. To learn memory management in C
4. To learn structures in C

**Course Outcomes:**
Upon successful completion of this course, the student will be able to –
1. Articulate the principles of procedure oriented problem solving and programming.
2. Explain programming fundamentals including statements, control flow and recursion
3. Able to formulate problems and implement algorithms in C
4. Analyze and use data structures to solve the complex problem statements.
5. Demonstrate file operations using file handling concepts through developing applications.

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Contents</th>
<th>No.of Lectures</th>
</tr>
</thead>
</table>
| 1        | Introduction to C:  
The Form of a C Program, The Library and Linking, Separate Compilation, Compiling a C Program, C’s Memory Map; Expressions – The Basic Data Types, Modifying the Basic Types, Identifies Names, Variables, The Four C Scopes, Type Qualifiers-const, volatile, Storage Class Specifiers; Statements - Selection Statements, Iteration Statements, Jump Statements, Expression Statements, Block Statements. | 6 |
| 2        | Console I/O & Basics of Array and Strings.  
Console I/O: Reading and Writing Characters, Reading and Writing Strings, Formatted Console I/O, printf(), scanf(), Suppressing Input. Arrays and Strings- Two-Dimensional Arrays, Arrays of Strings, Multidimensional Arrays, Array Initialization, Variable-Length Arrays. | 6 |
| 3        | Functions:  
The General Form of a Function, Understanding the Scope of a Function, Parameter passing, Passing arrays to functions, Function Arguments, argc and argv-Arguments to main(), The return Statement, What Does main() Return?, | 6 |

4  **Pointers:**  6

**Structures, Unions, Enumerations, and typedef:**  6
5  Structures, Arrays of Structures, Passing Structures to Functions, Structure Pointers, Arrays and Structures Within Structures, Unions, Bit-Fields, Enumerations, Using sizeof to Ensure Portability, typedef.

**File I/O:**  6

**Instructions for Practical Examinations:**
It should consist of minimum 10-12 experiments based on the syllabus and concepts mention below. Students of different batches should implement different programs. Student should perform all experiments using GCC under Linux environment.

**TEXT BOOKS:**

**REFERENCE BOOKS:**

**List of Experiments**
1. Branching Statements
2. Looping
3. Arrays
4. Functions
5. Storage Class.
7. Implementation of STACK.
8. Implementation of QUEUE.
9. Implementation of LINKED LIST.
10. Copy Contents of one file to another file.
11. Implementation of GRAPH.
12. Implementation of TREE.
S. Y. B. Tech (Computer Science and Engineering) Sem – III

7. SOFT SKILLS (HM-CS307)

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<thead>
<tr>
<th>TEACHING SCHEME</th>
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<tbody>
<tr>
<td>Theory : ---</td>
<td>Theory : ---</td>
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<tr>
<td>Tutorial : ---</td>
<td>Term work: 25 Marks</td>
</tr>
<tr>
<td>Practical: 2 Hrs./ Week</td>
<td>Practical: 25 Marks</td>
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<tr>
<td>Credits: - 1</td>
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</tbody>
</table>

Prerequisite: English language

Course Objectives:
1. To make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
2. To develop and nurture the soft skills of the students through individual and group activities.
3. To expose students to right attitudinal and behavioral aspects and to build the same through activities.
4. To encourage the all round development of students by focusing on soft skills.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. Effectively communicate through verbal/oral communication and improve the listening skills.
2. Actively participate in group discussion / meetings / interviews and prepare & deliver presentations.
3. Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

Contents

Unit No

Understanding Communication Skills: Verbal Communication - Effective Communication - Active listening – Articulation Paraphrasing – Feedback
Non- Verbal Communication- Body Language of self and others

Behavioral Skills / Self Development: SWOT Analysis, Confidence improvement, values, positive attitude, positive thinking and self esteem.

Leadership and Team Building
Culture and Leadership- Salient Features of Corporate Culture, Leadership Styles, Leadership Trends, Team Building- Team Development Stages, Types of Teams, Attributes of a successful team – Barriers involved

Developing Writing skills
E-mail writing, report writing, resumes writing, practice.
Stress and Time Management

Stress in Today’s Time- Identify the Stress Source, Signs of Stress, Ways to Cope with Stress. Healthier Ways to Combat Stress, Steps to be taken in the Organizations: Open communication, Time Management, Working towards Your Goals, Smart Work, Prioritize your Tasks

Professional Skill
Ethics, Etiquette and Mannerism-All types of Etiquette (at Meetings, Etiquette at Dining. Involuntary Awkward Actions, Public Relations Office (PRO)’s Etiquettes)
Technology Etiquette: Phone Etiquette, Email Etiquette, Social Media Etiquette, Video Conferencing Etiquette, Interview Etiquette.
Dressing Etiquettes: for Interview, offices and social functions.
Ethical Values: Importance of Work Ethics, Problems in the Absence of Work Ethics.

TERM WORK:
1. The instructor shows videos to enhance skills supporting career aspects and discussion about same videos. Multiple set of observations based on videos can be prepared by students.
2. Multiple set of activity based assignments can be prepared to allow multiple skills exposure for example a group task encouraging discussions, team building, value sharing, leadership and role play all at the same time. Every student must be given adequate opportunity to participate actively in each activity.
3. Each student will write one report based on visit/project/business proposal etc.
4. Faculty may arrange one or more sessions from following: Yoga and Meditation. Stress management, relaxation exercises, and fitness exercises. Time management and personal planning sessions.
5. The student must prepare the journal in the form of report elaborating the activities performed in the lab. Continuous assessment of laboratory work is to be done based on overall performance and lab assignments performance of student. Each lab assignment assessment will assign grade/marks based on parameters with appropriate weightage. Suggested parameters for overall assessment as well as each lab assignment assessment include- timely completion, performance, punctuality, neatness, enthusiasm, participation and contribution in various activities-SWOT analysis, presentations, team activity, event management, group discussion, Group exercises and interpersonal skills and similar other activities/assignments.

TEXT BOOKS:
1. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
3. Essentials of Effective Communication, Ludlow and Panthon; Prentice Hall of India.

REFERENCE BOOKS:
2. Seven Spiritual Laws of Success - Deepak Chopra
S. Y. B. Tech (Computer Science and Engineering) Sem – IV

1. Automata Theory(PCC-CS-401)

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<td>Theory : 3 Hrs/Week</td>
<td>Theory : ESE 70Marks</td>
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<td>Tutorial : ---</td>
<td>Term work: ---</td>
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<tr>
<td>Practical: ---</td>
<td>Practical :---</td>
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<tr>
<td>Credits: 3</td>
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**Prerequisite:** Basic Mathematical Concepts, Sets, graphs. **Course Objectives:**

1. To introduce students to the mathematical foundations of computation, the theory of formal languages and grammars.
2. To strengthen the students’ ability to understand and conduct mathematical proofs for computations.
3. To make the students understand the use of automata theory in Compilers & System Programming.
4. To analyze and design finite automata, pushdown automata, grammars & Turing machines.

**Course Outcomes:**

Upon successful completion of this course, the student will be able to –

1. Understand basic concepts of Regular Language and Regular Expressions.
2. Select appropriate abstract machine to recognize a given formal language.
3. Generate complex languages by applying Union, Intersection, Complement, Concatenation and Kleene * operations on simple languages.
4. Apply parsing concepts for syntax analysis.
5. Be familiar with thinking analytically and intuitively for problem solving situations in related areas of theory in computer science.

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Regular Languages and Finite Automata&lt;br&gt;Proofs, Recursive Definitions, Regular expressions and regular languages, Finite Automata, unions, intersection &amp; complement of regular languages, Applications of FA</td>
<td>7</td>
</tr>
<tr>
<td>2</td>
<td>Nondeterminism and Kleene’s Theorem&lt;br&gt;Nondeterministic finite automata, NFA with null transition, Equivalence of FA’s, Kleene’s Theorem (Part I &amp; Part II), Minimal Finite Automata</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>Context free Grammars&lt;br&gt;Definition, Union, Concatenation and Kleene *’s of CFLs, Derivation trees and ambiguity, Simplified forms and normal forms</td>
<td>5</td>
</tr>
</tbody>
</table>
4 Parsing and Pushdown Automata
Definition of Pushdown Automata, Deterministic PDA, Equivalence of CFG’s & PDA’s, Top down parsing, bottom up parsing.

Context free languages
5 CFL’s and non CFL’s, Pumping Lemma, intersections and complements of CFLs

Turing Machines
6 Definition, TM as language acceptors, combining Turing Machines, Computing partial function with a TM, Multi-tape TMs, and Universal TM

Text Books:
1. Introduction to Languages & the Theory of Computations – John C. Martin (Tata MGH Edition)

Reference Books:
1. Introduction to Automata Theory, Languages and computation – John E. Hopcraft, Raje
3. Introduction to theory of Computations – Michael Sipser (Thomson Books/Cole)
4. Theory of Computation – Vivek Kulkarni
Prerequisite: Computer Network-I.

Course Objectives:
1. To understand the Client server model & socket interface
2. To perceive IPv6 addressing and protocol
3. To explain and learn basic internet technology protocols
4. Simulate protocols using software tools.

Course Outcomes:
Upon successful completion of this course, the student will be able to –
1. program the client server model using sockets
2. understand and apply next generation protocol and addressing model
3. elaborate the fundamentals of Domain Name Systems
4. apply the concepts of Remote login and FTP in network applications
5. learn fundamentals of web, HTTP and e-mail communication protocols.
6. understand multimedia streaming and relevant protocols.

Unit No | Contents | No. of Lectures
--- | --- | ---
1 | **Client server model & socket interface:**
   The Socket Interface, The Client Server model and Software design, Concurrent processing in client-server software, Algorithms and issues in Client-Server design, Multiprotocol Servers, Multiservice Servers, Concurrency in clients, Unix Internet Super server (inetd). | 6
2 | **Next Generation IPv6 and ICMPv6:**
   IPV6 addresses, packet format, ICMPv6, Transaction from IPv4 to IPv6 | 5
3 | **BOOTP, DHCP and Domain name system:**
   Name Space, Domain Name Space, Distribution of name space, and DNS in internet, Resolution, DNS massages, Types of records, Compression examples, and encapsulation. BOOTP, DHCP | 6
Remote Login: TELNET and File Transfer FTP, TFTP:
Concept, NVT, Embedding, Options & options/sub-option negotiation, controlling
the server, Out-of-band signaling, Escape charter, Mode of operation, user interface.

FTP:
Connections, Communication, Command processing, File transfer, User
interface, Anonymous FTP, TFTP.

Web Applications Service Protocols:
HTTP: Architecture, Web Documents, HTTP Transaction, Request and Response,
HTTP Headers and Examples, Persistent Vs Non- Persistent HTTP, Proxy servers.

Electronic Mail:
Architecture, User agent, addresses, Delayed delivery, SMTP
commands and responses, Mail transfer phases, MIME, POP3

Multimedia In Internet:
Streaming stored audio/video, Streaming live audio/video, Realtime interactive
audio/video, Real Time Transport Protocol (RTP), Real Time Transport Control
Protocol (RTCP), Voice Over IP (VoIP), Session Initiation Protocol (SIP)

Text Books:
2. Computer Networks by Andrew S Tanenbaum.

Reference Books:
1. Data Communications and Networking by Behrouz A Forouzan
2. Internetworking with TCP/IP by Douglas Comer

Term work:
It should consist of minimum 8 - 10 experiments based on the following guidelines
1. Client program using UDP to connect to well known services (echo, time of the day service etc.).
2. Implementing concurrent TCP multiservice client/server.
3. Implementing Iterative UDP client/server.
4. Study of following DNS Tools with all its options. nslookup, dig, host, whois.
5. Implement trivial file transfer protocol (TFTP).
6. Configuration of basic services for FTP, HTTP, Telnet etc. on Linux Platform
7. Write program to send a mail using SMTP commands and receive a mail using POP3 commands.
8. Capturing & Analyzing operation of various application layer protocols using network protocol
   analyzer. (Wireshark and tcpdump)
9. Study of various streaming multimedia protocols in Internet (Using various audio/video streaming
   services on the Internet)
S. Y. B. Tech (Computer Science and Engineering) Sem – IV

3. Computer Organization and Architecture (PCC-CS-403)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
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<tbody>
<tr>
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<td>Theory : ESE 70Marks</td>
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<td>CIE 30Marks</td>
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<tr>
<td>Tutorial : ---</td>
<td>Term work: ---</td>
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<tr>
<td>Practical: ---</td>
<td>Practical :---</td>
</tr>
<tr>
<td>Credits: 3</td>
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</tbody>
</table>

**Prerequisite:** Basic Computer and Microprocessor

**Course Objectives:**
1. To provide a high-level overview of Computer organization.
2. To discuss the basic of I/O addressing and access.
3. To make the students aware of overall design and architecture of computer and its organization.
4. To analyze performance issues in processor and memory design of a digital computer.

**Course Outcomes:**
Upon successful completion of this course, the student will be able to –
1. recapitulate the history of computer system and the basic concepts of computer architecture and organization.
2. understand the concept of I/O organization.
3. apply the different algorithms to perform arithmetic operations.
4. articulate the design issues in the development of processor.
5. conceptualize instruction level parallelism.
6. understand the concept of memory techniques.

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No.of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computer Evolution and Performance</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Input and Output Organization</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Accessing I/O devices, Direct Memory Access (DMA), Buses: Synchronous Bus and Asynchronous Bus, Interface Circuits, Standard IO Interface.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Arithmetic</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>The Processing Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The Processing Unit</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Some fundamental Concepts, Execution of complete Instruction, Multiplebus</td>
<td>6</td>
</tr>
</tbody>
</table>
organization, Hardwired control, Micro programmed Control

**Pipelining**
5 Basic Concepts: Role of Cache Memory, Pipeline Performance. Data Hazards: Operand Forwarding, Handling Data Hazards in Software and Side Effects and Instruction Hazards: Unconditional Branches and Conditional Branches and Branch Prediction

**Computer Memory System**

**Text Books:**

**Reference Books:**
5. [http://cse.stanford.edu/class/sophomore-college/projects-00/risc/risccisc/(RISC vs.CISC)](http://cse.stanford.edu/class/sophomore-college/projects-00/risc/risccisc/(RISC vs.CISC))
4. Operating System I (PCC-CS-404)

**Prerequisite:** Computer Network-I.

**Course Objectives:**
1. To make the students understand basic concepts of operating system
2. To expose the students to various functions of the Operating system and their usage
3. To give hands on exposure to Linux commands and system calls.

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Contents</th>
<th>No. of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Overview of OS</strong> Abstract view of an operating system, Fundamental principles of OS operations, OS interaction with the computer and user programs, Efficiency, system performance and user service, Batch Processing System, Multiprogramming System, The Time Sharing System, The Real Time Operating System, Distributed operating system, Operation of OS, Operating system with monolithic structure, Virtual machine operating system, Kernel based operating system</td>
<td>6</td>
</tr>
<tr>
<td>2</td>
<td><strong>Processes, Threads and Synchronization</strong> Processes and programs, Implementing processes, Threads, Process synchronization, Race condition, Critical Section, Synchronization approaches, Classic process synchronization problems, Semaphores, Monitors</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td><strong>Process Scheduling</strong> Scheduling terminology and concepts, Non-preemptive scheduling policies, Preemptive scheduling policies, Long, Medium and short term scheduling</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td><strong>Deadlock</strong> What is deadlock, Deadlock in resource allocation, Handling Deadlocks: Deadlock Detection and Resolution, Deadlock prevention, Deadlock avoidance</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td><strong>Memory Management</strong> Managing the memory hierarchy, Static and Dynamic Memory Allocation, Heap Management, Contiguous Memory Allocation and Non Contiguous Allocation, Segmentation and Segmentation with paging, Virtual memory basics, Demand paging, Page replacement policies</td>
<td>6</td>
</tr>
</tbody>
</table>
6 **File systems and I/O systems** Overview of file processing, Files and file operations, Fundamental file organizations and access methods, Layers of the Input Output control system, Overview of I/O system

**Text Books:**
2. Operating System Concepts – Abraham Silberschatz, Peter B. Galvin & Greg Gagne (Wiley)

**Reference Books:**
1. UNIX Concepts and Applications – Sumitabha Das (TMGH).
2. Operating System: Concepts and Design – Milan Milenkovic (TMGH)

**Term work:**
The tutorials should be conducted on the following guidelines.
1. Six assignments should be based on theoretical / analytical concepts, preferably from the exercises of the books covering all topics of the syllabus.
2. Four assignments should be on usage of Unix / Linux commands and system calls concerned with General purpose utilities, file system, handling ordinary files, basic file attributes, the Shell, the Process and Filters using regular expressions as mentioned in the reference book at serial no.1.
3. Installation of any two operating system using VMware.
   These assignments should be practically conducted during the tutorial sessions.
S. Y. B. Tech (Computer Science and Engineering) Sem – IV

5. Software Engineering (PCC-CS-405)

<table>
<thead>
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<td>Term work: ---</td>
</tr>
<tr>
<td>Practical: ---</td>
<td>Practical :---</td>
</tr>
<tr>
<td>Credits:- 3</td>
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</table>

**Course Objectives:**
1. To expose the students to basic concepts & principles of software engineering.
2. To make the student aware of the importance of SDLC in their project development work.
3. To expose the students to software testing techniques and software quality management.

**Course Outcomes:**
1. Comprehend systematic methodologies of SDLC (Software Development LifeCycle)
2. Discriminate competing and feasible system requirements indicating correct real world problem scope and prepare stepwise system conceptual model using stakeholder analysis and requirement validation.
3. Prepare SRS document for a project
4. Apply software design and development techniques
5. Develop a quality software project through effective team-building, planning, scheduling and risk
6. Understand testing methods at each phase of SDLC

**Unit No.** | **Contents** | **No. of Lectures**
---|---|---
2 Software Requirements Analysis & specification | Value of Good SRS, Requirement Process, Requirements Specification, Other Approaches for Analysis, Validation | 5
3 Software Planning & Scheduling | Responsibilities of Software Project Manager, Project Planning, Project Scheduling, Project Staffing, People CMM, Risk Management | 6
5  **Coding & Testing**  Coding & Code Review, Testing, Unit Testing, Black Box Testing, White Box Testing, Program Analysis Tools, Integration Testing, System Testing


**Text Books:**
1. Software Engineering: A precise Approach – Pankaj Jalote (Wiley India) (Unit 1, 2, 4).

**Reference Books:**
6. Object Oriented Programming (PCC-CS406)

**TEACHING SCHEME**

<table>
<thead>
<tr>
<th>Theory</th>
<th>2 Hrs/Week</th>
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<tbody>
<tr>
<td>Tutorial</td>
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**EXAMINATION SCHEME**

| Theory | --- |
| Term work | 50 marks |
| Practical | 50 marks |

**Pre-requisites:** Basics Of C Programming Language

**Course Objectives:**

1. To learn advanced features of the C++ programming language as a continuation of the previous course.
2. To learn the characteristics of an object-oriented programming language: data abstraction and information hiding, inheritance, and dynamic binding of the messages to the methods.
3. To learn the basic principles of object-oriented design and software engineering in terms of software reuse and managing complexity.
4. To enhance problem solving and programming skills in C++ with extensive programming projects.
5. To become familiar with the LINUX software development environment.

**Course Outcomes:**

After the completion of this course, a successful student will be able to do the following:

1) Use the characteristics of an object-oriented programming language in a program.
2) Use the basic object-oriented design principles in computer problem solving.
3) Use the basic principles of software engineering in managing complex software project.
4) Program with advanced features of the C++ programming language.
5) Develop programs in the LINUX programming environment.
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<td>Power of Templates</td>
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6 I/O System Basics, File I/0
Streams, File Pointers & Redirections Streams, C++ stream, C++
Predefined stream classes, Formatted I/O, C++ file I/O, manipulators,
fstream and the File classes, File operations, namespaces, std
namespaces

TERM WORK:

- It should consist of minimum 10-12 experiments based on the syllabus and concepts mentioned below. Students of different batches should implement different programs based on the following guidelines.
- Student should perform the Practicals on Linux platform.

List of Experiments
1. Classes & objects
2. Constructors & destructors
3. Friend function and Friend class
4. Inline Function, Static data members & member functions,
5. Array, Array of Objects, Pointer to Object, THIS pointer, Dynamic allocation operators (New & Delete)
6. Function overloading, Operator overloading (unary/binary/arithmetic/comparison)
7. Inheritance (multilevel, multiple, hybrid, Hierarchical)
8. Virtual function and Virtual class, early and late binding
9. Generic function & classes
10. STL
11. Exception Handling
12. File handling

TEXT BOOKS:

REFERENCE BOOKS:
2. Object oriented Programming with C++- by Sourav Sahay (Oxford) 2nd edition
7. Mini Project (PW-CS407)

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Pre-requisites: Knowledge of software engineering and C/C++

Course Objectives:
1. To expose the students to solve the real world problems.
2. To utilize the techniques, Skills and modern Engineering tools for building the project.
3. To follow the methods and tasks as per SDOLC Approach

Course Outcomes:
1. Define the problem statement.
2. Organize, Plan and prepare the detailed project activities.
3. Construct Flowchart, System Architecture based on the project description
4. Implement the solution for their problem.

Platform: - C, C++

Course Contents/Description:-

The Mini Project should be undertaken preferably by a group of 3-4 students who will jointly work together and implement the project. The Mini Project topic should be based on the any one subject concepts that students have studied for their Academic Year. The group will select the project with the approval of the guide and submit the name of the project with a synopsis of the proposed work not more than 02 to 03 pages. In the Synopsis they have to state Flowchart, Usage of the logic, algorithm, functions and suitable data structure for implementing the solution. They have to implement project using C, C++ languages.
8. ENVIRONMENTAL STUDIES (PCC-CS408)

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SHIVAJI UNIVERSITY, KOLHAPUR

REVISED STRUCTURE AND SYLLABUS

SECOND YEAR (B. Tech) CBCS

ELECTRICAL ENGINEERING

To be introduced from the academic year 2019-20
(i.e. from June 2019) onwards
### SHIVAJI UNIVERSITY, KOLHAPUR

**CBCS STRUCTURE FOR ELECTRICAL ENGINEERING**

**(Semester III and Semester IV 2nd Year)**

#### SEMESTER – III (Duration – 6 Months)

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CIE – Continuous Internal Evaluation  
ESE – End Semester Examination

- Candidate contact hours per week : 30 Hours (Minimum)  
- Total Marks for S.E. Sem III & IV : **1650**

- Theory and Practical Lectures : 60 Minutes Each  
- Total Credits for S.E. Sem III & IV : **50**

- In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.
- There shall be separate passing for theory and practical (term work) courses.

**Note:**

1. **BSC-EE:** Basic Science Course- Electrical Engineering are compulsory.  
2. **PCC-EE:** Professional Core course – Electrical Engineering are compulsory.  
3. **MC-EE:** Mandatory Course : Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.
Shivaji University, Kolhapur

S.Y. B. Tech in Electrical Engineering Syllabus

w.e.f. June 2019-2020

Semester III

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SHIVAJI UNIVERSITY, KOLHAPUR

SECOND YEAR B.TECH (ELECTRICAL) SEMESTER-I

ENGINEERING MATHEMATICS-III

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ISE: In Semester Evaluation    MSE: Mid Semester Evaluation    ESE: End Semester Evaluation

Objectives:

1. To introduce the concept of linear differential equations of higher and their applications.
2. To introduce concept of vector calculus.
3. To learn the concept of Fourier series.
4. To familiarize the students with concepts and applications of Laplace Transforms.
5. To understand the concept of Z-transform.

Course Outcomes: After completion of this course students will be able to:
1) Linear differential equations and problems related to applications of differential equation.
2) Perform vector differentiation and integration.
3) Find Laplace transform and Inverse Laplace transform of various functions
4) Apply Laplace transform to solve Linear differential equations
5) Find Z-Transform and inverse Z-transform by using different properties.
6) Find Expansions of function by using Fourier series.

SECTION I

Unit 1: Linear Differential equations with constant coefficients: (8)
1.1 Linear Differential equations with constants coefficients and their methods of solutions
1.2 Applications of Linear Differential equations with constants coefficients to electrical engineering problems

Unit 2: Vector differential calculus (6)
2.1 Differentiation of vectors Consistency of linear system equations
2.2 Gradient of scalar point function and directional derivative
2.3 Divergence of vector point function and solenoidal vector fields
2.4 Curl of a vector point function and irrotational vector field

Unit 3: Fourier Series (7)
3.1 Definition, Euler’s formulae
3.2 Expansions’ of functions in the interval ((0,2π)
3.3 Change of interval.
3.4 Expansion of Even and Odd functions
SECTION II

Unit 4: Laplace Transform (8)
  4.1 Definition and transforms of elementary functions
  4.2 Properties of Laplace transform
  4.3 Inverse Laplace transform

Unit 5: Applications of Laplace transform: (7)
  5.1 Laplace Transform of Periodic functions
  5.2 Laplace Transform of Heaviside’s Unit – Step functions
  5.3 Laplace Transform of Unit Impulse function (Dirac-Delta function)
  5.4 Solution of Linear Differential equations with constants coefficients

Unit 6: Z-Transform: (6)
  6.1 Definition, Z-Transform of standard functions
  6.2 Properties of Z-Transform
  6.3 Inverse Z-Transform

General Instructions:
  1. Batch wise tutorials are to be conducted. The number of students per batch should be as per the university pattern for practical batches.
  2. Minimum number of assignments should be 8 covering all topics.

Recommended Books:

Reference Books:
  1. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd.
SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER –I

ELECTRICAL ENGINEERING MATERIALS AND ENERGY CONVERSION

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ISE: In Semester Evaluation    MSE: Mid Semester Evaluation    ESE: End Semester Evaluation

Objectives:
1. To classify different materials from Electrical Engineering application point of view.
2. To understand various properties and characteristics of different classes of materials.
3. To select materials for applications in various electrical equipment.
4. To impart knowledge of Materials for direct Energy conversion devices

Course Outcome:
At the end of this course, the students will be able to
1. Understand the types of engineering materials
2. Understand the principles of Electro-mechanical Energy Conversion
3. Use materials for energy conversion

SECTION I
Unit 1: Conductive materials
General properties and specifications of conductor materials, Factors affecting resistivity, Thermal conductivity of metals, Conductor bimetals, Types of fuse, Electrical carbon materials, Superconductivity

Unit 2: Insulating Materials
General properties of insulating materials, Thermal classification, Dielectric gases, Liquid & solid insulating materials, Insulation measurement, Insulating materials for electrical devices

Unit 3: Magnetic Materials
Magnetic parameters, Classification of magnetic materials, Ferromagnetic behaviour below critical Temperature, Ferromagnetic Materials at high temperature, Weiss theory of ferromagnetism, Magnetic materials for electric devices, Soft magnetic materials, Hard magnetic materials
SECTION II

Unit 4: Dielectrics:  
(5)  
Dielectric parameters and dielectric losses, Different types of dielectric materials and their classification. Dielectrics as electric field medium, Dielectric properties of insulators in static fields, Mechanism of polarization, ionic polarization, orientational polarization, Internal field in solids and liquids.

Unit 5: Principles of Electro-mechanical Energy Conversion:  
(7)  

Unit 6: Materials for direct Energy conversion devices:  
(5)  
Solar cells, MHD generation, Fuel cells, Thermoelectric generator, Thermo ionic converters.

General Instructions:
1. Minimum number of assignments should be 6 covering all topics.

Recommended Books:
2. Electrical Engineering Materials, A.J. Dekker, PHI.

Reference Books:
1. Materials Science for Electrical & Electronics Engineers, Ian P. Jones, Oxford
SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -III

ANALOG ELECTRONICS ENGINEERING

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ISE: In Semester Evaluation    MSE: Mid Semester Evaluation    ESE: End Semester Evaluation

Course Objectives:
1. Understand various semiconductor devices
2. Describe BJT and JFET operation
3. Classify feedback amplifiers & analyze various oscillators
4. List ideal op amp characteristics and explain configuration
5. Explain op-amp applications
6. Describe applications of IC 555 timer.

Course Outcomes (Cos):- Upon successful completion of this course, the student will be able to
1. Explain various semiconductor devises and its applications.
2. Illustrate & Compare BJT and JFET.
3. Classify feedback amplifiers & analyze various oscillators
4. List op-amp characteristics and distinguish its configurations
5. Explain applications of op-amp.
6. Interpret applications of IC 555 timers.

SECTION I

Unit 1: Applications of semiconductor devices (9)
1. Review of diode
2. Construction, characteristics and applications of special purpose diodes- LED, Photo diode, Zener diode, Tunnel diode, Varactor diode, Schotky diode
3. Types of rectifiers and its analysis: - Half wave rectifier, center tapped full wave rectifier and full wave bridge rectifier.
4. Filters
5. Series and shunt voltage regulators (Numerical on rectifiers expected)

Unit 2: Small Signal Analysis (7)
1. Review of transistors,
2. Load line and operating point of BJT
3. Bias stability
4. Biasing circuits of transistors  
5. Thermal runaway and use of heat sink  
6. Cascade amplifier  
7. Construction and working of JFET and MOSFET

Unit 3: Feedback Amplifiers
1. Introduction to positive and negative feedback amplifiers  
2. Barkhausen criterion  
3. Voltage/current, series/shunt feedback amplifiers,  

SECTION II

Unit 4: Op-amp Fundamentals and its characteristics
1. Introduction to op-amp: definition, symbol, block diagram  
2. Op-amp characteristics: - ideal and practical  
3. Op-amp parameters- Input offset voltage, Input bias current, input offset current, Output offset voltage, CMRR, SVRR etc.  
4. DC and AC characteristics-  
5. Thermal drift  
6. Slew rate and slew rate equation  
7. Op-amp configuration: - open loop and closed loop  
8. Inverting, non-inverting and differential amplifier, voltage gain derivation (Numerical expected)

Unit 5: Applications of Op-amp
1. Summing, scaling and averaging amplifier  
2. Instrumentation amplifier  
3. Integrator  
4. Differentiator  
5. Log and antilog amplifiers  
6. Peak detector  
7. Basic comparator  
8. Schmitt trigger  
9. Precision rectifiers: - Half wave and Full wave  
10. Triangular and Square wave generator

Unit 6: Special IC Applications
1. Introduction of timer and its need.  
2. IC 555 Timer functional diagram  
3. IC 555 as Monostable multi-vibrator and its application  
4. IC 555 as Astable multi-vibrator and its application  
5. Phase Locked Loops – operating principles, PLL IC 565 and its applications.
Recommended Books:

Reference Books:
1. “Operational amplifiers and linear ICs”, David A Bell, Oxford University Press, 2010
3. “Principle of Electronics”, V.K.Mehata, RohitMehata, S. Chand
5. “Electronic Devices and circuits”, Allen Mottershead, PHI publication,

List of Experiments

Minimum 8 experiments shall be performed from the following list

1. Study of Full Wave Rectifier with and without filter
2. Study of Zener diode as shunt voltage regulator
3. Study of transistorized series voltage regulator
4. Study of frequency response of RC coupled amplifier
5. Study of transistor biasing circuit
6. Study of transistorized oscillator
7. Study of Inverting and Non-inverting amplifier
8. Study of op-amp based adder and subtractor circuits
9. Study of Schmitt trigger circuit
10. Study of integrator circuit
11. Study of differentiator circuit
12. Study of op-amp based oscillator
13. Study of IC 555 as astablemulti-vibrator
14. Study of IC 555 as mono stable multi-vibrator
SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -I

BASIC CIRCUIT THEORY

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ISE: In Semester Evaluation        MSE: Mid Semester Evaluation        ESE: End Semester Evaluation

Objectives:
To make students ready to
1. Analyze the A. C and D.C. Circuit
2. Apply network theorems to solve problems
3. Solve problem on coupled circuit
4. Solve problem on two port network
5. Solve problem on Laplace Transformation

Course Outcome:
At the end of this course, the students will be able to
1. Analyze the A. C and D.C. Circuit
2. Apply network theorems to solve problems
3. Solve problem on coupled circuit
4. Solve problem on two port network
5. Solve problem on Laplace Transformation

SECTION I
Unit 1: Analysis of D. C. Circuit (8)
Types of Sources, Dependent and Independent Sources, Source transformation, Star/delta Transformation, Ladder Network, Nodal and Mesh Analysis.

Unit 2: Network Theorems (6)
Superposition theorem, Millman’s theorem, Norton’s theorem, Thevenin’s theorem, Maximum power transfer theorem, Reciprocity theorem, compensation theorem, Tellegen’s Theorem

Unit 3: First order and Second Order Circuit (10)
SECTION II

Unit 4: Sinusoidal Steady State Analysis (08)
Sinusoidal steady state analysis: Properties of sinusoidal functions, Phasor, Impedance and admittance, Series and parallel resonance, Q factor, Selectivity and band width, A.C. network solution using Norton’s theorem, Thevenin’s theorem, Superposition theorem

Unit 5: Two Port Network(8)
Single port and two port networks, Driving point function, Transfer function of two port network. Z parameters, Y parameters, Hybrid parameters, ABCD parameters, Inter relation between parameters, parameters of interconnected two port networks

Unit 6: Network Solution using Laplace transform(8)
Introduction to Laplace transform, Properties of Laplace transforms, impulse function, application to solution of differential equation describing volatage-current relationship for circuit in time domain, transformed circuit, transfer function, Determination of Initial Conditions.

General Instructions:
1. Minimum number of assignments should be 6 covering all topics.

Recommended Books:

Reference Books:
SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B.TECH (ELECTRICAL) – PART-II, SEMESTER -III

ELECTRICAL MEASUREMENT

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ISE: In Semester Evaluation    MSE: Mid Semester Evaluation    ESE: End Semester Evaluation

Course Objectives:

1. To Identify errors in the instruments.
2. To Identify unknown electrical parameters by using various methods.
3. To Solve the numerical on range extension of meters.
4. To Discuss various methods of measurement of Power & Energy.
5. To Demonstrate digital and advance instruments.
6. To Examine theoretically the performance of CT’s and PT’s.

Course Outcomes:

1. Explain various concepts of measuring instruments
2. Explain different types of secondary instruments.
4. Describe various methods for measurement of Power & energy.
5. Illustrate & Explain concept of displacement measurement.
6. Describe various modern techniques used in measurement.

SECTION I

Unit 1: Principle of Measuring Instruments (8Hrs)

Unit 2: Measurement of Resistance, Inductance & Capacitance (9Hrs)
Measurement of low, medium and high resistance Wheatstone bridge, Kelvin’s double bridge, ammeter-voltmeter method, Megger, Earth tester for earth resistance measurement. Maxwell’s Inductance bridge, Maxwell’s Inductance & Capacitance Bridge, Hay’s bridge, Anderson’s bridge, Campbell’s Bridge, Owen’s bridge, Schering Bridge (Numerical on Maxwell Bridge)
Unit 3: Measurement of Power (6Hrs)
Power & Its types (Active, Reactive & Apparent Power), Power in DC & AC Circuits, Power factor. Construction, working principle, torque equation, errors and their compensation, advantages and disadvantages of dynamometer type wattmeter, low power factor wattmeter, poly-phase wattmeter. Active & reactive power measurement in three phase system for balanced and unbalanced load using three wattmeter method, two wattmeter method & one wattmeter method.

SECTION II

Unit 4: Measurement of Energy (6 Hrs)

Unit 5: Transducers & Displacement Measurement (9 Hrs)
Construction and working principle of CRO & DSO, advantages and disadvantages of DSO over CRO.
Transducers: Introduction, classification, basic requirements for transducers. Selection of Transducer, Electrical transducer, Resistive transducer, Resistive position transducer, Resistance thermometer, inductive transducer, Pressure inductive transducer, capacitive transducer (pressure), High pressure measurement using electric methods, Piezzo-electric & photo electric transducer, temperature transducers.
Displacement Measurement- LVDT & RVDT construction, working, application, advantages, disadvantages.

Unit 6: Recent Development in Measurements (4 Hrs)
Wave Analysers & Harmonic Distortion, Power Analyser, Computer aided measurements, Instrument Transformers: Construction, connection of CT & PT in the circuit.

Recommended Books:

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<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author</th>
<th>Publisher</th>
<th>Edition</th>
<th>Year</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>A Course in Electrical and Electronic Measurements &amp; Instrumentation</td>
<td>A. K. Sawhney</td>
<td>Dhanpat Rai &amp; Co.</td>
<td>9th</td>
<td>2014</td>
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<tr>
<td>2</td>
<td>A Course in Electronics &amp; Electrical Measurements &amp; Instrumentation</td>
<td>J. B. Gupta,</td>
<td>S. K. Kataria &amp; Sons.</td>
<td>8th</td>
<td>2012</td>
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Reference Books:

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<th>Publisher</th>
<th>Edition</th>
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<td>1</td>
<td>Electrical Measurements &amp; Measuring Instruments</td>
<td>E. W. Golding F. C. Widdies</td>
<td>Reem Publications</td>
<td>3rd</td>
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<tr>
<td>2</td>
<td>Electrical Measurement &amp; Instrumentation</td>
<td>RS SirohiRadhakrisnan</td>
<td>New Age International</td>
<td>3rd</td>
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List of Experiments:

The term work shall consist of any 8 experiments (excluding study experiments) from list given below:

1. Demonstration of various analog measuring instruments
2. Measurement of Active & reactive power in three phase circuit using two wattmeter method
3. Calibration of Single phase Induction type energy meter at different power factors
5. Measurement of resistance using Whetstone’s/Kelvin’s bridge.
7. Measurement of capacitance using Schering’s bridge
9. Displacement measurement by LVDT.
10. Study of Digital Meters and Oscilloscopes.
12. Study of C.T. and P.T.
C PROGRAMMING

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1) **C Fundamentals:** Operators & expression, data I/P & O/P, Control statements, (2) functions, Program structure, arrays.

2) **Pointers**
   a. Fundamentals
   b. Point Declaration
   c. Passing Pointer to Function
   d. Pointer & One Dimensional Array
   e. Operation Pointers
   f. Pointer & multidimensional array
   g. Passing Function to other Function
   h. More about pointer declaration

3) **Structure & Pointer**
   a. Passing Structures to functions
   b. Self-referential structures
   c. Unions

4) **Data Files**
   a. Opening & Closing of Data Files
   b. Creating & Processing Data Files
   c. Unformatted Data Files

5) **Low Level Programming**
   a. Register Variables
   b. Bitwise Operator
   c. Bit Fields

6) **Additional Features of C**
   a. Enumeration
   b. Command Line Parameter
   c. Macros
   d. C Preprocessor
   e. MATLAB with C
   f. File Handling in MATLAB with C codes.

**TERM WORK:** Minimum TEN Programs covering all Topics with One Small Project.

**REFERENCE BOOKS:**
1. Programming With C Bryan Gottfried, Schaum’s Outline
2. Programming in Ansi C E Balguruswamy(TMH)
3. Let us C YashwantKanetkar[BPB]
4. C Made easy Herbert Schield
5. Understanding pointers in C YashwantKanetkar[BPB]
6. Getting started with MATLABRUDRAPRATAP[OXFORD]
SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B. TECH. (ELECTRICAL) SEMESTER –IV

DCMT

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Objectives:

1. To understand art of operation and performance of DC machines and transformers
2. To evaluate ratings of DC machines & transformers for various applications
3. To evaluate the performance of DC machines and Transformers as per IS

SECTION I

Unit 1: DC Machines:

Constructional Details: power flow diagram of D.C. machines. Construction of D.C. machines, magnetic circuit of DC machines, commentator and brush arrangement, EMF equation, torque equation

Armature Winding: Simple lap winding and wave winding, winding diagram and tables, brush position, dummy coils.


Unit 2: D.C. Motors:

Concept of back e.m.f., characteristics of D.C. motors, Method of speed controls, electro braking, parallel and series operation of motor. Testing of D.C. Machines:
Losses and efficiency, Break test, Swinburn’s test, Hopkinson’s test, Retardation test, Field test on D.C. series motor. Applications of DC Machines

**Unit 3: Universal Motor:**

Development of torque & power, rotational and transformer emf in commutator winding, commutation in universal motor, complex or diagram, circle diagram, operation on A.C. and D.C. supply, compensated winding, applications.

**SECTION II**

**Unit 4: Single Phase Transformer:**

Construction and type, EMF equation phasor diagram, equivalent circuit, efficiency, losses, regulation, Experimental determination of equivalent circuit parameters and calculation of efficiency and regulation, parallel operation.

**Unit 5: Poly Phase Transformer:**

Construction, single phase bank, polarity test, transformer winding, Grouping YD1, YD11, DY1, DY11, DZ1, DZ11, YZ1, YZ11, Parallel operation of Dy1 and Dy11.

**Unit 6: Performance of Three Phase Transformers:**

Switching inrush current, Harmonics in exciting current causes and effects, Harmonics with different transformer connections, tertiary winding, oscillating neutral, Testing of transformers as per IS2026, heat run test, Sumpner’s test, Equivalent delta test.

**Text Books:**

2. M. G. Say. “Performance Design of AC Machines”.
3. O. E. Taylor, “Performance Design of AC commutator motors”.

**References Books:**

SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B. TECH. (ELECTRICAL) SEMESTER –IV

POWER ELECTRONICS

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Objectives:

1. This course intends to provide basic knowledge of different power electronic devices, rectifiers, converters, inverters and choppers.
2. It is aimed to impart skills of analysis for different types of converters such as rectifiers, controlled converters, inverters and choppers.
3. Make the students acquainted with design of different types of converters such as rectifiers, controlled converters, inverters, choppers and their associated control circuit

SECTION I

Unit 1: Power Semiconductor Switches

Characteristics of an ideal switch. Characteristics, Rating, protection and cooling of power semiconductor devices such as power diodes, transistor, MOSFET, IGBT and GTO, Study of the driver circuits for thyristor, GTO and IGBT, Introduction to smart power modules, Comparative study of MOSFET, thyristor, GTO, BJT and IGBT.

Unit 2: Single phase and three phase Rectifiers

Single phase half wave and single phase full wave diode bridge. Three phase half wave and three phase full wave diode bridge, Transformer power rating for above configurations waveforms of source current, DC current and output DC voltage waveforms.

Unit 3: Phase Controlled AC to DC Converters:

Classification of converters, Single phase half controlled and fully controlled thyristor converters, Three pulse and six pulse controlled converters, operation of converter with freewheeling diode. Effect of source inductance on the performance of the converter,
overlap – angle. Performance factors for the converter such as displacement factor, distortion factor, total harmonic distortion, ripple factor and transformer utilization factor. Introduction to 12 pulse converter, single phase and three phase dual converter, firing scheme for 1 phase and three phase converter.
SECTION II

Unit 4: DC to DC Converters (7)

Control of DC to DC converters, step down (buck) converter, Analysis of buck converter with RLE load, step up converter, buck – boost converter, full bridge DC to DC converter, concept of multiphase choppers, cuk converter.

Unit 5: Switch Mode DC – AC Inverters (8)

Basic concepts of switch mode inverters, single phase half bridge and full bridge inverter, three phase six step inverter, 1200 mode of conduction, 180 degree mode of conduction, three phase PWM Inverter, sinusoidal PWM and selective harmonics elimination methods of PWM. Voltage and frequency control, Effect of blanking time on output voltage in PWM inverters. Applications of three phase and single phase inverters

Unit 6: Cyclo-converters and Matrix Converter (6)

Introduction to Single phase and three phase cyclo-converters. Working and topologies of Matrix converter, control methods, performance analysis of matrix converter. Applications of Cyclo-converters and Matrix Converter

Text Books:


References Books:

SHIVAJI UNIVERSITY, KOLHAPUR  
SECOND YEAR B. TECH. (ELECTRICAL) SEMESTER –IV

POWER SYSTEM - I

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Course Objectives:

The objectives of the course are to
1. Provide the knowledge to typical A.C. and D.C. Power Supply Scheme.
2. To teach the knowledge to understand line constants.
3. Analyze sending end voltage, receiving end voltage, transmission efficiency and regulation in case of transmission line and cables.
4. Recognize the common cause of voltages drops and faults in power system.

1. Supply System


2. Electrical Design of overhead lines


Classification of overhead Transmission Lines—Important Terms—Performance of
Single Phase Short Transmission Lines—Three-Phase Short Transmission Lines—
Effect of load p.f.on Regulation and Efficiency—Medium Transmission Lines—End
Condenser Method—Nominal T Method—Nominal π Method— Long Transmission
Lines—Analysis of Long Transmission Line—Generalised Constants of a

5. Underground Cables

Construction of Cables—Insulating Materials for Cables—classification of Cables—
Cables for 3-Phase Service—Laying of Underground Cables—Insulation Core Cable—
Dielectric Stress in a Single Core Cable—Most Economical Conductor Size in a
Cable—Grading of Cables—Capacitance Grading—Intersheath Grading—Capacitance
of 3-Core Cables—Measurement of Cc and Ce—Current carrying capacity of
underground cables—Thermal resistance—Thermal resistance of dielectric of single-
core cable—Permissible current loading—Types of cable faults—Loop tests for
location of faults in underground cables.

6. Distribution System General

Distribution systems – classification and arrangement of distribution systems –Voltage
drop calculations in radial and ring mains – comparison of different systems - DC, AC -
single phase,three phase 3 wire - 4 wire systems

TEXT AND REFERENCE BOOKS:

SHIVAJI UNIVERSITY, KOLHAPUR
SECOND YEAR B.TECH (ELECTRICAL) – SEMESTER -II

ELECTROMAGNETIC

<table>
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ISE: In Semester Evaluation  
MSE: Mid Semester Evaluation  
ESE: End Semester Evaluation

Course Outcome:

At the end of this course, the students will be able to
1. To differentiate different types of coordinate systems and use them for solving the problems of electromagnetic field theory.
2. To describe static electric and magnetic fields, their behavior in different media, associated laws, boundary conditions and electromagnetic potentials.
3. To use integral and point form of Maxwell’s equations for solving the problems of electromagnetic field theory.
4. To describe time varying fields, propagation of electromagnetic waves in different media, pyonting theorem, their sources & effects and to apply the theory of electromagnetic waves in practical problems.

SECTION I

UNIT 1: Vector Analysis:  
(06 Hrs)
Introduction, Coordinate systems and Transformations, Line, surface and volume integrals, Vector calculus, concept of gradient, divergence and curl

UNIT 2: Electrostatics:  
(10 Hrs)
Coulomb’s law, Electric field intensity due to point Charge, line charge, surface charge and volume charge distribution, Electric flux density, Gauss’s law and Divergence theorem, Energy, potential energy and work done, potential gradient, dipole and its electric field, dipole movement, energy density in electrostatic field

UNIT 3: Conductor, Dielectrics and Capacitance:  
(8 Hrs)
Current and current density, Continuity equation of current, properties of conductors, boundary conditions, Energy stored in capacitors, Poisson’s and Laplace’s equations, Capacitance between parallel plates and co-axial cable using Laplace’s equation
SECTION II

UNIT 4: Steady Magnetic Field: (10Hrs)
   Biot-Savert’s law, Magnetic field due to infinitely long current carrying conductor, Magnetic Field due to infinite sheet of charge, Ampere’s circuital law, Application to co-axial cable. Curl operator, Magnetic flux density, Stoke’s theorem. Scalar and vector magnetic potential, Lorentz’s force equation. Energy stored in magnetic field, boundary conditions

5. Time varying fields and Maxwell’s Equations: (06 Hrs)
   Faraday’s law, General case of Induction, Displacement Current, Modified Amper’s Law, Maxwell’s equations (Differential, Integral, Phasor forms),

Unit 6: Electromagnetic Waves (8)
   Uniform plane wave, wave equation for free space, wave equation for lossy media, wave propagation in good conductor and good dielectric, Pointing vector and power flow, Skin effect,

General Instructions:

1. Minimum number of assignments should be 6 covering all topics.

Recommended Books:

2. Electromagnetic field theory fundamental, Guru and Hizirogli,, Thomson Publication

Reference Books:

1. Antenna and Wave Propagation, K .D. Prasad, SatyaPrakashan
2. Electromagnetic Engineering, Ryder
CONTROL SYSTEM –I

<table>
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<th>Course</th>
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</table>

ISE: In Semester Evaluation       MSE: Mid Semester Evaluation          ESE: End Semester Evaluation

Course Objectives
The course aims:
1. To provide an introduction and basic understanding of Control System
2. To develop time & frequency domain analysis
3. To analyze & compare different control systems
4. To understand the concept of stability & state space variables

Course Outcomes:
After successful completion of this course, the student will be able to:
1. Apply knowledge of mathematics, science, and engineering to design, analyze and control the different systems
2. Explain time & frequency domain analysis for different control systems
3. Demonstrate & compare different control systems
4. Describe state variables 5 Design model for control system

Unit I
Introduction Need & classification of control system, Effects of feedback, Mathematical models – (Mechanical & Electrical systems) Differential equations, Transfer function – Armature & field control of DC servo motor, Block diagram algebra – Block diagram reduction, Representation by Signal flow graph – Reduction using Mason’s gain Formula.

Unit II

Unit III
**Unit IV**
Frequency Response Analysis Introduction, Frequency domain specifications—Bode plots, Determination of Frequency domain specifications and transfer function from the Bode Plot – Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability Criterion, Nyquist plot & stability analysis.

**Unit V**
Classical Control Design Techniques Compensation techniques –Lag, Lead, Lead-Lag Controllers design in frequency Domain, Design of PID control system.

**Unit VI**
State Variable Analysis and Design Concept of state, state variable & state model, state model for linear continuous time systems, state variable & linear discrete time system.

**General Instructions:**

**Term Work:** Minimum 04 experiments and 04 assignment on MATLAB based on above syllabus should be performed.

**Recommended Books:**

**Reference Books:**
4. Modern Control system, Dorf and Bishop, 8th Edition Adison Wesley Longman 1998
## ENVIRONMENTAL STUDIES

<table>
<thead>
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<th>Teaching Scheme</th>
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SHIVAJI UNIVERSITY, KOLHAPUR

REVISED SYLLABUS AND STRUCTURE

SECOND YEAR (B. Tech)

Electronics and Telecommunication Engineering

To be introduced from the academic year 2019-20
(i.e. from June 2019) onwards
### Semester III

<table>
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**over and above credit**

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***For Theory CIE 30 Marks,

Two tests of 30 marks at college should be conducted and best of two marks should be communicated to university.

***Guidelines to paper setter:

In theory ESE examination of 70 marks following pointes should be considered,

1. First question of 10 marks should be allotted to Objective type questions.
2. In Remaining 60 marks, four questions of 15 marks should be considered.
## SECOND YEAR ELECTRONICS & TELECOMMUNICATION ENGINEERING – CBCS PATTERN

### Semester Examination

<table>
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### Notes:
- Candidate contact hours per week: 30 Hours (Minimum)
- Total Marks for S.E. Sem III & IV: **1600**
- Theory and Practical Lectures: 60 Minutes
- Total Credits for S.E. Sem III & IV: **50**
- In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.
- There shall be separate passing for theory and practical (term work) courses.
Note:

1. **BSC-ETC**: Basic Science Course- Electronics & Telecommunication Engineering are compulsory.

2. **PCC-ETC**: Professional Core course – Electronics & Telecommunication Engineering are compulsory.

3. **MC-ETC**: Mandatory Course: Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.
SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

ENGINEERING MATHEMATICS-III

Course Details

Class: S. Y. B. Tech Sem - III
Course Code and Course Title: BSC-ETC-301- Engineering Mathematics -III
Prerequisites: Basic Trigonometry, Derivative and Integration, Basic Probability.

Teaching scheme: Lecture /Practical/Tutorial 3/0/1
Credits: 3+1
Evaluation scheme: CIE/ESE for Theory 30/70

<table>
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<th>Teaching scheme</th>
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<td>Lectures :03Hrs/week</td>
<td>Theory : 100 Marks, 70(ESE)+30(CIE)</td>
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<td>Tutorial : 01Hr/week</td>
<td>TW: 25 Marks</td>
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Course Objectives: The course aims to:

01 To develop mathematical skills and enhance thinking power of students

To give the knowledge to the students of fuzzy set theory, Linear Differential Equations probability, Laplace transforms, Fourier series with an emphasis on the application of solving engineering problems

03 To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:
Upon successful completion of this course, the students will be able to:

01 Make use of Linear Differential Equations to solve the Electrical Engineering problems.

02 Apply knowledge of vector differentiation to find directional derivatives, curl and divergence of vector fields.

03 Define fuzzy sets using linguistic words and represent these sets by membership functions, convexity, Normality, support, etc.

04 Develop Fourier series expansion of a function over the given interval.

05 Find Laplace transforms of given functions and use it to solve linear differential equations.

06 Solve basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions.
Course Content

Section I

Unit No 1  
**Linear Differential Equations (LDE) and its Applications:**  
1.1 Linear Differential equations with constant coefficients.  
1.2 Rules to find complementary function.  
1.3 Methods to find particular Integral  
\( e^{ax}, \sin ax \text{ or } \cos ax, x^m, e^{ax}x^m, e^{ax}\sin ax \text{ or } e^{ax}\cos ax \)  
1.4 Cauchy’s homogeneous linear differential equations.  
1.5 Applications of linear differential equations with constant coefficients to Electrical engineering.

Unit No 2  
**Vector Differential Calculus:**  
2.1 Differentiation of vectors.  
2.2 Gradient of scalar point function.  
2.3 Directional derivative.  
2.4 Divergence of vector point function.  
2.5 Curl of a vector point function.  
2.6 Irrotational, Solenoidal and Scalar potential function of a vector field.

Unit No 3  
**Introduction to Fuzzy sets:**  
3.1 Crisp set and Fuzzy set.  
3.2 Basic concepts of fuzzy sets  
3.3 Basic operations on fuzzy sets.  
3.4 Properties of fuzzy sets.

Section II

Unit No 4.  
**Fourier Series:**  
4.1 Introduction.  
4.2 Definition, Euler’s formulae.  
4.3 Dirichlet's conditions.  
4.4 Change of interval.  
4.5 Expansions of odd and even functions.  
4.6 Half range series.

Unit No 5  
**Laplace Transform and its Applications:**  
5.1 Laplace transform of elementary functions.  
5.2 Properties of Laplace transforms(First Shifting, Change of scale property, Multiplication & Division by t).
5.3 Laplace transforms of derivatives and integral.
5.4 Inverse Laplace transforms by partial fractions & convolution theorem.
5.5 Solution of Linear differential equation with constant coefficients using Laplace transform.

Unit No 6 Probability Distribution: 07hrs

6.1 Random variables.
6.2 Discrete Probability distribution.
6.3 Continuous probability distribution.
6.4 Binomial Distribution.
6.5 Poisson Distribution.
6.6 Normal Distribution.

Text Books:
01 Higher Engineering Mathematics, by B. S. Grewal (Khanna Publication Delhi.)
02 Applied Mathematics Wartikar P N and Wartikar J N, (Pune Vidyarthi Grah Prakashan)

Reference Books:
01 Advance Engineering Mathematics by Erwin Kreyszig (Wiley India.)
02 Mathematical Methods of Science and Engineering, by Kanti B. Datta (Cengage Learning.)
03 Advanced Engineering Mathematics, 3e, by Jack Goldberg (Oxford University Press.)
04 Engineering Mathematics by V. Sundaram (Vikas Publication.)
05 Higher Engineering Mathematics, by B. S. Grewal (Khanna Publication Delhi.)
06 Higher Engineering Mathematics, by B. V. Ramana (Tata McGraw-Hill)
07 Advanced Engineering Mathematics, by H. K. Das (S. Chand Publication.)
08 Fuzzy Sets and Fuzzy Logic: Theory and Applications, by George J. Klir and Bo Yuan (Prentice Hall of India Private Limited.)
09 Applied Mathematics by Navneet D. Sangle (Cengage Publication)

General Instructions:
1) For the term work of 25 marks, batch wise tutorials are to be conducted. The number of students per batch per tutorial should be as per University rules.
2) Number of assignments should be at least six (All units should be covered).

Prepared By BOS Maths:
1. Electronic Circuit Design - I

Course Details:

Class: S.Y.B. Tech. Sem-III
Course Code & Course Title: PCC-ETC-301-Electronic Circuit Design - I
Prerequisites: Basic Circuit Law’s, Semiconductor diode, Zener diode, BJT details.
Teaching scheme: Lecture/Practical: 4/2
Credits: 4 + 1
Evaluation Scheme CIE/ESE for Theory: 30/70

<table>
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<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tr>
<td>Lectures : 04 Hrs /week</td>
<td>Theory : 100 Marks</td>
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<tr>
<td>Practical : 02 Hrs /week</td>
<td>70 (ESE) + 30(CIE)</td>
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<td>TW: 25 Marks</td>
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Course Objectives:
The course aims to:
1. Provide an introduction and basic understanding of Semiconductor Devices viz. diodes and BJT, JFET.
2. Provide basic analog electronic circuit design techniques using diodes and bipolar junction transistors and to develop analytical skills.
3. Develop student ability to apply basic engineering sciences to understand the operation & analysis of electronic circuits using diodes and bipolar junction transistors.
4. Design electronic circuits to meet the desired specifications.

Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Analyze and design electronic circuits such as rectifiers & unregulated power supply.
2. Analyze and design electronic circuits such as regulated power supply.
3. Analyze & Design of BJT & FET Biasing.
4. Explain the hybrid model of transistor and analyze the transistor amplifier (CE, CB, CC) using h-parameters.
5. Analysis of CE Amplifier for low frequency & High frequency response for sinusoidal & square wave input.
6. Analyze & Design LPF, HPF, Clipper, Clamps, Multipliers.
Course Contents

Unit No: 1 Wave Shaping Circuits: Low pass & high pass RC circuits (analysis for square, step, ramp, exponential input), High pass RC circuit as a differentiator, Low pass RC circuit as integrator. Clipping circuits: diode clippers, transistor clippers, Transfer characteristics, Clamping circuits: Classification, clamping operations, Clamping circuit theorem, practical clamping circuits, and voltage multipliers. 08 Hrs

Unit No: 2 Unregulated Power Supplies: Rectifiers: Half wave, full wave: center tap and bridge type, analysis for different parameters: PIV, TUF, efficiency, ripple factor, regulation, form factor etc. Filters: Need of filters, Types: capacitor, inductor, LC, CLC, and Analysis for ripple factor. Design of unregulated power supply with filter using full wave rectifier. 08 Hrs

Unit No: 3 Voltage Regulators: Need of voltage regulator, Stabilization factors, Analysis & Design of Shunt regulator (using Zener diode & BJT), emitter follower regulator, series pass voltage regulator (using BJT), Pre-regulator & Overload protection circuit. 08 Hrs

Unit No: 4 BJT & FET Biasing Introduction to BJT, Need of Biasing, Generalized stability factor derivation, Biasing of CE configuration-Fixed Bias, Collector to Base Bias & Voltage Divider Bias (Analysis & Design of the same with & without Re). Introduction to JFET, Biasing of CS configuration- Fixed Bias, Self Bias (Analysis & Design of the same). MOSFET- EMOSFET & DMOSFET (Working & Characteristics) 08 Hrs

Unit No: 5 Voltage Amplifiers: H-Parameters, Hybrid model for transistor (CE, CB& CC configuration), amplifier equations for Voltage Gain, Current gain, Input resistance & Output resistance taking Rg of source into account. (Numerical are expected) 08 Hrs

Unit No: 6 Frequency Response of Single Stage RC Coupled Amplifier: Low frequency response: Effect of emitter bypass capacitor(CE ) & Coupling capacitor(CC), Amplifier response to square wave, percentage Sag calculation, (Numerical are expected) High frequency response: Hybrid π model, Derivation for CE short circuit & resistive current gain, β cutoff, α cutoff frequency, amplifier high freq. response to square wave, gain bandwidth product, (Numerical are expected). Design of single stage RC coupled amplifier. 08 Hrs
Text Books:
1. Electronic devices & circuits, Allen Mottershed, Prentice Hall India

Reference Books:
1. Electronic devices & circuits, David A. Bell, Oxford University

List of Experiments (Minimum 08 experiment + 01 Simulation + 01 Mini Project compulsory):
1. Design and study of Low pass filter
   a. Frequency response (sinusoidal)
   b. Integrator (Square wave input)
2. Design and study of High pass filter
   a. Frequency response (sinusoidal)
   b. Differentiator (Square wave input)
3. Study of different types of clipper circuits.
4. Study of different types of clamping circuits.
5. Design and analysis of full wave rectifier with capacitive filter.
6. Design and analysis of full wave rectifier with inductive filter.
7. Design and analysis of zener shunt regulator
8. Design and analysis of transistorized shunt regulator
9. Design and analysis of emitter follower regulator
10. Design and analysis of series pass voltage regulator
11. Determination of H-parameter for CE configuration using input and output characteristics.
12. Simulation of FWR using C-filter
13. Simulation of Single stage RC-Coupled Amplifier
14. Mini Project (PCB Design)
   a. Design of FWR (Different output voltages for different groups) with C filter.
   b. Design of Single Stage RC Coupled Amplifier (Different voltage Gain for different groups).

Guidelines for Paper Setter: 70 marks.

Q.1. 10 MCQ’s based on complete syllabus. (10 Marks)
Q.2 & Q. 3 Based on unit no 1,2,3 (Each carries 15 marks)
Q.4 & Q. 5 Based on unit no 4,5,6 (Each carries 15 marks)
3. Network Analysis

Course Details:

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<th>B. Tech. Sem-III</th>
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<tbody>
<tr>
<td>Course Code &amp; Course Title</td>
<td>PCC-ETC-302-Network Analysis</td>
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<tr>
<td>Prerequisites</td>
<td>Fundamentals of Network Elements</td>
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<td>Teaching scheme: Lecture/Practical/Tutorial</td>
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<td>30/70</td>
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<tr>
<td>TW: 25 Marks</td>
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Course Objectives:
The course aims to:
1. To understand basic theorems used for network analysis.
2. To understand two port networks and its parameters
3. To understand series and parallel resonance and its effects
4. To understand system behavior using pole zero plot
5. To understand and implement filter approximations

Course Outcomes:
Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Analyze AC and DC circuits using different network Theorems and Apply graph theory to solve network equations
2. Identify and analyze the series, parallel resonance circuits, calculate the bandwidth, selectivity factor also
3. Evaluate two port parameters and Understand network transfer functions in s-domain
4. Analyze and design prototype LC filters.
5. Evaluate initial conditions and solve differential equation for RL, RC, and RLC circuits and carry out transient analysis.
Course Contents

Unit No: 1  Network Fundamentals:
Network Elements & its types, Energy sources, KVL & KCL, series & parallel connection of passive elements(R,L,C), Combination of energy sources, Current Division & Voltage division, source transformation, Star-Delta transformation, Mesh & Super mesh analysis, Node & super node analysis

Graph Theory: graph of network & its parts, tree & co-tree, incidence matrix, Tie Set matrix, cut sets

Unit No: 2  Network Theorems:
Superposition Theorem, Thevenin’s Theorem, Norton’s Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Compensation theorem, Duality theorem, Millman’s Theorem

Unit No: 3  Resonance:
Parallel resonance–Ant resonance frequency, Resonant frequency for a tank circuit, variation of impedance & admittance with frequency, Selectivity, Quality factor. & B.W. Comparison of series and parallel resonant circuits.

Unit No: 4  Two Port Network & Network Functions:
Two port network: Z, Y, ABCD, h parameters, Interrelation of different parameters, Interconnections of port network (Series, Parallel, Cascaded, Series-Parallel)

Network Functions: Network functions for one port & two port networks, Driving point impedance and admittance of one port network, Driving point impedance & admittance function, Transfer function Concept of complex frequency, significance of poles & zeros. Restrictions on poles & zeros for transfer& drawing point’s function, Stability of circuit using Routh criterion, Pole zero diagram, Time response from pole zero plot.

Unit No: 5  Filters
Definitions, classification & characteristics of different filters, decibel & Neper. Filter fundamental such as attenuation constant (α), phase shift (β) propagation constant (γ) and characteristic impedance (Z₀), Design & analysis of constant K, M derived (low pass, high pass, band pass & band stop filters): T & Pi sections.

Unit No: 6  Transient Response:
Text Books:


Reference Books:

1. D. Roy Choudhury ‘Networks & Systems’ - New Age International Publisher
6. R.G. Kaduskar, S.O. Rajankar, T.S. Khatavkar, Network Fundamentals and Analysis – Wiley India

Note for Paper setter: 40% theory and 60% numerical are expected

Term Work: (Minimum 06 tutorials):
Minimum 06 tutorials based on above syllabus covering all units.
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ELECTRONICS AND TELECOMMUNICATION ENGINEERING

4. Transducers and Measurements

Course Details:
Class S.Y.B. Tech. Sem-III
Course Code & Course Title PCC-ETC-303-Transducers and Measurements
Prerequisites Knowledge of Fundamentals of Electronics and Computer course of F.Y.B.Tech
Teaching scheme: Lecture/Practical 3/2
Credits 3 + 1
Evaluation Scheme CIE/ESE for Theory 30/70

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<td>TW: 25 Marks</td>
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<td>POE: -----</td>
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Course Objectives:
The course aims to:
1. Provide introduction to different types of Transducers with their classification, construction & application
2. Provide knowledge of different sensors and their applications
3. Provide knowledge of signal conditioning and instrumentation system
4. Provide basic knowledge of measurement system
5. Provide basic understanding of different Electronic instruments
6. Provide knowledge of different types of bridges

Course Outcomes:
Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Student will able to select appropriate transducer and sensors as per required.
2. Students will get acquainted with different DAS
3. Student will be able to design instrumentation system
4. Student will able to understand measurement basics and select proper instrument for particular measurement of electrical parameters.
Course Contents

UnitNo: 1 Transducers:

UnitNo: 2 Sensors:
Proximity Sensors, optical Sensors, IR sensors, Piezo – electric sensors Smart Sensors: Fiber opticsensors, Film sensors, Nano sensors, Electrochemical sensors, biosensors, MEMS 4Hrs

UnitNo: 3 Signal Conditioning & Data Acquisition System:
Introduction, AC & DC Signal Conditioning, Chopper Stabilized Amplifier, Instrumentation Amplifier, Isolation And Programmable Gain Amplifier, Grounding And Shielding, principles and working of different types of ADCand DAC Instrumentation Techniques:Introduction to Process Instrumentation, Instrumentation set up for measurement of nonelectrical quantity such as weight using strain gauge. 7Hrs

UnitNo: 4 Introduction to Measurement:

UnitNo: 5 Measurement & Display Devices:
CRO: Dual Beam, Dual Traces Sampling, Digital storage, measurement of phase and frequency using Lissajous pattern, CRO probes: active, passive, current, attenuators, LED, LCD, Graphics Display, Signal Generators, Function generators. Spectrum analyzer, logic analyzer 7Hrs

UnitNo: 6 Bridges:
Measurement of Resistance with Bridges, Wheatstone’s Bridge, Kelvin Double Bridge, AC Bridges such as Haye’s Bridge, Wein Bridge, Maxwell’s-Wein Bridge, Maxwell’ L/C Bridge, Descourty’s Bridge & Schering Bridge 4Hrs

Text Books:
1. A course in Electrical, Electronics measurement and Instrumentation, A.K.Sawhney
2. Electronic Instrumentation, H. S. Kalsi, MGH, 3rd Edition
Reference Books:

1. Electronic Instrumentation and Measurement Techniques, Welfrick Cooper.
2. Instrumentation for Engineers And Scientists, John Turner, II Edition, Wiley
5. Sensors And Transducers, Patranabis D., PHI, 1999
6. Smart Sensors For Industrial Applications, Krzysztof Iniewski, CRC press, Tailor & Francis
7. Introduction to electrochemical transducer, Brian R Eggins, Willey
   (for chapter 2: Electrochemical sensors, biosensors)

List of Experiments (Minimum 10):

1. Study of weight measurement using strain gauge
2. Study of displacement measurement using LVDT.
3. Study of temperature measurement using RTD PT100/LM 35
4. Study of temperature measurement using Thermistor
5. Study of temperature measurement using Thermocouple
6. Study of cathode ray oscilloscope & Measurement of amplitude and frequency using CRO
7. Measurement of phase and frequency by lissajous pattern using CRO.
8. Study of function generator
9. Study of spectrum analyzer
10. Study of AC bridges
11. Study of DC bridges
12. Study of Logic analyzer
13. Study of smart sensors
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5. Analog Communication

Course Details:
Course Objectives:
The basic objective of this course is to introduce the students with analog communication, AM, FM modulation techniques, their analysis, bandwidth calculations. It also focuses on the performance analysis of analog communications systems under the presence of noise and finally introduces the pulse and digital modulation techniques.

Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Understand and identify the fundamental concepts and various components of analog communication systems.
2. Understand, analyze and explain various analog modulation schemes.
3. Understand the performance of analog communications systems under the presence of noise.
4. Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
5. Analyze Basic communications systems and their performance under the presence of noise.
6. Differentiate between various pulse modulation techniques.

Course Contents
Unit No: 1 Amplitude Modulation:
Elements of electronic communication systems, Need for modulation, channel, frequency spectrum, time and frequency domain signals, Amplitude Modulation principles, AM envelope, frequency spectrum & BW, Modulation index, % modulation, AM transmitters: Block of low level DSBFC, High level DSBFC, Trapezoidal patterns Evolution and descriptions of SSB, Suppression of carrier using balanced modulator, Suppression of unwanted sideband, Methods: Filter system, phase shift & third method Vestigial sideband (VSB).
### Unit No: 2
**Angle Modulation:**
- Instantaneous frequency, Concept of angle modulation, frequency spectrum,
- Narrowband & WideBand FM, Modulation Index, Bandwidth, Phase modulation, Bessel function and its mathematical analysis,
- Generation of FM (Direct and Indirect Method)

**Unit No: 3**
**Noise:**
- Sources of noise, Types of noise White noise, shot noise, thermal noise, partition noise, low frequency or flicker noise, burst noise, avalanche noise, signal to noise ratio, Noise Figure, Noise Temperature, FRISS formula for noise figure

**Unit No: 4**
**AM Receiver:**
- Simplified block diagram of AM receiver, receiver parameters: Sensitivity, Selectivity, dynamic range, Tracking, fidelity, Types of AM receiver: TRF and superheterodyne (block diagram), AM detection types: using diode detector, distortion in diode detector. Negative peak clipping & diagonal clipping, Demodulation of SSB
- Automatic Gain Control (AGC).

**Unit No: 5**
**FM Receiver:**
- Double conversion FM receivers, block diagram, FM demodulator, tuned circuit frequency discriminators, slope detectors, fosters seeley discriminator, ratio detectors, PLL-FM demodulators, FM noise suppression

**Unit No: 6**
**Pulse Modulation:**
- Introduction, Sampling theorem: Occurrence of allising error, PAM: Channel BW for PAM, Natural Sampling, Flat-top Sampling, PAM & TDM, Signal Recovery;
- PWM: Uses of PWM, Generation of Analog W/F using PWM, PPM: Generation of PAM, Generation of PWM, Generation of PPM

### Text Books:

### Reference Books:

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**SHIVAJI UNIVERSITY, KOLHAPUR**

**ELECTRONICS AND TELECOMMUNICATION ENGINEERING**

**Name of subject:** Programming Lab-I

**Course Details:**
- **Class:** S.Y. B. Tech. Sem-III


**Course Code & Course Title**  
PCC-ETC-305

**Prerequisites**  
Computer fundamentals

**Teaching scheme: Lecture/Practical**  
2/2

**Credits**  
3

**Evaluation Scheme CIE/ESE for Theory**

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<td>Tutorial - /week</td>
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<td>TW: 25 Marks</td>
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<td>POE: 50 Marks</td>
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**Course Objectives:**  
The course aims to:

1. To understand how to design flowchart and algorithms for procedure oriented programs.
2. To develop programming skills using the fundamentals and basics of C Language, control structures and looping statements.
3. To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
4. To design and implement programs using files handling and user defined types.

**Course Outcomes:**  
Upon successful completion of this course

1. Student will be able to understand the basic concepts of procedure oriented programming language.
2. Student will be able to use the control statements, looping statements and functions concepts.
3. Student will be able to design programs using user defined functions and data type.
4. Student will be able to design & apply the skills for solving the engineering problems.

**Course Contents**

1. Programming Fundamentals,  
   04 Hrs

2. Introduction to C  
   Introduction to Constants, Variables, Data Types, Operators, Expressions, Structure of C Programming, Identifiers, Decision & Loop control statements  
   05 Hrs

3. Arrays and Structures  
   Arrays::Introduction to 1-Dimensional arrays, Declaration and Initialization of 1-Dimensional arrays, Declaration and Initialization of 2-Dimensional arrays, Declaration and Initialization of Multi-Dimensional arrays. Structures-Declaring of Structures, Accessing Structure elements, arrays of structures  
   04 Hrs
4. Functions and Pointers

Introduction of functions, Need for functions,, Multifunction Programming, Elements of functions, Definition and declaration of functions, return values and their types, function call, arguments, return value, nesting and recursion

Pointers- Introduction to pointers, pointer variables, Declaration and initialization of pointer variable, accessing pointer

5. Strings

Declaration and Initialization of string, Reading from Terminal, Writing to screen, Standard library string functions

6. File handling

File operation, counting character tabs, spaces ,file copy program, file opening modes, text file- binary file, Real time case study.

Text Books:


Reference Books:


List of Experiments (Minimum 10 + mini project):

1. Develop Program using decision control statements
2. Develop Program using control statements
3. Develop Program using loop control statements
4. Develop Program using functions
5. Develop Program using pointers
6. Develop Program using array
7. Develop Program using two dimensional arrays
8. Develop Program using structures
9. Develop Program using dynamic memory allocation
10. Develop Program using strings
11. Develop Program using any sorting technique
12. Develop Program using file handling.
13. Mini project
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ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Environmental Studies

Course Details:
Class: S.Y. B. Tech. Sem-IV
Course Code & Course Title: MC-ETC-301-Environmental Studies
Prerequisites: Basic knowledge about natural process and fundamentals of environmental aspects.
Teaching scheme: Lecture/Practical: 3 lectures/week
Credits: 3**

Electronic Circuit Design - II

Course Details:
Class: S.Y.B. Tech. Sem-IV
Course Code & Course Title: PCC-ETC-401-Electronic Circuit Design - II
Prerequisites: Basic Circuit Law's, Single Stage RC coupled amplifier
Teaching scheme: Lecture/Practical: 4/2
Credits: 4 + 1
Evaluation Scheme CIE/ESE for Theory: 30/70

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<td>TW: 25 Marks</td>
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<td>POE: 50 Marks</td>
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Course Objectives:
The course aims to:
1. Provide an introduction and basic understanding of feedback amplifiers, power amplifiers, oscillators, multivibrators.
2. Develop student ability to apply basic engineering sciences to understand the operation & analysis of electronic circuits using diodes, bipolar junction transistors and field effect transistors.
3. Provide analog electronic circuit design techniques using diodes, bipolar junction transistors, and field effect transistors, and to develop analytical skills.
4. Design electronic circuits to meet desired specifications.
5. Apply knowledge of mathematics, science, and engineering to design, analyze and implement electronic circuits.

Course Outcomes:
Upon successful completion of this course, the student will be able to:
Course Contents

Unit No: 1  Multistage Amplifiers  
Need of cascading, Parameter evaluation such as $R_i$, $R_o$, $A_v$, $A_i$ & bandwidth for general multistage amplifier, Design of two stage RC coupled, Direct coupled amplifier using BJT.  
7 Hrs

Unit No: 2  Feedback Amplifiers:  
General theory of feedback, reasons for negative feedback. Analysis of Voltage series, Current series, Voltage shunt, Current shunt feedback amplifiers, Design of two stage Voltage series feedback amplifier.  
8 Hrs

Unit No: 3  Power Amplifiers:  
Need of Power amplifier, classification of power amplifier, Power considerations, Distortion in power amplifiers: Phase, Frequency, amplitude/harmonic/nonlinear distortion, amplitude distortion using Three point method. analysis and design of Class A single ended transformer coupled amplifier & class A Push pull amplifiers, Class B amplifier & class B push pull amplifier, crossover distortion, class AB Push pull amplifiers. Complementary symmetry push pull power amplifier.  
10 Hrs

Unit No: 4  Oscillators:  
Barkhausen’s criteria, Frequency and amplitude stability, Classification, RC oscillators: analysis & design of RC phase shift & Wein bridge oscillator using BJT. LC oscillators: analysis & design of Colpit's & Hartely’s oscillators using BJT, Crystal oscillator.  
9 Hrs

Unit No: 5  Multivibrators:  
Transistor as a switch, Different transistor switching parameters, overdrive factor, classification of multivibrators, Analysis and design of collector coupled -Astable, Monostable, fixed bias and self-bias bistable multivibrator and Schmitt trigger using BJT considering overdrive factor. Triggering circuits for Multivibrators  
9 Hrs

Unit No: 6  IC voltage regulator  
Study and design of regulators using IC’s: 78XX, 79XX, LM723, LM317, LM337.  
5 Hrs

Text Books:  
2. Electronic devices & circuits, Allen Mottershed Prentice- Hall India
Electronic devices & circuits, G. K. Mittal
Pulse digital and switching circuits, Millman Taub, Tata McGraw Hill

Reference Books:
1. Electronic devices & circuits, David A. Bell, Oxford University
List of Experiments (Minimum 08 experiment + 01 Simulation + 01 Miniproject compulsory):

1. Design and frequency response of direct coupled amplifier.
2. Design and frequency response of two stage RC coupled amplifier.
3. Design and frequency response of voltage series feedback amplifier.
4. Design of transformer coupled class A amplifier.
5. Design of RC phase shift oscillator using BJT
6. Design of wein bridge oscillator using BJT
7. Design of colpitts oscillator using BJT
8. Design of hartley oscillator using BJT
9. Design of Astable multivibrator
10. Design of monostable multivibrator using BJT
11. Design of bistable multivibrator using BJT
12. Design of Schmitt trigger using BJT
13. Design of voltage regulator using LM317
14. Design of voltage regulator using IC723
15. Simulation of Oscillator
16. Simulation of Multivibrator
17. Miniproject (PCB Design)
   c. Design of Astable Multivibrator or Schmitt trigger.
   d. Design of Power Supply using IC voltage Regulator.

Guidelines for Paper Setter: 70 marks.
Q.1. 10 MCQ’s Based on complete syllabus. (10 Marks)
Q.2 & Q. 3 Based on unit no 1,2,3 (Each carries 15 marks)
Q.4 & Q. 5 Based on unit no 4,5,6 (Each carries 15 marks)
2. Linear Integrated Circuits

Course Details:

Class: S.Y B. Tech. Sem-III
Course Code & Course Title: PCC-ETC-402 Linear Integrated Circuits
Prerequisites: Basic knowledge of electronics
Teaching scheme: Lecture/Practical: 4/2
Credits: 4 + 1
Evaluation Scheme CIE/ESE for Theory: 30/70

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Course Objectives:
The course aims to:
1. Explain the internal circuit of operational amplifier and its parameters
2. Explain the application of Op-amps.
3. Design various Active filters.
4. Analyze and design of various wave generators

Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Explain operational amplifier with its parameters
2. Classify different configuration of op-amp
3. Identify and explain different applications of op-amp
4. Design and implement various filters
5. Analyze different waveform generator circuits
6. Apply knowledge of op-amp in various industrial applications

Course Contents

Unit No: 1 Introduction to op-amp
9 Hrs
Block diagram of op-amp in detail, Differential Amplifier configurations, Differential amplifier analysis (AC and DC) for dual-input balanced-output configuration, level shifter, current mirror circuits, ideal parameters and practical parameters of op-amp and their comparison. (Numerical expected)

Unit No: 2 Op-amp configurations & frequency response
6 Hrs
Virtual ground concept, Open loop configuration, closed loop configuration, unity gain amplifier, frequency response of both configuration. Slew rate equation

UnitNo: 3 **Applications of Op-amp**

UnitNo: 4 **Active Filters**

UnitNo: 5 **Waveform Generators**
Analysis & Design of Square wave generator, Triangular wave generator, Sawtooth wave generator. Analysis & Design of RC phase shift oscillator, RC wein bridge oscillator, Colpitts oscillator, Hartley oscillator.

UnitNo: 6 **Industrial applications of special OPAMP ICs**
Introduction, block diagram, operating principal and applications of IC 555,IC 565,OP177,AD620

**Text Books:**

**Reference Books:**
1. David Bell, “Operational Amplifiers and Linear ICs”, Third ed, Oxford University Press
4. Datasheets

**List of Experiments**
1. Design of inverting, noninverting amplifier & their frequency response
2. Design of Summing, scaling, and averaging amplifier
3. Design, build and test precision half & full wave rectifier
4. Design, build and test Comparator and Schmitt trigger
5. Design of Butterworth filters
6. Design, build and test square & triangular wave generator.
7. Design, build and test Integrator and Differentiator

**Note: one small project based on OPAMP applications**
3. Control System Engineering

Course Details:

Class: B. Tech. Sem-III
Course Code & Course Title: PCC-ETC-403 Control System Engineering
Prerequisites

Teaching scheme: 3/0/1
Lecture/Practical/Tutorials: 3 + 1
Credits: 3 + 1
Evaluation Scheme CIE/ESE for Theory: 30/70

Teaching Scheme | Examination Scheme
---|---
Lectures: 03 Hrs /week | Theory: 100 Marks
Tutorial: 01 Hr /week | 70 (ESE) + 30(CIE)

Course Objectives:
The course aims to:
1. To provide an introduction and basic understanding of Control System
2. To develop time & frequency domain analysis
3. To analyze & compare different control systems
4. To understand the concept of stability & state space variables

Course Outcomes:

Upon successful completion of this course, the student will be able to:
1. Apply knowledge of mathematics, science, and engineering to design, analyze and control the different systems
2. Explain time & frequency domain analysis for different control systems
3. Demonstrate & compare different control systems
4. Describe state variables
5. Design model for control system

Course Contents

Unit No: 1  Introduction: 7 Hrs
Need & classification of control system, Effects of feedback, Mathematical models – (Mechanical & Electrical systems) Differential equations, Transfer function, Block diagram algebra – Block diagram reduction, Representation by Signal flow graph – Reduction using Mason’s gain formula.

Unit No: 2  Time Response Analysis: 6 Hrs

**Unit No: 3  Stability Analysis In S-Domain**  
6 Hrs


Root Locus Technique: The root locus concept – construction of root loci -effects of adding poles and zeros to G(s) H(s) on the root locus.

**Unit No: 4  Frequency Response Analysis**  
7 Hrs

Introduction, Frequency domain specifications-Bode plots, Determination of Frequency domain specifications and transfer function from the Bode Plot – Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability Criterion, Nyquist plot & stability analysis.

**Unit No: 5  Compensators**  
6 Hrs

Compensation techniques –Lag, Lead, Lead-Lag Controllers design in frequency Domain, Design of PID control system.

**Unit No: 6  State Space Analysis**  
4 Hrs

Concept of state, state variable & state model, state model for linear continuous time systems, Decomposition of Transfer Function, Transfer function from state model, Computation of state transition matrix, Controllability & Observability

**Text Books:**

2. A. Anandkumar, “Control System Engineering” PHI Publication 2\textsuperscript{nd} edition

**Reference Books:**

1. Norman S Nise “control system engineering” 8\textsuperscript{th} edition, Wiley Publication
2. Sanarjjet Ghosh,”Control system theory & application” 1\textsuperscript{st} edition Pearson Education.

**Note: Per Unit Two Tutorials**

**Note for Paper setters: Theory 40%**

**Numerical, Design & Derivations 60%**
4. Digital Communication

Course Details:

Class: S.Y.B. Tech. Sem-III
Course Code & Course Title: PCC-ETC-404- Digital Communication
Prerequisites: Analog communication
Teaching scheme: Lecture/Practical: 3/2
Credits: 3 + 1
Evaluation Scheme CIE/ESE for Theory: 30/70

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Course Objectives:
The course aims to:

1. Study the random signal theory with its mathematical analysis base.
2. Understand the concept of information theory in detail with different coding theorems.
3. Elaborate the different source coding techniques with the help of their block diagrams and function.
4. Explain the different digital modulation techniques.
5. Describe the baseband transmission and reception system.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Describe the probability of random signal
2. Solve the problem based on information theory
3. Classify different source coding technique
4. Explain different line coding techniques.
5. Compare different digital modulation technique

Course Contents

Unit No: 1  Probability Theory: 6 Hrs
Introduction to digital communication system, probability and sample space, Bayes” rule, Joint & conditional Probability, PDF & CDF, Statistical averages
### Unit No: 2 Information Theory:
Measure of Information, Entropy, Information Rate, Shannon’s encoding theorem, communication channels – Discrete & Continuous, Shannon–Hartley theorem, Huffman’s coding & Shannon-Fanno Coding techniques.

### Unit No: 3 Source Coding:
Quantization–Uniform, Non-Uniform. Study of PCM, DPCM, ADPCM, DM, ADM

### Unit No: 4 Digital Carrier Line Encoding:
Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband pulse Shaping, Duo binary

### Unit No: 5 Bandpass Modulation Techniques:
ASK, FSK, PSK, DPSK, QPSK, & QAM. Coherent, Non-Coherent detection. Introduction to Spread Spectrum techniques: DSSS, FHSS.

### Unit No: 6 Baseband Transmission Of Digital Signals:
M-ary Signaling, eyediagram, ISI, scrambler, Unscramble. Optimum Receivers-Matched Filters, Correlation receivers, Optimum detection using ML criteria.

### Text Books:
1. K. Sam Shanmugam–Digital & Analog Communication (John Wiley)
2. Simon Haykin – Digital Communication (Wiley)
3. Communication Systems, Singh Sapre, TMH

### Reference Books:

### List of Experiments (Minimum-8 ):
1. Perform PCM–TDM.
2. Perform Compander.
3. Perform DPCM.
4. Perform ADPCM.
5. Perform DM
6. Perform ADM.
7. Perform CVSD.
8. Perform ASK, FSK & PSK.
9. Perform QPSK.
11. Perform Eye Diagram using oscilloscope
12. Experiments on digital modulation techniques using MATLAB/Simulink Software.
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5. Data Structures

Course Details:

Class: S.Y. B. Tech. Sem-IV
Course Code & Course Title: PCC-ETC-405 Data Structures
Prerequisites: Knowledge of Mathematics, Computer Resources.
Teaching Scheme: Lecture/Practical/Tutorial: 3/0/1
Credits: 3 + 1
Evaluation Scheme CIE/ESE for Theory: 30/70

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<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<td>Lectures: 03 Hrs /week</td>
<td>Theory: 100 Marks</td>
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<td>Tutorial: 01 Hr /week</td>
<td>70 (ESE) + 30 (CIE)</td>
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<td>TW: 25 Marks</td>
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Course Objectives:

The course aims to:
1. Provide basic concept of data structure & its types.
2. Provide the knowledge of arrays & records as well as relevant operations on it.
3. Provide the knowledge of linked list & relevant operations on it.
4. Provide the concept of stacks, queues & its applications.
5. Provide the knowledge of various types of trees & relevant operations.
6. Provides the Knowledge of Graphs & Hashing techniques.

Course Outcomes:

Upon successful completion of this course, the student will be able to:
1. Elaborate the basic concept of data structure & its types.
2. Design and Implement the various algorithms on arrays & records.
3. Implement algorithms on linked list.
4. Understand the concept of stacks, queues & its applications.
5. Construct various types of trees & their applications.
6. Understand the concept of Graph & Hashing.

Course Contents

Unit No: 1 Introduction & Overview: (02 Hrs)
Introduction to theory of data structures, data types, Classification of data structure, Algorithms: complexity, time space trade-off with example.
UnitNo: 2  **Arrays, Records & Pointers:**  
Introduction, linear arrays, representation of linear array in memory, 
Algorithm for traversing linear arrays, inserting & deleting, 
Sorting: bubble sort, searching: linear search, binary search, 
Multi-dimensional arrays, Pointers: pointer arrays, Records: Record 
structures, representation of records in memory, parallel arrays, matrices, 
sparse matrices.  

(06 Hrs)

UnitNo: 3  **Linked Lists:**  
Introduction, linked lists & its representation, Traversing & searching a 
linked list, memory allocation, Garbage collection, insertion & deletion 
of nodes of linked list, header linked list, two-way lists.  

(06 Hrs)

UnitNo: 4  **Stacks & Queues:**  
Introduction to stacks, stack as an Abstract Data type, representation 
through Arrays & linked lists, arithmetic expressions, polish notation, 
Applications of stacks, stacks & recursion, Queue, representation of 
queue as an array and as a linked list, circular, double ended, priority, 
application of queues.  

(07 Hrs)

UnitNo: 5  **Trees :**  
Binary Tree: introduction, types, definition, properties, representations, 
operations, binary tree traversal, reconstruction, counting number of 
binary trees, applications.  
Advanced trees : AVL trees or height balanced trees, representation 
operation, Threaded binary trees, Expression trees. Multi way trees: 
trees, multi way search trees, B+ trees, Heaps, construction of a Heap.  

(07 Hrs)

UnitNo: 6  **Graphs &Hashing:**  
Introduction, Graph theory terminology, sequential representation of 
graphs: Adjacency Matrix, Path matrix, Warshall’s Algorithm, shortest 
paths, linked representation. Operations, Traversing, Posets, Topological 
sorting. Hashing, Hash functions, collision, chaining  

(08 Hrs)

**Minimum Ten Tutorials Based on above syllabus**

**Text Books:**

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<tr>
<td>1</td>
<td>Data structure using C By ISRD group, published by Tata McGraw Hill</td>
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**Reference Books:**

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<tr>
<td>1</td>
<td>Data structure &amp; algorithm analysis in C by Mark Allen Weiss published by Pearson Education (LPE)</td>
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<td>Introduction to Data structure in C by A.N. Kathie published by Pearson Education (LPE)</td>
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SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

Name of Subject: Programming Lab-II

Course Details:
Class: S.Y. B. Tech. Sem-IV
Course Code & Course Title: PCC-ETC-406
Prerequisites: Computer fundamentals
Teaching scheme: Lecture/Practical: 2/2
Credits: 3

Course Objectives:

1. To understand features of object-oriented programming and design C++ classes
2. To understand how to overload functions and operators in C++.
3. To learn how to implement copy constructors and class member functions.
4. To learn how inheritance and virtual functions implement dynamic binding with polymorphism.
5. To learn how design inheritance for code reuse in C++.
6. To learn how to design and implement generic classes with C++ templates and exception handling

Course Outcomes:

Upon successful completion of this course, the student will be able to:
1. Student will be able to understand the basic concepts of procedure oriented programming language.
2. Student will be able to use the class, objects, function and operator overloading concepts
3. Student will be able to understand and implement the concept of inheritance, template and exception handling applications
4. Student will be able to design & apply the skills for solving the engineering problems.

Course Contents

<table>
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<tr>
<th>UNIT 1</th>
<th>Introduction To Object Oriented Programming</th>
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<td></td>
<td>Difference between procedure oriented programming and object oriented programming, basic concepts and features of object oriented programming, structures and classes, declaration of class, member functions, defining the object of class, accessing member of class, array of class objects.</td>
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<tr>
<th>UNIT : 2</th>
<th>Overloading</th>
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<tbody>
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<td>Function overloading, assignment operator overloading, binary operator overloading, unary operator overloading.</td>
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</table>
UNIT : 3  Constructors And Destructors
Constructors- copy constructor, default constructors, destructors, inline member function, friend function, dynamic memory allocation.

UNIT : 4  Polymorphism
Polymorphism, early binding, polymorphism with pointers, virtual functions, late binding, pure virtual functions, abstract base classes, constructor under inheritance, destructor under inheritance, virtual destructors, virtual base classes.

UNIT : 5  Inheritance
Introduction, Single Inheritance, Types Of Base Classes- Direct, Indirect, Array Of Class Object And Single Inheritance, Multiple Inheritances.

UNIT : 6  Template And Exception Handling
Function template, class template, exception handling.

Text Books:
2. Object oriented Programming with C++, E Balagurusamy, Mc Grow Hill

Reference Books:

List of Experiments (Minimum 10 + mini project):
1. Develop a Program for implementation of array
   a) One-dimensional array
   b) Multi-dimensional array
2. Develop a Program for implementation of classes and Objects.
3. Develop a Program for implementation of types of constructor
   a. Default constructor
   b. Parameterized constructor
   c. Copy constructor
4. Develop a Program for implementation of polymorphism
5. Develop a Program for implementation of Friend Functions in Class
6. Develop a Program for implementation of types of inheritance
   a. Single level Inheritance
   b. Multi-level Inheritance
   c. Multiple Inheritance
   d. Hybrid Inheritance
   e. Hierarchical inheritance
7. Develop an Object oriented Program to Insert the Number in an Array
8. Develop an Object oriented program to Delete the Number in an Array
9. Develop an Object oriented program on Bubble Sort
10. Develop an Object oriented program to Perform Linear or binary search
11. Develop an Object oriented program to Insert and delete a Node in Link List
12. Develop an Object oriented program to implement stack using linked list.
13. Mini project.
SHIVAJI UNIVERSITY, KOLHAPUR

REVISED STRUCTURE AND SYLLABUS

SECOND YEAR (B. Tech) CBCS

MECHANICAL ENGINEERING

To be introduced from the academic year 2019-20
(i.e. from June 2019) onwards
### SECOND YEAR MECHANICAL ENGINEERING– CBCS PATTERN

#### SEMESTER - III

| Sr. No | Course (Subject Title) | Credits | No. of Lecture | Hours | Credits | No. of Lecture | Hours | Credits | No. of Lecture | Hours | Mode | Marks | Total Marks | Min Hours | Max Hours | Hours Mode | Min | Max | Hours Mode | Min | Max | Hours Mode | Min | Max | Hours Mode | Min | Max | Hours Mode |
|--------|------------------------|---------|---------------|-------|---------|---------------|-------|---------|---------------|-------|-------|--------|-------------|-----------|-----------|-------------| --- | --- |-------------| --- | --- |-------------| --- | --- |-------------| --- | --- |-------------| --- | --- |-------------|
| 1      | BSC-ME201              | 3 3 3   | 1 1 1         | - - - |         |               |       |         |               |       | CI E 0| 100    | 4 0         | - -       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |     |       |               |
| 2      | BSC-ME202              | 3 3 3   | - - -         | 1 2# 2|         |               |       |         |               |       | CI E 0| 100    | 4 0         | - -       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |     |       |               |
| 3      | PCC-ME203              | 3 3 3   | - - -         | 1 2 2 |         |               |       |         |               |       | CI E 0| 100    | 4 0         | 1 0       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |     |       |               |
| 4      | PCC-ME204              | 3 3 3   | - - -         | 1 2 2 |         |               |       |         |               |       | CI E 0| 100    | 4 0         | 1 0       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |     |       |               |
| 5      | PCC-ME205              | 3 3 3   | - - -         | 1 2 2 |         |               |       |         |               |       | CI E 0| 100    | 4 0         | 1 0       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |
| 6      | PCC-ME206              | - - -   | - - -         | 1 2 2 |         |               |       |         |               |       | CI E 0| 100    | 4 0         | 1 0       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |
| 7      | PCC-ME207              | - - -   | - - -         | 1 2 2 |         |               |       |         |               |       | CI E 0| 100    | 4 0         | 1 0       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |
| 8      | PCC-ME208              | - - -   | - - -         | 1 2# 2|         |               |       |         |               |       | CI E 0| 100    | 4 0         | 1 0       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |
| 9      | MC-ME209               | 3 3 3   | - - -         | - - - |         |               |       |         |               |       | CI E 0| 100    | 4 0         | - -       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |

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#### SEMESTER –IV

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| 1      | PCC-ME201              | 3 3 3   | - - -         | 1 2 2 |         |               |       |         |               |       | CI E 0| 100    | 4 0         | - -       | 2 2 5       | 1 0         |       |       |               |     |       |               |     |       |               |

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### ESE – End Semester Examination

- Candidate contact hours per week : 30 Hours (Minimum)
- Total Marks for S.E. Sem III & IV: 1650
- Theory/Tutorial Duration : 60 Minutes and Practical Duration : 120 Minutes
- Total Credits for S.E. Sem III & IV : 50
- In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.
- There shall be separate passing for theory and practical (term work) courses.

### Note:

- CIE - Continuous Internal Evaluation
- ESE – End Semester Examination
1. Basic Science Courses - Mechanical Engineering (BSC-ME) are compulsory.
2. Professional Core Course - Mechanical Engineering (PCC-ME) are compulsory.
3. Mandatory Course (MC-ME) Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.

COURSE CODE AND DEFINITION

Semester III

<table>
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<td>BSC-ME201</td>
<td>Engineering Mathematics - III</td>
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<td>PCC-ME202</td>
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<td>PCC-ME203</td>
<td>Applied Thermodynamics</td>
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<td>PCC-ME205</td>
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<td>*Computer Programming Using C++</td>
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<td>MC-ME209</td>
<td>Environmental studies</td>
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Total 26
### Semester IV

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S.Y.B. Tech. (MECHANICAL ENGINEERING)- Semester – III
ENGINEERING MATHEMATICS-III BSC-ME201

Teaching Scheme
Lectures : 3 hours/week
Tutorial : 1 hour/week
Credits : 4

Examination Scheme
ESE : 70 marks
CIE : 30 marks
Term Work : 25 marks

Course Objectives:
1) To develop mathematical skills and enhance thinking power of students.
2) To give the knowledge to the students of Statistics, Linear Differential Equations, Vector Differential Calculus, Laplace transforms, Fourier series with an emphasis on the application of solving engineering problems.
3) To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes:
Upon successful completion of this course, the student will be able to:
1) Solve Linear Differential Equations with constant coefficients.
2) Describe the statistical data numerically by using Lines of regression and Curve fittings.
3) Find Laplace transforms of given functions and use it to solve linear differential equations.
4) Apply knowledge of vector differentiation to find directional derivatives, curl and divergence of vector fields.
5) Develop Fourier series expansion of a function over the given interval.

6) Make use of Partial Differential Equation to solve the Mechanical Engineering problems.

SECTION – I

Unit 1. Linear Differential Equations: 07
1.1 Linear Differential equations with constant coefficients.
1.2 Rules to find complementary function.
1.3 Methods to find particular Integral (e^{ax}, \sin ax or \cos ax, x^m, e^{ax}x^m, e^{ax}\sin ax or e^{ax}\cos ax)
1.4 Cauchy’s homogeneous linear differential equations.

Unit 2. Correlation, Regression & Curve Fitting: 07
2.1 Introduction.
2.2 Karl Pearson’s Coefficient of Correlation.
2.3 Lines of regression of bivariate data.
2.4 Fitting of Curves by method of Least-squares:
   2.4.1 Fitting of Straight lines.
   2.4.2 Fitting of exponential curves.
   2.4.3 Fitting of second degree Parabolic curves.

Unit 3. Laplace Transform and its Applications: 07
3.1 Laplace transform of elementary functions.
   3.2 Properties of Laplace transforms(First Shifting, Change of scale property, Multiplication & Division by t).
3.3 Laplace transforms of derivatives and integral.
3.4 Inverse Laplace transforms by partial fractions & convolution theorem.
3.5 Solution of Linear differential equation with constant coefficients using Laplace transform.

SECTION – II

Unit 4. Vector Differential Calculus: 06
4.1 Differentiation of vectors.
4.2 Gradient of scalar point function.
4.3 Directional derivative.
4.4 Divergence of vector point function.
4.5 Curl of a vector point function.
4.6 Irrotational, Solenoidal and Scalar potential function of a vector field.

Unit 5. Fourier Series: 06
5.1 Introduction
5.2 Definition, Euler’s formulae.
5.3 Dirichlet's conditions.
5.4 Change of interval.
5.5 Expansions of odd and even functions.
5.6 Half range series.

Unit 6 Partial Differential Equations and Applications: 09
6.1 Formation of partial differential equation
6.2 Method of separation of variables.
6.3 Wave Equation and its solution
6.4 One dimensional heat flow equation
6.5 Solutions of Laplace equations by the Gauss – Seidel iterative method

Reference Books:
1) Advance Engineering Mathematics by Erwin Kreyszig (Wiley India.)
2) Mathematical Methods of Science and Engineering, by Kanti B. Datta (Cengage Learning.)
3) Advanced Engineering Mathematics, 3e, by Jack Goldberg (Oxford University Press.)
4) Engineering Mathematics by V. Sundaram (Vikas Publication.)
5) Higher Engineering Mathematics, by B. S. Grewal (Khanna Publication Delhi.)
7) Advanced Engineering Mathematics, by H. K. Das (S. Chand Publication.)
8) Applied Mathematics by Navneet D. Sangle (Cengage Publication)

General Instructions:
1) For the term work of 25 marks, batch wise tutorials are to be conducted. The number of students per batch per tutorial should be as per University rules.
2) Number of assignments should be at least six (All units should be covered).

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester:III
2.ELECTRICAL TECHNOLOGY
Subject Code:BSC-ME202

TeachingScheme: Examination Scheme:
Lectures: 3 Hrs.perweek ESE: 70Marks
Practical: 2 Hrs. per alternate week CIE: 30Marks
Credit: 04 TERM WORK:25 Marks

Pre-requisites: Basic Electrical Engineering

Course Objectives:
1) To understand Essential concepts & applications of Electric motors
2) To Select suitable drives for different mechanical systems.
3) To understand concept of electrical heating.

**Course Outcomes:** At the end of this course, student will be able to

1) Deals the principles of Electrical Engineering
2) Understands the theoretical and practical’s concepts of Electric motors
3) Apply Electrical heating methods for Industrial furnaces.
4) Identify and select suitable types of motors and drives
5) Decide complete Electrical drive system for Industrial applications.
6) Design various speed control techniques for Electric motors.

**Unit No. 01 : DC motors**

Construction, Working, Types, Back emf, Speed equation, Torque equation, Speed torque characteristics, Power losses in d.c. Motors. Need of starter, 3 point starter, 4 point starter. Speed control of D.C. Shunt and series motor (numerical treatment on speed control methods). Reversal rotation of D.C motor

**Unit No. 02 : Three Phase Induction Motor:**

Construction, Types, Working, Speed equation, Torque equation, Starting torque, full load torque, Torque speed characteristics, Power stages in motor, Advantages of 3- Phase Induction motor. (Numerical treatment on power stages)

**Unit No. 03 : Three Phase Induction Motor Control**

Need of starter, Star delta starter, DOL starter, Autotransformer starter, Rotor resistance starter. Speed control methods- Pole changing, Voltage control, frequency control, Block diagram of VFD control, Reversal rotation 3- Phase Induction motor.

**Unit No. 04 : Fractional Horse Power Motors**

Construction, Working, characteristics and Applications of Single phase permanent capacitor type Induction motor, AC servo motor, DC servo motor, Stepper motor (VR type and PM type).
Unit No. 05 : Electrical Drives

Advantages of electrical drives, Types – Individual & Group drive, Nature of Mechanical loads With respect to speed–torque variation, 4 quadrant operation of DC motor. Criteria for selection of motors for applications like lathe, Traction, pumps, Conveyors, Lift, etc.

Unit No. 06 : Electric Heating

Construction and Working of - Direct & Indirect resistance Heating, Direct arc furnace, Indirect arc furnace, Horizontal Core type induction furnace, Coreless induction furnace. (Numerical treatment on Electrical to Thermal energy conversion)

TERM WORK/ LIST OF EXPERIMENTS

Minimum six experiments from the following list should be performed.
1. Speed control of d.c. shunt motor by flux control method.
2. Speed control of d.c. shunt motor by armature voltage control.
3. Reversal of rotation of d.c. motor.
4. Load test on d.c. shunt motor.
5. Study of d.c. motor starters.
6. Speed control of 3 phase induction motor
7. Load test on 3 phase induction motor.
8. Reversal of rotation of 3 phase induction motor
9. Study of 3 phase induction motor starter
10. Load test on Single phase Induction motor
11. Study of Servomotors

TEXT BOOKS

REFERENCE BOOKS
S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

3. APPLIED THERMODYNAMICS

SUBJECT CODE: PCC-ME-203

Teaching Scheme:
Lectures: 3 Hrs.per week
Practical: 2 Hrs. per week
Credit: 04

Examination Scheme:
ESE: 70 Marks
CIE: 30 Marks
Term Work: 25 Marks
Practical: 25 Marks

Pre-requisites: Applied Physics, Applied Chemistry

Course Objectives:
1. To introduce student about basic physics and chemistry behind thermodynamics.
2. To study basic concepts of thermodynamics and its applications.
3. To study physical significance of entropy term and its application.
4. To study application of first and second law of thermodynamics to various thermodynamic devices like Steam generator, Condenser, Nozzles and Turbines.
5. To study different types of turbines and corresponding velocity diagrams.

**Course Outcomes:** At the end of this course, student will be able to

1. Remember the fundamental laws of thermodynamics
2. Understand and Solve the introductory problems on Rankine cycle.
3. Classify steam generators and condensers and Steam turbines.
4. Design the steam nozzle.
5. Understand and Solve problems on Steam turbines.
6. Understand the property of lubricants and selection of lubricants.

**Unit No. 01 : Review of Laws of Thermodynamics:**


**Unit No. 02: Properties of Pure Substances and Vapour Power Cycles**

Properties of steam, Use of steam table and Mollier chart, Temperature Entropy Diagram Carnot cycle using steam, Limitations of Carnot cycle Rankine cycle, Representation on P-v, T-s and h-s planes, Thermal efficiency, Specific steam consumption. Work ratio, Effect of steam supply pressure and temperature, Condenser pressure on the performance. (Numerical Treatment), Reheat and regenerative steam power cycles.

**Unit No. 03: Steam Condensers**
Steam Condenser, Functions, Elements of condensing plant, Types of steam condensers, surface and jet condensers, Comparison, Vacuum efficiency, Condenser efficiency, Sources of air leakages, Methods of leak detection, Edward Air Extraction Pump Estimation of cooling water required (Numerical Treatment on Steam Condensers)

**Unit No. 04 : Steam Nozzles**

Functions, Shapes, Critical pressure ratio, Maximum discharge condition, Effect of faction, Design of throat and exit areas, Nozzle efficiency, Velocity coefficient, Coefficient of discharge, Supersaturated flow, Degree of under-cooling and degree of super saturation, Effects of super saturation (Numerical Treatment on nozzle without friction)

**Unit No. 05 : Impulse Turbines**

Principles of operation, Classification, Impulse and reaction steam turbine, compounding of steam turbines. Flow through impulse turbine blades, Velocity diagrams, Work done, Efficiencies, End thrust, Blade friction, condition curve and reheat factors. (Numerical Treatment on Single stage impulse turbine)

**Unit No. 06: Reaction Turbines**

Comparison between impulse and reaction, Flow through impulse reaction blades, turbine Velocity diagram, and degree of reaction, Parson's reaction turbine, Governing of steam turbines. Losses in steam turbines, Performance of steam turbines. Function of diaphragm, Glands, Turbine troubles like Erosion, Corrosion, Vibration, Fouling etc. (Numerical Treatment on Single stage impulse reaction turbine)

**TERM WORK**

1. Study and Demonstration of water tube and fire tube boilers.
2. Study and Demonstration of boiler mountings, Accessories and steam calorimeters
3. Study and Demonstration of condenser and study of cooling towers
4. Significance and relevance of lubrication properties and systems
5. Test on Grease penetrometer and dropping point apparatus
6. Test on Carbon residue, Cloud and Pour point apparatus.
7. Test on Red wood viscometer and Aniline point apparatus.
8. Determination of flash and fire point of a lubricating oil
9. Study / Trial on steam power plant
10. Report on industrial visit to a steam power plant

**Instructions for practical examination**

1. Four to five experiments shall be selected for practical examination.
2. The number of students for each practical set up would not be more than four students.

**TEXT BOOKS:**


**REFERENCE BOOKS:**

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

4. METALLURGY

SUBJECT CODE: PCC-204

Teaching Scheme:  Examination Scheme:
Lectures: 3 Hrs. per week  ESE: 70 Marks
Practical: 2 Hrs. per week  CIE: 30 Marks
Credit: 04  Term Work: 25 Marks
Practical: 25 Marks

Pre-requisites: Applied Physics, Applied Chemistry, Fundamental knowledge of materials and their basic properties.

Course Objectives:

1. To acquaint students with the basic concepts of Metal Structure
2. To impart fundamental knowledge of Ferrous and Non Ferrous Metal Processing
3. To study applications of different Metals and Alloys
4. To Know Fundamentals of Metallography
5. To develop futuristic insight into Metals

Course Outcomes: At the end of this course, student will be able to

1. Understand basic concept of metal structure.
2. Understand fundamental knowledge of Ferrous and Non Ferrous Metal.
3. Selection of Metals and Alloys for different application.
4. Understand need of Heat treatment and various heat treatment processes.

Unit No. 01 : Metals and Alloy Systems [07]

Introduction to Metallic and Non-metallic materials and its classification (metals/alloys, polymers and composites)
   a) Metals, Metallic bonds, Crystal structure (SC, BCC, FCC, HCP), Imperfections in crystals
   b) Alloy formation by crystallization, Nucleation and growth, Cooling curves, Dendritic structure and coring.
   c) Solid solutions and intermediate phases
   d) Phases and Gibbs phase rule
   e) Construction of equilibrium diagrams from cooling curves, Isomorphous system (Solid Solution), Eutectic, Partial solubility Peritectic and Intermetallic Compounds Lever arm principles.

Unit No. 02 : Study of Phase Diagrams [11]

(With respect to typical compositions, Properties and Applications for the following alloys.)
   a) Fe- Fe3C equilibrium diagram - Ferrous alloys (Plain carbon steels, cast iron)
   b) Alloy steels- Free cutting steels, HSLA high carbon low alloy steels, maraging steels. creep resisting steels, Stainless steels- different types. Tool steels- types,
   c) Selection of materials and Specifications based on -IS, BS, SAE, AISI,
   d) Copper based alloys brasses Cu- Zn, Bronzes Cu- Sn, , Cu- Be, Cu-Ni.
   e) Aluminum based alloys Al- Cu(Duralumin) - Al-Si (Modification),
f) Pb- Sn  (Solders and fusible alloys)

Unit No. 03 :Principles of Mechanical Testing:  [04]

a) Destructive Testing methods: Tensile, Compressive, Impact, Fatigue, Creep, Hardness (Rockwell, Brinell and Vickers)
b) Non- Destructive Testing: Dye Penetrant, Magnetic, Ultrasonic, Radiography, Eddy Current testing.

Unit No. 04 :Principles of Heat Treatment & heat treatment of Ferrous Alloys  [06]

a) Transformation of Pearlite into austenite upon heating,
b) Transformation of austenite into Pearlite, Bainite and Martensite on cooling.
c) TTT –Diagram and CCT - Diagrams - significance, Effect of alloying elements on TTT diagram and its significance.
d) Heat treatment furnaces and equipments, controlled atmosphere

Unit No. 05 :Heat Treatment Processes:  [08]

a) Heat Treatment of Steels
I. Annealing – Types-Full, Partial and Sub critical annealing (Various types) and purposes
II. Normalising- Purposes
III. Hardening (Hardening types), Purposes, Austempering and Martempering, Mechanism of quenching and Quenching media, Hardenability- Concept and methods of determination of hardenability— Grossmans critical diameter method and Jominy end quench test.
IV. Tempering Types, Structural transformations during tempering, purposes
sub zero treatment
V. Surface hardening - Flame and Induction
VI. Chemical heat treatments for case hardening - Carburising, Nitriding, Cyniding, Carbonitriding
VII. Annealing- Stress relief, Recrystallization and Process annealing
VIII. Precipitation hardening - Basic requirements, Stages, Common alloys, Variables, theories
IX. Heat treatment defects and remedies

Unit No. 06: Powder Metallurgy:  [04]

a) Advantages, Limitations and Applications of Powder Metallurgy
b) Powder manufacturing types- Mechanical, Physical, Chemical and Electro-Chemical  
c) Mixing/Blending.  
d) Compaction- types- Conventional, Isostatic, HERF, Powder rolling and extrusion  
e) Sintering- Types liquid stage and solid stage sintering  
f) Finishing operations: Sizing, Machining, Infiltration and Impregnation  
g) Flowcharts for – Self-lubricating bearings.

**TERM WORK/ LIST OF EXPERIMENTS**

1) Tensile testing of M.S. and C.I.  
2) Hardness testing (Rockwell and Brinell)  
3) Impact testing (Izod and Charpy) of M.S, Brass and Al Alloy.  
4) Demonstration of N.D.T. (Minimum two of different NDT tests)  
5) Macroscopic Examinations Spark Test.  
6) Examination of microstructure of steels and Cast Irons.  
7) Examination of microstructure of Non ferrous alloys (Brass, Duralimin, Babbit)  
8) Heat treatment of steels (Annealing, Normalizing, Hardening on medium/ high carbon steels  
9) Jominy end - quench test for hardenability  
10) Observation of various industrial heat treatments processes during industrial visits.  
11) Any five assignments on above units are to be included in journal.

**TEXT BOOKS**

5. “Heat Treatments Principles and Practices”, T.V. Rajan / C.P. Sharma, Prentice Hall of India Pvt Ltd, New Delhi,  

**REFERANCE BOOKS**


S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

5. FLUIDMECHANICS

SUBJECT CODE:PCC-ME205

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tr>
<td>Lectures: 3 Hrs.perweek</td>
<td>ESE: 70Marks</td>
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<tr>
<td>Practical: 2 Hrs.perweek</td>
<td>CIE: 30Marks</td>
</tr>
<tr>
<td>Credit: 04</td>
<td>Term Work: 25 Marks</td>
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<td></td>
<td>Practical: 25 Marks</td>
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Pre-requisites: Applied Physics, Applied Chemistry

Course Objectives:
1. To identify various properties of fluids and their SI units.
2. To state and illustrate fundamentals of Fluid Statics, Kinematics and Dynamics.
3. To study the use of Continuity Equation, Bernoulli’s Equation and Momentum Equation for various applications.
4. To study the theory of laminar flow and application of Hagen Poiseuille’s equation
5. To understand the physics of fluid flow through the pipe and its applications.

**Course Outcomes:** At the end of this course, student will be able to

1. Understand properties of fluids and classification of fluid flows
2. Identify the fluid flow problem and explain the theoretical concepts of fluid statics, fluid kinematics and fluid dynamics
3. Apply fundamental equation of fluid mechanics i.e. Continuity equation, Bernoulli’s Equation and momentum equation for different fluid flow applications
4. Make basic analysis of laminar flow to calculate resistance to it through circular pipe and parallel plates
5. Calculate different losses in fluid flow through different arrangements of pipes
6. Apply theory of boundary layer, Drag and lift forces in proper cases

**Unit1 Fluid Properties and Fluid Statics:**

A) **Fluid Properties:** Definition of fluid, Properties of fluid

- Mass Density, Weight Density, Specific Volume, Specific Gravity, Dynamic Viscosity, Kinematic Viscosity, Surface Tension, Capillarity and Compressibility, Types of fluid

B) **Fluid Statics:** Statement of Pascal’s law, Hydrostatic law of pressure, Definition of Total Pressure, Centre of Pressure, Buoyancy, Metacenter, Condition of Equilibrium of floating and submerged bodies (No Numerical Treatment on fluid Statics)
Unit 2 Fluid Kinematics


Unit 3 Fluid Dynamics

Euler’s Equation of motion, Integration of Euler’s equation as energy equation. Kinetic Energy correction factor, Applications of Bernoulli’s equation. Venturimeter, orifice meter and Pitot tube,

Definition of Notch, classification and it Applications, Derivation of Flow over triangular and rectangular notches only, Definition of Orifice, classification and it Applications, Hydraulic Coefficients $C_d$, $C_c$ and $C_v$ and $C_r$.

Unit 4 Momentum Equation and Laminar Flow

A) Derivation of momentum equation, Applications of momentum equation, momentum correction factor, Analysis of fluid flow through pipe bends.

B) Laminar Flow: Laminar flow through circular pipes and derivation of Hagen Poiseuille’s equation. Laminar flow through parallel plates, Introduction of CFD and its applications.

Unit 5 Fluid Pipe through Flow

Different energy losses in flow through pipe, Losses due to friction: Darcy’s Weisbach equation and Chezy’s equation, Minor Losses due to expansion, contraction, pipe fittings, at entrance, at exit, due to obstruction etc. Flow through Series pipe, Parallel
pipe, Siphon pipes, Branching pipes and equivalent pipes, Hydraulic Gradient line (HGL) and Total Energy Line (TEL).

**Unit 6  Boundary Layer Theory and Forces on Immersed Body**

A) **Boundary Layer Theory:** Boundary layer thickness, its characteristics, laminar and turbulent boundary layers, Displacement thickness, Momentum thickness, Energy thickness, separation, boundary layer control

B) **Forces on Immersed Bodies:** Lift and Drag, Drag on a flat plate and on aerofoil, Types of drags, Development of lift. (Magnus effect) stalling condition of aerofoil.

**TERM WORK**

**List of Assignments and Experiments**

The term work shall consist of the report on following assignments and experiments

**Assignments on**

1. Study and demonstration of Pressure Measuring Devices (Compulsory)
2. Theoretical assignment of Dimensional analysis which may include procedure and Numerical on Rayleigh's method and Buckingham $\pi$ theorem. (Compulsory)

**Experiments List**

3. Flow visualization by plotting of streamlines (Heleshaw’s apparatus).
4. Reynolds experiment
5. Verification of Bernoulli's equation
6. Calibration of venturimeter
7. Calibration of notches
8. Calibration of orifice under steady and unsteady flow condition
9. Determination of minor losses in pips-fittings
10. Determination of coefficient of friction in pipes of different materials.

**TEXTBOOKS:**

4. “Fluid Mechanics and Hydraulic Machines”, Ramamrutham
5. “Fluid mechanics and Hydraulic Machines”, Modi and Seth,

REFERENCE BOOKS:

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: III

6: MACHINE DRAWING

SUBJECT CODE: PCC-ME206

Teaching Scheme: Examination Scheme:
Practical: 2 Hrs. per week Term Work: 25 Marks
Credit: 02
Pre-requisites: Engineering Graphics

Course Objectives:
1. To study BIS conventions used in machine drawing.
2. To find the line/curve of intersection between two solids.
3. To study the function of various machine components.
4. To study the use of production drawings.
5. To study assembly and detail drawings.
Course Outcomes: At the end of this course, student will be able to
1. Use BIS conventions in machine drawings.
2. Find line/curve of intersection between two solids.
3. Sketch the various machine components.
4. Read and interpret the given production drawings.
5. Understand significance of assembly and detail drawings.

Study of B.I.S. (Bureau of Indian Standards) Conventions:
Significance and importance of BIS Conventions, Drawings sheet sizes and layout recommended by BIS. Conventional representation of engineering materials, BIS conventions for sectioning, Types of threads profiles, Internal and external threads, Types of springs, Types gears and gearings, Conventional representation of common features (Splined shaft, Serrated shaft, Knurling, Bearings etc.). BIS methods of Linear-and angular dimensioning. Symbolic representation of welds as per BIS for representation of above conventions.

Interpenetration of Solids:
Introduction, interpenetration of Prism with Prism, Prism with cylinder, Prism with cone, prism with pyramid. (Prisms and Pyramids limited up to Rectangular base), Cylinder with Cylinder, Cone with Cylinder.

Sketching of Machine Component:
Importance of sketching and entering proportionate dimensions on sketches. Sketches of nut, Bolts square and Hexagonal Flanged nuts, Lock nuts, Dome nut, Capstan nut, Wing nut, Castle nut, Split pin, Square headed bolt, Cup headed bolt, T-headed bolt, Types of foundation bolts, Stud, Washer, Set screws, Cap screws. Various types of rivets and riveted joints, Various types of keys, Socket and spigot (Cotter joint), Knuckle (pin) joint, Muff coupling, Protected and unprotected Flanged, Coupling, Universal coupling, solid and bush bearing. Plummer block (pedestal bearing), Foot step bearing. Flat and V-belt pulleys, Fast and loose pulleys, speed cone pulleys, Pipe joint for C.I. Flanged, socket and spigot type pipe joint. Union pipe joint and standard pipe-fittings. Students should know the applications of above machine components.

Auxiliary Projection:
Projection on auxiliary vertical and horizontal plane, Auxiliary projection of simple machine components.
**Limits, Fits and Tolerances:**
Significance of system of limits and fits. Definitions, Types, Recommendations and selections, Tolerances of form and position, surface finish symbols as per BIS, Selection and entering of all these symbols with reference to details and assembly drawings, Tolerancing an individual dimensions of details drawing.

**Details and Assembly Drawing:**
To prepare detail drawings from given assembly drawing. To prepare assembly drawing from given drawing of details. The number of parts is limited to ten to twelve. Preparation of detail and assembly drawing from the following details such as: - Machine tool parts: Tool post, Tailstock, Machine vice, Chucks etc.- Engine parts: Stuffing box, Crosshead assembly, Piston and connecting rod, etc. - Miscellaneous parts: Valve assembly, Screw jack, Jigs and fixtures, Pipe vice etc. Assembly selected should include different types of sections.

**TERM WORK:**
- **Sheet No. 1:** Sheet Based on BIS conventions
- **Sheet No. 2:** Sketching (Free hand drawing) of various machine components.
- **Sheet No. 3:** Sheet Based on limits, Fits and tolerances (Production Drawing)
- **Sheet No. 4:** To draw details and assembly drawing of machine component containing 10 to 12 parts.
- **Sheet No. 5:** Sheet based on auxiliary projection OR
- **Sheet No. 5:** Sheet based on interpenetration of solids.

**TEXT BOOKS:**

**REFERENCE BOOKS:**
4. IS: 919-Recommendation for Limits and Fits for Engineering, B.I.S. Publications
8. Computer Programming Using C++

SUBJECT CODE –PCC- ME207

Teaching Scheme: Examination Scheme:
Practical: 2 Hrs.peralternate week Term Work: 25 Marks
Credit: 01

Pre-requisites: Computer Programming in C

Course Objectives:

1. To understand how C++ improves C with object-oriented features.

2. To introduce an object oriented programming language.

3. After the students have successfully completed the course, they shall have sufficient knowledge of the basic computer operations and various programming techniques especially in C++.

4. To develop and enhance the programming skills amongst the students in general aswell as application of it in the field of Mechanical Engineering.

Course Outcomes: At the end of this course, student will be able to

1. Write, compile and debug programs in C++ language.

2. Design programs involving decision control statements, loop control statements and case control structures.

3. Develop algorithms for solving problems using object oriented language.

4. Apply their knowledge and programming skills to solve various computing problems in the field of Mechanical Engineering.

1. Evolution of Programming methodologies, Introduction to OOP and its basic features, Basic components of a C++, Program and program structure, Compiling and Executing C++ Program. Selection control statements in C++. 
2. **Data types, Expression and control statements Iteration** statements in C++, Introduction to Arrays, Multidimensional Arrays, Strings and String related Library Functions.

3. **Functions**, Passing Data to Functions, Scope and Visibility of variables in Functions,

4. **Creating classes and Abstraction**: Classes objects, data members, member functions, this Pointer, Friends, Friend Functions, Friend Classes, Friend Scope, and Static Functions. Structures in C++. **Constructors and Destructors**, Static variables and Functions in class.


**TERM WORK/ LIST OF EXPERIMENTS**

1. One assignment based on Object-Oriented programming: Introduction, Basic concepts, Benefits, Object-oriented languages, Applications.
2. Minimum 2 program on Data types, Expression and control statements Iteration statements in C++, Introduction to Arrays, Multidimensional Arrays, Strings and String related Library Functions.
3. Minimum 2 program on Functions, Passing Data to Functions, Scope and Visibility of variables in Functions, Structures in C++.
4. Minimum 2 program on Creating classes and Abstraction: Classes objects, data members, member functions, this Pointer, Friends, Friend Functions, Friend Classes, Friend Scope, and Static Functions. Constructors and Destructors, Static variables and Functions in class
5. Minimum 2 program on Operator Overloading in C++, Overloading Unary Operators, Overloading binary operators.
TEXT BOOKS
5. “Object-Oriented Programming in C++”, Rajesh K Shukla, Wiley India

REFERENCE BOOKS
1. “Professional C++”, Solterwiely India
9. WORKSHOP PRACTICE III

SUBJECT CODE PCC ME 208

Teaching Scheme:
Practical: 2 Hrs. per week

Examination Scheme:
Term Work: 25 Marks

Credit: 01

Pre-requisites: Engineering Graphics, Basic Mechanical Engineering

Course Objectives:
1. To study Patterns, Core boxes, Preparation of Pattern for solid casting.
2. To study Sand testing, Size analysis, Moisture percentage, Permeability Test.
3. To study Gating system for metal casting with casting defects.

Course Outcomes: At the end of this course, student will be able to
1. Understand types of Patterns, Core boxes and Preparation of Pattern for solid casting.
2. Understand properties of sand by permeability test, moisture percentage test, and green strength.
3. Understand gating system for metal casting with casting defects

Term Work:
1. Study of Patterns – Types, Materials used, Pattern Allowances, Construction and color code.
2. Study of Core boxes: Types, Allowances
3. Preparation of Pattern for solid casting
4. Sand testing for green sand and core sand (Any four)
   a. Preparation of standard specimen
   b. Preparation of green sand mould
   c. Size analysis. Grain fineness Number
   d. Moisture percentage
   e. Permeability Test
   f. Green Compressive strength
   g. Clay content
   h. Mould hardness
5. Foundry visit to study pattern shop, sand making and moulding.
NOTE:

1. The load of Workshop Practice III will be allotted to the Teaching Faculty.
3. Term work will consist of Job on Pattern Making Carrying 15 Marks, Journal Assessment along with internal oral 10 marks.

S.Y. B. Tech. (MECHANICAL ENGINEERING) Semester: IV

09. ENVIRONMENTAL STUDIES

SUBJECT CODE: MC ME 209

Teaching Scheme: 
Lectures: 3 Hrs. per week
Credit: 03

Examination Scheme:
ESE: 70 Marks
CIE: 30 Marks

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester IV

01. APPLIED NUMERICAL METHODS

SUBJECT CODE: PCC-ME-210

Teaching Scheme:
Lectures: 3 Hrs. per week
Practical: 2 Hrs. per week
Credit: 04

Examination Scheme:
ESE: 70 Marks
CIE: 30 Marks
Term Work: 25 Marks
Course Objectives:

1. To introduce numerical methods to solve different types of equations.
2. To introduce regression and interpolation techniques.
3. To know various methods of Differentiation & Integration.
4. To apply the knowledge of these methods to solve practical problems.
5. To transform various methods into Computer Programs.

Course Outcomes:

1. Understand and apply various methods to find roots of equations.
2. Learn and Implement different methods to solve simultaneous equations.
3. Understand and apply the methods of Regression and interpolation.
4. Implement various numerical methods for differentiation and Integration.
5. Apply various methods to solve engineering problems with Ordinary differential equations.
6. Understand the methods to solve Partial differential equations involved in Engineering Problems.

Unit 1 [7]


b. Roots of Equation:
   a. Bracketing Method: Bisection Method, False position method
   c. Roots of polynomial: Muller’s Method, limited to TWO Iterations. Initial guesses not to be given.

Unit 2 [5]

Linear Algebraic Equation:

   b. LU decomposition method, Gauss-Jacobi and Gauss-Seidel Iteration method

Unit 3 [8]

Curve Fitting & Interpolation:
a. Least Square Regression – Linear regression, Parabolic regression
b. Interpolation–Interpolating polynomial, Lagrange’s interpolating polynomial, Divided Difference Formula

Unit 4 [7]
Numerical Differentiation and Integration
a. Newton-Cote’s Integration of equation: Trapezoidal rule, Simpson’s rules
b. Integration of Equation: Gauss Quadrature methods.
c. Numerical differentiation: For Equally spaced Data: Forward difference Formula, Central difference Formula, Backward difference Formula,
d. For unequally spaced Data: Divided difference Formula.

Unit 5 [6]
Ordinary Differential Equation:

b. Boundary value Problem: Finite Difference Method

Unit 6 [7]
Partial Differential Equation:

a. Finite Difference–Elliptical equation, Liebmann’s method to Solve Laplace’s and Poisson’s Equations
b. Finite Difference- Parabolic Equation
c. Implicit Method- Crank-Nicolson method (Derivation Only)

TERM WORK:

Term work should contain at least SIX assignments based on SIX Units.

a. At least one problem should be solved based on each method from every Unit.

b. A computer program along with Flowchart on following methods using C++/MATLAB/SCILAB or any other suitable software:
   • Method of false Position,
   • Gauss elimination method & Gauss Jacobi method,
   • Least Square method for Line fitting,
• Forward difference method for Num. Diff. & Trapezoidal method of Integration,
• Runge-Kutta method of 4th Order,
• Liebmann’s method to solve Elliptic equations.

TEXT BOOKS:


REFERENCE BOOKS:

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

02. ANALYSIS OF MECHANICAL ELEMENTS

SUBJECT CODE: PCC-ME211

Teaching Scheme:  
Lectures: 3 Hrs. per week  
Practical: 2 Hrs. per week  
Credit: 04

Pre-requisites: Engineering Mechanics

Examination Scheme:  
ESE: 70 Marks  
CIE: 30 Marks  
Term Work: 25 Marks
Course Objectives:

1. To gain knowledge of different types of stresses, strains and deformation induced in mechanical components due to external loads.
2. To study shear force and bending moment distribution for different types of loads and support conditions.
3. To study the distribution of various stresses and deformation in mechanical elements.
4. To study the analytical and graphical method to solve the problems in principal planes and stresses.
5. To study the effect of component dimensions and shape on stresses and deformations.
6. To study the buckling, and strain energy effect in mechanical elements.

Course Outcomes: At the end of this course, student will be able to

1. Apply concepts of analysis of mechanical elements to obtain solution to various types of loading and stresses induced in real time engineering problems.
2. Draw shear force and bending moment diagrams for simple beams subjected to various loads and support conditions.
3. Compute and analyze bending and shear stresses in mechanical components.
4. Determine plane stress, principal stress, maximum shear stress and their orientations using analytical method and Mohr’s circle.
5. Analyze the effect of deflection in beams.
6. Evaluate buckling and strain energy in beams subject to various types of loading.

Unit No. 01 Stresses and Strains: [06]

Concept of Stress and Strain, (Linear, Lateral, Shear and Volumetric), Hooke's Law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Stress-strain diagram for ductile and brittle material, Factor of safety, Working stress. Normal and shear stresses, Thermal Stresses, Bulk Modulus, Inter-relationship between elastic constants.

Unit No. 02 [08]
A. **Torsion:** Introduction to Torsion, Basic assumptions, Torsion formula, Hollow and solid circular shafts, Angular deflection.

B. **Shear Force and Bending Moment:** Concept and definition of shear force and bending moment in determinate beams (Simply supported, cantilever and overhanging) due to concentrated, UDL, UVL and Couple.

**Unit No. 03 Stresses in Beams:**

A. **Bending Stresses:** Symmetric pure bending of beams, Flexure formula, moment of resistance of cross-sections, Simple built-up section, Design of rectangular and circular (solid and hollow) sections; L, I and T sections

B. **Shear Stresses:** Distribution of shear stresses in beams of various commonly used sections such as circular, I, T, and angles.

**Unit No. 04 Principal Stresses and Strains:**

Normal and shear stresses on any oblique planes, Concept of Principal planes, Derivation of expression for Principal stresses and maximum shear stress, Positions of principal planes and planes of maximum shear, Graphical solutions using Mohr’s circle of stresses, Combined effect of shear and bending in Beam.

**Unit No. 05 Deflection of Beams:**

Strain curvature and moment curvature relation, Solution of beam deflection problem by Double integration method, Macaulay’s method and Area moment method. (Simply Supported Beam and Cantilever.)

**Unit No. 06**

A. **Columns:** Euler's formula for different end connections, Concept of equivalent length, Eccentric loading, Rankine formula.

B. **Energy Methods:** Concept of strain energy, Resilience, Proof resilience, Modulus of resilience, derivation for deformation of axially loaded members under gradual, sudden and impact loads (including Numerical).
TERM WORK/ LIST OF EXPERIMENTS

A term work shall consist of report on the assignments given below.

1. Stresses and strains.
2. Torsion (Problems based on industrial applications)
3. Shear force diagram & bending moment diagram.
4. Bending stresses and shear stresses in beams.
5. Principal stresses (both analytical and graphical).
6. Deflection of beams.
7. Columns.
8. Strain Energy.

TEXTBOOKS:

REFERANCE BOOKS:
S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

03. FLUID AND TURBO MACHINERY

SUBJECT CODE- PCC-ME212

Teaching Scheme:
Lectures: 3 Hrs.perweek
Practical: 2 Hrs.perweek
Credit: 04

Examination Scheme:
ESE: 70Marks
CIE: 30Marks
Term Work: 25 Marks
Practical: 25 Marks

Pre-requisites: Fluid Mechanics, Applied Thermodynamics

Course Objectives:
1. To learn the working principles of Impulse water turbines and also to study its velocity triangles. To study design parameters related to Turbines
2. To learn the working principles of Reaction water turbines and also to study its velocity triangles. To study design parameters related to Turbines
3. To understand the concept of Centrifugal pumps and its construction. To understand NPSH terms related to centrifugal pumps
4. To illustrate the concept of Reciprocating Air Compressors. To understand various parameters related to Air Compressors.
5. To illustrate the concept of centrifugal compressor, Axial compressors. To understand various parameters related to rotodynamic air compressors
6. To discuss the working of Gas Turbines, and Jet engine and know its various configurations. To determine the efficiencies of gas turbines

Course Outcomes: At the successful completion of this course, student will be able to,

1. Classify and understand working principle of rotodynamic machines and Reciprocating compressor.
2. Remember Euler’s equation of rotodynamic machines
3. Remember Euler’s equation of rotodynamic machines
4. Apply the theoretical knowledge to solve numerical problems, select the machines for particular application.
5. Analyze the machines to evaluate the performance.

Unit No. 01 Impulse Water Turbines: [07]

Euler’s equation for work done in Rotodynamic Machines classification of water turbines, Pelton wheel, its construction and working, velocity triangles, types. Pelton wheel design (bucket dimensions, Number of buckets, Jet diameter, Wheel diameter, Jet ratio, Speed ratio, Number of jets,) Calculation of efficiency, Power, Discharge etc. Governing of Pelton wheel.

Unit No. 02 Reaction Water Turbines: [07]

Unit No. 03 Centrifugal Pumps:  [06]
Working principles, Construction, Types, Various heads, Multistage pumps, Velocity triangles, Minimum starting speed, Cavitation, Net positive suction head (NPSH), efficiencies, Discharge, Blade angles, Head, Power required, Impeller dimensions etc.

Unit No. 04 Reciprocating Air Compressors:  [08]

Unit No. 05 Rotodynamic Air Compressors:  [07]
Centrifugal compressor, velocity diagram. Theory of operation, losses, Adiabatic efficiency, Effect of compressibility, Diffuser, Prewhirl, Pressure coefficient, Slip factor, performance, Surging, Chocking, Stalling, Performance, Comparison with centrifugal. Introduction to Axial flow compressors, Roots blower and vane blower (Descriptive treatment)

Unit No. 06 Gas Turbines:  [05]

TERM WORK/ LIST OF EXPERIMENTS

1. Study and demonstration of Model & Testing, Unit quantities of turbine & pump.
2. Trial on Pelton wheel with characteristics curve.
3. Trial on Francis/ Kaplan turbine with characteristics curve.
4. Trial on Centrifugal pump with characteristics curve.
5. Trial on reciprocating compressor
6. Study & Trial on centrifugal blower
7. Study of hydraulic devices- Intensifier, Accumulator, Hydraulic jacks, Press, Crane. hydraulic
8. Study of other types of pumps- Reciprocating pump, Gear pump, Jet pump, Submersible pump, Air lift pump.
9. Industrial visit to Pump/Turbine Manufacturing Industry or Hydro Power Plant.

**TEXT BOOKS:**
5. “Thermal Engg.”, Kumar vasantdani, Khanna publisher
7. “Gas turbines and Compressor”, Cohen and Rogers, Saravanamutto Publisher

**REFERENCES BOOKS:**
S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

04. THEORY OF MACHINES-I (*)

SUBJECT CODE: PCC-ME-213

Teaching Scheme:

Lectures: 3 Hrs. per week
Practical: 2 Hrs. per week
Credit: 04

Examination Scheme:

ESE: 70 Marks
CIE: 30 Marks
Term Work: 25 Marks

Course Objectives:

1. To represent kinematic behavior of different machine elements and mechanisms.
2. To select various Power transmitting devices.
3. To explain types of Cam with followers and select according to their applications.
4. To compare types of Governing mechanisms.
5. To analyze effect of friction in Mechanisms and machines

Course Outcomes: At the end of this course, student will be able to

1. Understand different types of mechanisms and their applications
2. Analyze kinematic theories of mechanism,
3. Design cam with follower for different applications
4. Select different power transmitting elements according to application
5. Select different governing mechanisms according to application.

Unit No. 01 Basic Concept of Mechanisms: [05]

Links, kinematic pair (lower and higher), Kinematic chain, Mechanism, inversion, Types of constraints, Grubbler’s criterion, Inversions of slider crank chain, Double slider crank chain, Four bar, Steering gear mechanisms, Hooke's joint (only theoretical treatment).

Unit No. 02 Velocity and Acceleration in Mechanisms: [10]

Graphical analysis of Velocity and acceleration for different mechanisms using relative velocity and acceleration method, Klein's construction for slider crank mechanism, Velocity analysis by Instantaneous center method.

Unit No. 03 Friction: [05]

Introduction to friction, Friction in pivot bearings, Inclined plane theory, Friction in screws

Unit No. 04 Cams: [08]

Types of cams and followers, Profiles of cams for specified motion of different followers, Spring load on the follower, Jumping of follower.

Unit No. 05 Belts and Dynamometers: [06]
Types of belt drives, Calculation of power transmitted, Belt tension ratio, Actual tension in a running belt, Centrifugal and initial tension in belt, Slip and creep of belt.

**Unit No. 06 Governors:**

Types of governors, Porter and Hartnell governor, Controlling force and stability of governor, Hunting, Sensitivity, Isochronism, Governor effort and power, Insensitiveness of governors.

**TERM WORK/ LIST OF EXPERIMENTS**

1. Study of basic mechanisms. (Demonstration of models, Actual mechanisms, etc.)
2. One A3 size sheet of Velocity problems by relative velocity method. (Minimum 4 problems)
3. One A3 size sheet of Velocity problems by Klien’s construction and Instantaneous center method. (Minimum 4 problems)
4. One A3 size sheet of Acceleration problems (including Coriolis component) by relative acceleration method. (Minimum 4 problems)
5. Verification of ratio of angular velocities of shafts connected by Hooks joint.
6. One A3 size sheet of Problems on cam profile. (Minimum 4 problems)
7. Experiment on Governor characteristics for Porter or Hartnell governor.
8. Experiment on Cam Profile
9. Experiment on belt drives.
10. Experiment on Dynamometer

**Note:** Minimum 8 experiment

**TEXT BOOKS**

REFERENCE BOOKS


Note: (*) Indicates Theory Paper of Three Hours Duration.

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

05.MACHINE TOOLS AND PROCESSES

Subject Code: PCC-ME214

Teaching Scheme: 
Lectures: 4 Hrs. per week
Credit: 03

Examination Scheme:
ESE: 70 Marks
CIE: 30 Marks

Pre-requisites: Basic Mechanical Engineering
Course Objectives:

1. To introduce different methods of Molding and Casting.
2. To introduce forming and Plastic Shaping processes.
3. To study various Metal Removal Processes and Machine tools.
4. To study Nonconventional Machining.
5. To study gear manufacturing processes.

Course Outcomes: At the end of this course, student will be able to

1. Identify various kinds of machine tools of previous and present era tools.
2. Describe construction and working of basic machine tools.
3. Demonstrate their understanding of plastic processing, injection moulding, extrusion and thermoforming.
4. Analyze the concept, mechanism of material removal with respect different processes.
5. In position to appreciate the merits of non-traditional machining and its applications in industries.

Unit No. 01 Casting Processes: [11]

Importance of casting as manufacturing process, advantages and limitations of casting processes, foundry layouts and mechanization, Moulding types such as Green sand moulding, Shell moulding, CO₂moulding, investment casting, Sand reclamation, Components of gating system, functions and importance of runners and risers, solidification control devices: chills, ceramics bricks, directional solidification, Introduction to permanent mould casting process such as continuous casting, Gravity die casting, pressure die casting, centrifugal casting, Melting practices and Metallurgical control in Cupola furnace, oil/gas fired furnaces, Induction and Arc Furnace, Solidification of castings, casting defects, metal pouring equipments, Cleaning-fettling and inspection of casting.

Unit No. 02 Forming Processes: [11]
a) **Rolling**: Introduction, Hot and cold rolling, Rolling Mill Classification, Defects in rolling.

b) **Forging**: Introduction, Forging Machines (board Hammer, Air and Steam, Hydraulic Hammer), Open and Closed die Forging, Defects in forging.

c) **Extrusion**: Introduction, Direct, Indirect, Tube, Impact and Hydraulic Extrusion, Defects in extrusion.

d) **Drawing**: Introduction and Types of Wire, rod and pipe drawing, defects in drawing.

**Unit No. 03 Plastic Shaping:**

Thermosetting and thermoplastic materials, their properties and applications, Introduction to blow moulding, injection moulding, extrusion, calendaring and thermo forming.

**Unit No. 04 Machine Tools for Metal Cutting I:**

a) **Lathe**: Introduction, Working principle, types, specifications, principle parts, accessories, attachments, and various lathe operations, Calculations of Change gears for thread cutting.

b) **Capstan, turret lathe**: Principle parts, Working, Turret indexing mechanism, bar feeding mechanism, Comparison with centre lathe.

c) **Drilling & Boring Machines**: Classification of drilling machines, Construction and working of radial drilling machine, Various accessories and various operations. Introduction to boring machines, Types of boring machine, different operations.

**Unit No. 05 Machine Tools for Metal Cutting II:**

a) **Shaping & Planning Machine**: Construction & working of shaper and Planer machine, Comparison between planer and shaper machine.

b) **Milling Machine**: Types- Horizontal, Vertical milling machines, Milling cutters, construction and working of column and knee type, milling operations, simple and compound indexing.

c) **Gear Manufacturing processes**: Study of various processes like gear shaping, gear hobbing, Gear finishing processes –Gear shaving, Gear burnishing and gear rolling.

**Unit No. 06 Nonconventional Machining:**

Fundamental principle, machining unit, tool material, advantages, limitations and applications of Abrasive Jet Machining, Electrical Discharge machining, Electro- Chemical machining, Laser beam machining, Ultrasonic machining, Water jet machining.

**Note:**

The Workshop practice IV should cover the practical based on this syllabus, the load of
which shall be allotted to teaching staff.

TEXT BOOKS:


REFERENCE BOOKS:

2. ASTM Volumes on Welding, casting, forming and material selection.
S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

06. Testing and Measurement

SUBJECT CODE: PCC-ME 215

Teaching Scheme: 
Practical: 2 Hrs. per week
Credit: 01

Examination Scheme:
Term Work: 25 Marks
Practical: 25 Marks

Pre-requisites: Applied Thermodynamics, Fluid Mechanics, Applied Physics

Course Objectives:
1. to gain knowledge of different types of measuring instruments for mechanical engineering
2. to study and calibration of various measuring instruments

Course Outcomes: At the end of this course, student will be able to

1. Understand basic constriction of working of various instruments
2. Select the various of types of instruments for the measurement system

TERM WORK/ LIST OF EXPERIMENTS
1. Study and assignment on generalized measurement system and characteristics of instruments.
2. Study and assignment on sensing elements and transducers.
3. Testing of mechanical pressure gauge by using dead weight pressure gauge tester
4. Study and Measurement of fluid flow by using Rota meter/ Anemometer/ Turbine meter/ Target Meter.
6. Study and Measurement of Temperature by using Thermocouple, RTD, Thermister/ Pyrometer.
7. Study and Measurement of Displacement by using LVDT.
8. Study and Measurement of Force and Torque by using Strain Gauges.
9. Study and Measurement of Vacumm by using Mc-lead guage/ Pirani gauge
10. Study of Vibrations testing by using Vibrometer.
11. Case study on measuring system for Pressure, flow, temperature etc.

TEXT BOOKS

REFERENCE BOOKS

S.Y. B. Tech (MECHANICAL ENGINEERING) Semester: IV

07. COMPUTER AIDED DRAFTING
SUBJECT CODE: PCC-ME216

Teaching Scheme: Practical: 2 Hrs. per week
Credit: 01
Pre-requisites:
1. Fundamentals of Engineering Graphics
Course Objectives:

1. To understand importance of CAD tool
2. To Develop an ability to create 2-D drawings
3. To Create 3-D models of machine components
4. To Create assembly of simple machine components with industrial approach.

Course Outcomes: At the end of this course, student will be able to

1. Draw 2D drawings and 3D models of simple components.
2. Analyze and interpret production Drawing
3. Use modern engineering techniques, tools and skills for engineering practice.
4. Develop the skills for drafting using CAD software and get the knowledge to enhance the CAD utilities.

1. Introduction to CAD: [03]
Basic commands to draw 2D objects like, point, line, circle, ellipse, polygon etc. Editing commands like, Erase, extension, break, trim, fillet, scale etc. Viewing commands like Zoom, pan, mirror, rotate, move, block, offsetting, Draw& Modify toolbars of any advance CAD Software.

2. Use of layers: [02]
Use of layers in 2D drawing, Annotation and Layers toolbars any advance CAD Software.

3. Geometric Dimensioning and Tolerancing: [02]
Geometric Dimensioning and Tolerancing For 2-D Objects: Straightness, Flatness, Perpendicularity, Angularity, Roundness, Concentricity, Cylindricity, Run out, Profile, Parallelism etc. Entering limits, fits, tolerances surface finish symbols and Machining Symbols on drawings.

4. Detail and Assembly Drawings: [02]
Preparing detail and assembly drawings in 2D. Preparing of bill of material (BOM). Maximum no. of parts to be limited to twelve only. Entering limits, fits, tolerances and surface finish symbols on detail and assembly drawings.

5. Production Drawing:  

Production drawing including production note, removed cross section, detail views, Cross sectional views, dimensions and tolerances etc.

6. Introduction 3D:  

Extrude, Cut, Revolve, Union, Rib, Fillet, Chamfer, UCS etc. using any advance CAD software.

TERM WORK/ LIST OF EXPERIMENTS:

1) Computer aided drafting of two simple components and print out of the same on A4 size sheet.
2) Drawing details and assembly with limit, fit, tolerances & Bill of material of assembly containing 6-8 major components. Print out of the same on A3 size sheet.
3) 3-D drawing of one simple components and plotting its 2-D views along with 3-D object drawing. Print out of the same on A4 size sheet.

Note: Latest drafting software like Auto cad and any advance 3-D modeling software are to be used.

TEXT BOOKS


REFERANCE BOOKS

2. “Auto Cad 2014”, Ellen Finkelsten, Wiley India Manuals and Tutorials of referred software”
Course Objectives:

1) To introduce student about computer graphics leading to the ability to understand contemporary.

2) To study basic concepts of computer graphics techniques, focusing on 3D modeling, Image synthesis.

3) To study physical significance of Curves and Surfaces.

Course Learning Outcomes:

1) To acquire the knowledge of basics of computer graphics.

2) To Apply basic programming in C for line, rectangle, circle etc for different shapes.

3) To recognize the importance of using three dimensional transformations like translation, scaling and rotating.

4) To Analyzing the hidden unwanted parts in graphics and do the program on animation

5) To choose the different of curves and surfaces

Unit 1:-


Display devices: Refresh Cathode ray Tubes, Random Scan and Raster Scan monitors, Colour CRT Monitors, Direct view Storage Tubes, Continuous Refresh and Storage display, LED and LCD Monitors.
Unit 2:-
Graphics programming, Initializing the graphics, C Graphical functions, simple programs
Graphic primitives: Points & Lines, Line drawing Algorithm, DDA and Bresenham’s Algorithm.
Fill Algorithm: Scan-Line Polygon Fill algorithm, Boundary Fill Algorithm, Flood Fill Algorithm, Area Filling. Generation of circles.

Unit 3:-
Two Dimensional Transformations and Clipping and Windowing
What is transformation?, Matrix representation of points, Basic transformation, Need for Clipping and Windowing, Line Clipping Algorithms, The midpoint subdivision Method, Sutherland – Hodgeman Algorithm, Viewing Transformations

Unit 4:-
Need for 3-Dimensional Imaging, Techniques for 3-Dimesional displaying, Parallel Projections, Perspective projection, Intensity cues, Stereoscope effect, Kinetic depth effect, Shading.

Unit 5:-
Curves and Surfaces
Shape description requirements, parametric functions, Bezier methods, Bezier curves, Bezier surfaces, B-Spline methods, Need for hidden surface removal, The Depth - Buffer Algorithm, Scan Line coherence algorithm, Span – Coherence algorithm,

Unit 6:-
Solid Area Scan Conversion and Three Dimensional Transformations
Solid Area Scan Conversion, Scan Conversion of Polygons, Algorithm Singularity, Three Dimensional transformation, Translations, Scaling, Rotation, Viewing Transformation, The Perspective, Algorithms, Three Dimensional Clipping, Perspective view of Cube.

TERM WORK:
Should contain at least 6 assignments (one per unit) covering the syllabus.

PRACTICAL:
Should contain following programs developed using C++. Some Sample practical are listed below.
1. Write a program with menu option to input the line coordinates from the user to generate a line using Bresenham’s method and DDA algorithm. Compare the lines for their values on the line.

2. Develop a program to generate a complete circle based on
   Bresenham’s Circle Algorithm
   Midpoint Circle Algorithm

3. Implement the Bresenham’s/ DDA algorithm for drawing line (programmer is expected to shift the origin to the center of the screen and divide the screen into required quadrants).

4. Write program to perform the following 2D and 3D transformations on the given input figure

   Rotatethrough degree
   Reflection
   Scaling
   Translation.

5. Develop a program to clip a line using Cohen-Sutherland line clipping algorithm between (x1,y1)(x2,y2) against a window (xmin, ymin)(xmax, ymax).

6. Write a program to implement polygon filling.

7. Write a program to draw Bezier and B-Spline Curves with interactive user inputs for control polygon defining the shape of the curve.

8. Write a program to generate a 2D/3D fractal figures (Sierpinski triangle, Cantor set, Tree etc).

TEXT BOOKS:

REFERENCE BOOKS:


S.Y. B. Tech. (MECHANICAL ENGINEERING) Semester: IV

08. WORKSHOP PRACTICE IV

SUBJECT CODE: PCC ME 218

Teaching Scheme: Practical: 2 Hrs. per week
Credit: 01

Examination Scheme:
Term Work: 25 Marks
Practical Exam: 25 Marks
Pre-requisites: Engineering Graphics, Basic Mechanical Engineering

Course Objectives:
1) To study Machine layout, installation of Machine Tools, selection of Tools.
2) To study Lathe Machine, Drilling Machine, Milling Machine.
3) To study machining operations and prepare Job with its process sheet on Lathe machine.
4) To study basics of CNC and VMC Machine

Course Outcomes: At the end of this course, student will be able to

3) Understand machining operations and prepare Job with plain turning, taper turning, external threading and knurling operation along with its process sheet
4) Understand basics of CNC and VMC Machine

Term Work:
1) Machine layout, existing machine specifications, Installation procedure of Machine Tools
2) Selection of tools for metal cutting based on work piece materials
3) Study of Construction, Mechanism and Application of following machines (any two)
   a. Lathe Machine
   b. Drilling Machine
   c. Milling Machine
4) One Job of MS material; plain turning, taper turning, external threading and knurling operation with its process sheet.
5) Introduction to CNC and VMC Machine (Construction working theoretical treatment only)
6) Industrial visit to study Plastic Shaping, Forming, Conventional Machine Shop and gear manufacturing processes

NOTE:
1) The load of Workshop Practice IV will be allotted to the Teaching Faculty.
3) Term work will consist of Job Carrying 15 Marks, Journal Assessment along with
internal oral 10 marks.

4) Practical Examination is on basis of Job done (25 Marks)
SHIVAJI UNIVERSITY, KOLHAPUR
SYLLABUS
Third Year (B. Tech.) CBCS
In
CIVIL ENGINEERING

(To be implemented From JUNE 2020)
### Third Year CIVIL ENGINEERING – CBCS PATTERN

#### SEMESTER – V

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#### SEMESTER – VI

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CIE - Continuous Internal Evaluation  
ESE – End Semester Examination
### SEMESTER - V

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### SEMESTER - VI

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Water Resources Engineering – I

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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To impart the basic knowledge of importance of Hydrology & irrigation in water resources development.
2. To know various hydrometeorological parameters and their estimation.
3. To create awareness about floods, their estimation using various methods.
4. To understand the importance of irrigation in Indian agricultural industry considering cropping patterns.
5. To understand the principles of watershed management and water harvesting.

Course Outcomes:
After successful completion of this course students will be able to:
1. Apply the knowledge of estimation of hydrometeorological parameters.
2. Estimate direct runoff and peak discharge using hydrograph technique.
3. Apply different methods of efficient irrigation and water conservation.
4. Determine reservoir capacity based on crop water requirement.

SECTION I

Unit 1: Hydrology and Precipitation

1.1 *Introduction of Hydrology:* Definition, Importance and scope of hydrology, Hydrologic cycle.
1.2 *Precipitation:* Forms and types of precipitation, Methods of measurement, Rain-gauge Network, Determination of average precipitation over the catchment & its numerical, Estimation of missing rainfall data, Graphical representation of rainfall - Mass rainfall curves, Double mass rainfall curve, Rainfall hyetograph.

Unit 2: Evaporation and Runoff

2.2 *Evaporation Transpiration:* Process, factors affecting, Measurement.
2.3 *Infiltration:* Process, Factors affecting and measurement of infiltration, Infiltration indices & its numerical.
2.4 *Runoff:* Classification, Factors affecting runoff, Determination of runoff-empirical equations, Rainfall runoff co-relation.

Unit 3: Hydrograph and Floods

3.1 *Hydrograph:* Components of Storm hydrograph, Base flow and Separation of base flow, Direct runoff hydrograph, Unit hydrograph — theory, assumptions and limitations,
Derivation and use of unit hydrograph, Conversion of UH of different durations using Principle of Superposition & S-curve hydrograph.


SECTION II

Unit 4: Ground Water Hydrology

4.1 Ground Water Hydrology: Occurrence, Distribution and classification of ground water, Darcy’s law, Aquifer parameters - Permeability, Specific yield, Specific retention, Porosity, Storage coefficient, Transmissibility.

4.2 Hydraulics of Well: Under steady flow conditions in confined and unconfined aquifers.

4.3 Construction: Tube wells and open wells. (Construction features only)

Unit 5: Irrigation and Minor Irrigation Works

5.1 Introduction to Irrigation: Definition and necessity of irrigation, ill-effects of irrigation, Systems of irrigation- Surface, Sub-surface (Drip irrigation), Sprinkler irrigation; Water logging and land drainage, Assessment of irrigation water.


Unit 6: Water Requirements of Crops

6.1 Water Requirement of Crops: Principal crops and crop seasons, cropping pattern and crop rotation, Classes and availability of soil water, depth and frequency of watering, Duty, delta, base period and their relationship, factors affecting duty, methods of improving duty, Numerical on command area calculations and reservoir capacity based on crop water requirement.

Term Work:

Assignments on the following topics

1. Determination of average annual rainfall using Thiessens polygon & Isohyetal map method.
2. Consistency of rain gauge station by double mass rainfall curves.
3. Determination of evaporation losses, effective rainfall hyetograph infiltration losses – Phi index calculation, Horton’s infiltration curve.
4. To develop a unit hydrograph from a total runoff hydrograph resulting from isolated storms.
5. Alteration of base period of given unit hydrograph using method of superposition and S-curve technique.
6. Determination of well discharge in a confined/unconfined aquifer.
8. Estimating depth and frequency of irrigation on the basis on soil moisture regime concept.
9. Crop water requirement and irrigation command area calculations.
11. Site visit & report on meteorological station.

Text Books:

4. “Irrigation and Water Power Engineering” – Dr. Punmia and Dr. Pande – Laxmi Publications, Delhi

Reference Books:

Guidelines Regarding Question Paper Setting:
1. Q.No. 4 and Q.No. 8 are compulsory and it should be based on all units of respective sections.
2. Attempt any two questions from Q. No. 1, 2, 3 and any two questions from Q. No. 5, 6, 7.

End Semester Examination Paper Pattern

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Design of Steel Structures

Course Objectives:
1. To understand the behavior of elements of steel structure.
2. To understand the design concept of steel structure and its members by LSM.

Course Outcomes:
After successful completion of this course students will be able to:
1. Describe the design philosophy, behavior of steel structure and failure mechanism.
2. Analyze and design different types of bolted & welded connections.
3. Assess the strength of structural members as per Indian Standards.
4. Analyze and design members subjected to tension, compression and flexure.

SECTION- I

Unit 1: Introduction and Connections 8hrs
1.1 Introduction: Design philosophy, Advantages and disadvantages of steel structures, Types of steel structures, Grades of structural steel, Loads and load combinations, Partial safety factors for load and materials for steel structures.
1.2 Connections: Bolted & welded- Analysis and design of axially and eccentrically loaded bolted and welded connections.

Unit 2: Tension Members 8hrs
2.1 Common sections, Net area, Modes of failure, Load carrying capacity.
2.2 Design of tension members.

Unit 3: Compression Members 8hrs
3.1 Compression members as struts common sections, Economical sections, Effective length, Slenderness ratio, Modes of failure, Classification of cross section, Behavior of compression member, Load carrying capacity
3.2 Design of compression members- Single and double angle.

SECTION- II

Unit 4: Column and Column Bases 8hrs
4.1 Columns: Design of column subjected to axial and eccentric loading, Design of lacing, Battening system, Column splices.
4.2 *Column Bases*: Design of slab base & gusseted base subjected to axial and eccentric loading, Design of concrete pedestal (dimensions only)

**Unit 5: Beams**  
5.1 Beam in flexure - Types of sections, Behavior, Design of laterally supported and unsupported beams, Rolledsteel sections, Built up beams/compound beams using flange plates, Curtailment of flange plates.  
5.2 Design for strength and serviceability  
5.3 Web buckling & web crippling.

**Unit 6: Gantry Girder**  
6.1 Forces acting on gantry girder, Commonly used sections  
6.2 Design of gantry girder as laterally unsupported beam  
6.3 Connection details

**Term Work:**  
One assignment per unit with minimum four numerical in each assignment

**Text Books:**

**Reference Books:**
1. “LRFD Steel Design” - William T. Segui, PWS Publishing 
6. “Steel Structure” - Controlling Behaviour Through Design, Englekirk, WILEY.

**I.S. Codes:**
1. IS: 800 – 2007 
2. IS: 875 (part I, II and III) 
3. SP 6 (1) & SP 6 (6), 
4. IS: 816 
5. IS: 808. 

**Guidelines Regarding Question Paper Setting:**
1. IS: 800 – 2007 is permitted in examination. 
2. Q. No. 1 and Q. No. 5 are compulsory. 
3. Attempt any two questions from Q. No. 2, 3, 4 and any two questions from Q. No. 6, 7, 8
## End Semester Examination Paper Pattern

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Environmental Engineering – I

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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

**Course Objectives:**
1. To understand various sources of water with respect to quality and quantity of water.
2. To describe and design the various water treatment units.
3. To learn the special water treatments and sequencing of treatment for various qualities of surface & ground water.
4. To design the various components related to transmission and distribution of water.
5. To understand various water supply appurtenances.

**Course Outcomes:**
After successful completion of this course students will be able to:
1. Describe the various sources of water with respect to quality and quantity of water.
2. Design the various water treatment units.
3. Illustrate the special water treatments and sequencing of treatment for various qualities of surface & ground water.
4. Describe the various components related to transmission and design of distribution of water.
5. Summarize the different water supply appurtenances.

**SECTION I**

**Unit 1: Introduction to Water Supply Scheme**  6hrs
1.1 *Introduction to Water Supply Scheme*: Data collection for water supply scheme, Components and layout, Design period, Factors affecting design period.
1.2 *Quantity*: Rate of water consumption for various purposes like domestic, industrial, institutional, commercial; Fire demand and water system losses, Factors affecting rate of demand, Population forecasting.
1.3 *Quality*: Water quality parameters, Characteristics & significance in water treatment, Drinking water quality standards- BIS, WHO Standards.
1.4 Water

*Intake Structures*: General design considerations, Types such as river intake, canal intake and reservoir intake, Concept of rising main and pumping station.

**Unit 2: Water Treatment**  6hrs
2.1 Water Treatment: Principles of water treatment processes. Introduction to different types of water treatment flow sheets.

2.2 Aeration: Principle and concept, Necessity, Methods, Design of cascade aerator.

2.3 Coagulation & Flocculation: Theory, Factors affecting, Destabilization of colloidal particles, Types of dosing of coagulants, Selection of coagulants, Jar tests, Design of rapid mixer & flocculator, Theory of clariflocculator.

2.4 Sedimentation: Theory, Types of settling, Types of sedimentation tanks, Principles & design, Concept of tube & plate settler.

Unit 3: Water Treatment

3.1 Filtration: Mechanism, Head loss development, Negative head loss, Types of filters- slow sand filter, rapid sand filter & pressure filter, Operation & design of slow sand & rapid sand filter.

3.2 Disinfection: Theory, Factors affecting disinfection, Types of disinfectants, Types and methods of chlorination break point chlorination

3.3 Water Softening Processes: Lime-soda process, Ion exchange

3.4 Demineralization: Reverse osmosis, Electro-dialysis

SECTION II

Unit 4: Distribution Reservoirs and Service Storages

4.1 Necessity, Location, Head requirement, Capacity determination by analytical & graphical method.

4.2 Transmission of water, Pumping & gravity mains, Choice of pipe materials, Forces acting on pressure pipes, Leakage & pressure testing of pipes, Corrosion types & control measures, Thrust block concept,

Unit 5: Water Distribution Systems

5.1 Method of distributing water, Layout pattern, Basic system requirements for water distribution system

5.2 Methods of Network Analysis: Equivalent pipe method, Hardy-Cross method, Design problem.

Unit 6: Water Supply Appurtenances

6.1 Types of Valve: Sluice valve, Air relief valve, Gate valve, Non-return valve, Scour valve

6.2 Fire hydrants water meter, Service connections, Maintenance & leak detection of water distribution system.

6.3 Necessity of water audit, Water audit in domestic sector, Concept of preparation of DPR.

Term Work:

A. Analysis of any 10 of the following test parameters for water

1. pH
2. Acidity
3. Alkalinity
4. Chlorides content
5. Hardness – Total, temporary and permanent
6. Turbidity
7. Residual Chlorine
8. Total dissolved solids through measurement of electrical conductivity
9. Dissolved Oxygen
10. Most Probable Number
12. Fluorides & Nitrogen
13. Iron and Manganese

B. Design/analysis problems on water treatment unit & distribution system.
C. Visit to a water treatment plant & visit report.

Text Books:
4. “Water and Wastewater Technology”- G.S. Birdie and J.S. Birdie

Reference Books:

Guidelines Regarding Question Paper Setting:
1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

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Course Objectives:
1. To provide a coherent development to the students for the courses in sector of Geotechnical Engineering & Soil Improvement Techniques etc.
2. To present the foundations of many basic Engineering tools and concepts related to Geotechnical Engineering.
3. To give an experience in the implementation of Engineering concepts which are applied in the field of Geotechnical Engineering.
4. To involve the application of scientific and technical principles of planning, analysis, design of foundation along with soil improvement techniques.

Course Outcomes:
After successful completion of this course, student will be able to:
1. Able to evaluate the Index and Engineering properties of soil
2. Understand the fundamental relationships in properties of soils
3. Evaluate the stress calculations in soil under different soil conditions
4. Understands the process and importance of compaction and consolidation
5. Know the shear strength of soil and its determination
6. Analyze the lateral pressure on vertical retaining walls

SECTION I

Unit 1: Soil Properties
1.1 Origin
of soil, Soil structure, Soil phase systems, Weight volume relationship
1.2 Index
Properties of Soil: Unit weights, water content, specific gravity, void ratio, porosity, air content, degree of saturation their relationships and significance
1.3 Particle size distribution by sieve analysis and hydrometer analysis
1.4 Atterberg’s consistency limits (Liquid limit, plastic limit, shrinkage limit), Consistency indices, Activity
1.5 IS
classification of soil, Casagrande plasticity chart
Unit 2: Permeability and Seepage Analysis

2.1 Darcy’s law and its validity, Factors affecting permeability
2.2 Determination of permeability of soil by constant head, Variable head, Permeability of stratified (layered) soil
2.3 Concept of total stress, Pore pressure and effective stress, Different forms of water
2.4 Seepage pressure, Seepage force, Seepage force per unit volume, Critical hydraulic gradient, Quick sand condition, Piping
2.5 Flow net construction and characteristics, Applications of flow net, Determination of seepage loss

Unit 3: Compaction and Consolidation

3.1 Concept of compaction, factors affecting compaction, Standard proctor test and modified proctor test as per IS 2720, Dry density and moisture content relationship, Zero air void line, Placement water content
3.2 Field compaction control, Field compaction equipment with their suitability.
3.3 Concept of consolidation, Factors affecting consolidation, Terzaghi’s piston and spring analogy model, Terzaghi’s theory of one-dimensional consolidation, Lab consolidation test to find coefficient of consolidation, Coefficient of volume change, Compression index, Coefficient of compressibility, NCC, UCC, OCC
3.4 Determination of coefficient of consolidation by square root of time fitting method and logarithm of time fitting method.

SECTION II

Unit 4: Stress Distribution in Soil

4.1 Boussinesq theory assumptions and application to point load, Strip load, Circular sections, Pressure distribution diagrams on horizontal and vertical plane, Radial shear stress
4.2 Isobars and pressure bulbs, Use of Newmark’s charts, Westergaard theory assumptions and application to uniformly loaded rectangular area.
4.3 Contact pressure for different footings in different soils, Equivalent point load method for stress calculation, Approximate method (2V:1H) method for stress calculation

Unit 5: Shear Strength of Soil

5.1 Concept of shear stress and shear strength, Mohr-Coulomb’s theory and failure envelopes for different types of soils such as C-soil, O-soil, and C-O soils, Representation of stress on Mohr’s circle
5.2 Terzaghi’s total stress and effective stress approach, Factors affecting shear strength of cohesive and cohesionless soils
5.3 Determination of shear strength of soil by Direct shear test, Triaxial compression test, under UU, CU & CD conditions, Unconfined compression test and vane shear test, Sensitivity, Skempton pore water pressure parameters

Unit 6: Earth Pressure Theory

6.1 Concept of earth pressure, Plastic equilibrium, Earth pressure at rest, Active and passive condition, its practical applications.
6.2 Rankine’s earth pressure theory for cohesionless soils under dry, Partially and fully submerged condition, Horizontal back fill with surcharge, Total lateral force on wall
6.3 Bell-Rankine’s theory for cohesive soils under dry, partially and fully submerged condition, tension cracks in soil, Critical height, Coulomb’s wedge theory for earth pressures
Term Work:
A. Performance of at least ten experiments from the following:
   1. Determination of specific gravity by pycnometer/density bottle method
   2. Determination of water content by oven drying method & Pycnometer method
   3. Particle size distribution by dry sieve analysis
   4. Particle size distribution by hydrometer analysis
   5. Determination of consistency limits (LL, PL, SL)
   6. Determination of field density by core cutter method
   7. Determination of field density by sand replacement method
   8. Determination of MDD & OMC by standard/Modified proctor test
   9. Determination of coefficient of permeability by variable head method/Constant head method
   10. Determination of shear strength parameters of soil by using direct shear test
   11. Determination of shear strength of soil using Triaxial, Unconfined and Vane shear Test (Any one)
B. One assignment per unit with minimum four numerical in each assignment

Text Books:
1. “Soil Mechanics and Foundation Engineering” - B. C. Punmia,Laxmi Publication
3. “Soil Mechanics and Foundation Engineering” - V. N. S. Murthy,Marcell Decker
5. “Geotechnical Testing and Instrumentation” -Alam Singh,CBS Publisher
6. “Geotechnical Engineering” - C. Venkatramaiah, New age International Publication
7. “Geotechnical Engineering” - Purushottam Raj

Reference Books:
1. “Soil Mechanics”- Terzaghi and Peak,Jony Willey and Sons, New York

Guidelines Regarding Question Paper Setting:
1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

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Third Year B.Tech. (Civil) Semester - V

Building Planning and Design

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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To study dimensions and space requirements for various elements of the building in relation to human body measurements.
2. To study Planning, designing of various public buildings considering principles of planning and Building Bye-Laws and regulations.
3. To study procedures for preparing perspective drawings of various objects as well as buildings.
4. To study Architectural composition and terms.

Course Outcomes:
After successful completion of this course students will be able to:
1. Specify dimensions and space requirements for various elements of the building in relation to human body measurements.
2. Plan, design public building considering principles of planning and Building Bye-Laws and regulations.
3. Prepare the submission and working drawings of public building.
4. Illustrate the procedures for preparing perspective drawings of various objects as well as buildings.
5. Apply knowledge of architectural composition and terms for betterment of aesthetic view.

Unit 1: Introduction  2hrs
1.1 Dimensions & space requirement in relation to body measurements
1.2 Human body figures and its applications in space design of service elements.

Unit 2: Planning and Design  14hrs
Site selection, site layout for various types of building such as:
2.1 Educational Buildings: Younger age range, Middle age range
2.2 Building for Health: Health centers, Hospitals
2.3 Assembly Buildings: Recreational halls, Cinema theatres, Restaurants, Hotels, Clubs
2.4 Business and Mercantile Buildings: Shops, Banks, Markets and malls
2.5 Industrial Buildings: Factories, Workshops, Cold storages
2.6 Office Buildings: Administrative buildings, Corporate office
2.7 Buildings for Transportation: Bus stations, Railway / metro stations

Unit 3: Perspective Drawings 6hrs
3.1 Elements of perspective drawings
3.2 Parallel perspective and angular perspectives of different objects and small buildings

Unit 4: Nature of Architecture 2hrs
4.1 Architectural composition and terms such as mass, space, proportion, symmetry, balance, contrast, pattern.

Term Work:
1. Sheet for human body dimensions for space design (different human body figures, dimensions and their relevant applications)
2. Visit to a building complex and a report based on that.
3. Planning and designing of a public building project (Max. five students group) for which drawings shall be prepared covering scope of:
   i) Municipal drawing
   ii) Layout plan showing site development details (Internal roads, parking, secondary structures for allied services)
   iii) Working drawings with suitable scale (Furniture, electrification, plumbing)
4. Perspective view of the buildings planned above.
5. Line plan of buildings on graph paper of at least five remaining types of buildings not covered in 2.
6. Two exercises on parallel and angular perspective of simple objects.
7. Report for the building project stated in 2, including necessary sketches and design details.
8. Minimum one exercise of preparing a plan and elevation on CAD.

Text Books:
3. “Planning and Designing Building” – Y.S.Sane, Modern Publication House, Pune

References Books:
1. “Building Planning” – Kumar Swami, Charotar Publication
2. “Civil Engineering Drawing” – M.Chakaborty, UBS publication.
Open Elective – I (Energy & Environment)
(Offered by Faculty of Civil Engineering to All Faculties)

Course Objectives:
1. To study energy needs, demand and various renewable alternatives.
2. To understand potential of renewable energy resources.
3. To study technologies to harness the energy.
4. To understand advantages, limitations of resources and energy management.

Course Outcomes:
After successful completion of this course students will be able to:
1. Compare conventional and renewable energy resources
2. Identify scope and potential of renewable energy
3. Analyze suitability of renewable energy resource.
4. Explain energy management principles and strategies

SECTION I

Unit 1: Introduction 5 hrs
1.1 Global energy, Environmental resources
1.2 Energy needs
1.3 Indian scenario- Energy consumption, Needs and crisis

Unit 2: Renewable Sources of Energy 9 hrs
2.1 Biogas: Types & factors affecting, Community biogas plant
2.2 Solar Energy: Introduction, Utilization methods, Merits and demerits & potential
2.3 Wind Energy: Site selection criteria, Potential & scope
2.4 Tidal Energy: Site suitability, Types

Unit 3: Non-Renewable Sources of Energy 4 hrs
3.1 Energy from Coal and Oil: Introduction, Merits and demerits
3.2 Natural Gas & Geothermal Energy: Introduction, Merits and demerits
3.3 Relevance to other branches, Green building
SECTION II

Unit 4: Environmental Impacts 5 hrs
  4.1 Global Warming
  4.2 Greenhouse effect
  4.3 Acid rain

Unit 5: Environmental Impact Assessment (E.I.A.) 6 hrs
  5.1 Objectives
  5.2 General E.I.A. process
  5.3 Capability & limitations

Unit 6: Energy Audit and Management 7 hrs
  6.1 Definition and objectives
  6.2 Types and general guidelines for energy audit
  6.3 Principles of energy management, Energy planning

NOTE: One assignment on each unit.

Text Books:

Reference Books:

Guidelines Regarding Question Paper Setting:
  1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
  2. All questions are compulsory.
  3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

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Open Elective – I (Waste Management)  
(Offered by Faculty of Civil Engineering to All Faculties)

Course Objectives:
1. To study the effects of the various types of waste on human being, animals and environment.
2. To study the water & wastewater management and solid waste of urban area.
3. To study the various techniques and options for handling industrial wastewater, hazardous waste and air pollution of urban area.

Course Outcomes:
After successful completion of this course students will be able to:
1. To evaluate the effects of various wastes on human beings, animals and on Environment.
2. To solve the water and wastewater treat by using conventional and advanced treatment methods.
3. To estimate quantity of solid waste, E-waste and biomedical wastes and to suggest their disposal methods.
4. To suggest reuse and recycles techniques of solid waste, E-waste and biomedical wastes and to suggest their disposal methods.
5. To characteristics and to select treatment options for selected industrial wastewater.
6. To discuss the impacts of hazardous waste and air pollution.

SECTION I

Unit 1: Introduction  
1.1 Definition of waste, Types and sources of waste, Properties of waste  
1.2 Effects on human beings and animals and on their environment  
1.3 Introduction to various acts and rules for waste in India

Unit 2: Domestic Water and Wastewater Management  
2.1 Importance of water and wastewater treatment, Water quality standards, Effluent standards  
2.2 Flow diagram of water and wastewater treatment
2.3 Advanced wastewater treatments-RO
2.4 Nitrification and De-nitrification process, SBR techniques

**Unit 3: Industrial Wastewater Management** 6 hrs
3.1 Volume and strength reduction, Equalization, Neutralization
3.2 Propagation techniques
3.3 Flow diagram and treatment methods for pulp and paper, dairy, sugar & textile industries

**SECTION II**

**Unit 4: Solid Waste Management** 6 hrs
4.1 *Municipal Waste*: Types, Sources, Collection, Transportation and disposal methods
4.2 *Biomedical Waste*: Types, Sources, Collection and disposal methods
4.3 *Construction and Demolition Waste*: Problems of collection, Segregation, Transportation & limitations, Reuse and disposal of waste

**Unit 5: Hazardous Waste Management** 6 hrs
5.1 Definition of hazardous waste, Classification of waste
5.2 Processing techniques
5.3 Rules and regulation of disposal of waste

**Unit 6: E-waste Management** 6 hrs
6.1 Composition, Segregation
6.2 Reuse and recycle
6.3 Disposal techniques, E-waste management rules 2016

**NOTE:** One assignment on each unit.

**Text Books:**
3. “Water and Wastewater Technology” - G.S. Birdie and J.S. Birdie
5. “Solid Waste Management” - Dr. A. D. Bhide

**Reference Books:**
4. “Solid Waste Management” - Gorge Tchobanoglous

**Guidelines Regarding Question Paper Setting:**
1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

**End Semester Examination Paper Pattern**
### Course Objectives:
1. To impart principles of elastic structural analysis and behavior of indeterminate structures.
2. To analyze indeterminate structures by using different methods.
3. To compare suitability of different methods.
4. To make aware of the limitations of the methods of solution and their outcomes.

### Course Outcomes:
After successful completion of this course students will be able to:
1. Understand the concept of determinacy and indeterminacy.
2. Apply various techniques of structural mechanics to solve indeterminate structures.
3. Analyze indeterminate structures by using various approaches.
4. Know the limitations of the methods of solution and their outcomes.

### SECTION I

**Unit 1: Introduction and Consistent Deformation Method**  
6hrs

1.1 Concept of determinacy and indeterminacy, Degrees of freedom and structural redundancy, Methods of analysis. (No numerical).

1.2 Consistent deformation method: propped cantilever with uniform section, fixed beam.

**Unit 2: Clapeyron’s Theorem**  
6hrs

*Clapeyron’s theorem of three moments, application to*

2.1 Continuous beams
2.2 Sinking of supports
2.3 Beams with different M.I.

**Unit 3: Energy Theorems**  
6hrs

*Castiglione’s theorem and unit load method (Degree of S.I. ≤ 2), application to*
3.1 Statically indeterminate beam
3.2 Truss (lack of fit and temperature variation effect)

SECTION II

Unit 4: Slope Deflection Method 6hrs
Slope deflection equation, Modified slope deflection equation (Degree of K.I. ≤ 2), application to
4.1 Beams, sinking of supports
4.2 Portal frames without sway

Unit 5: Moment Distribution Method 6hrs
Moment distribution method (Degree of S.I. ≤ 2), application to
5.1 Beam
5.2 Sinking of supports
5.3 Portal frames without and with sway.

Unit 6: Matrix Methods 6hrs
6.1 Flexibility Method: Flexibility coefficients, Development of flexibility matrix, Compatibility equations, Application to propped cantilever, fixed beam, continuous beam (Degree of S.I. ≤ 2)
6.2 Stiffness Method: Stiffness coefficients, Development of stiffness matrix, Equilibrium equations, Applications to beams and portals (Degree of K.I. ≤ 2)

Term Work:
One assignment per unit with minimum four numerical in each assignment

Text Books:

Reference Books:
4. “Matrix analysis of structures” - Gere & Weaver.
5. “Indeterminate structural analysis” - C.K. Wang

Guidelines Regarding Question Paper Setting:
1. Section I - Q. No. 1 to 4 and Section II - Q. No. 5 to 8
2. Q. No. 1 & 5 is compulsory question based on entire theory of section I and section II respectively.
3. Solve any two questions out of remaining three questions in each section

End Semester Examination Paper Pattern
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Third Year B.Tech. (Civil) Semester - VI

Engineering Management

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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To introduce management theories.
2. To learn project management tools.
3. To understand Resource management.
4. To get acquainted with financial management.

Course Outcomes:
After successful completion of this course students will be able to:
1. Understand importance of management in construction.
2. Use the Project planning and management tools in Construction.
3. Evaluate and draw project network for estimating time and cost.
4. Know the techniques of Material Management.
5. Explore and understand the concepts of Economics in construction.
6. Know the advance concepts in management.

SECTION I

Unit 1: Management Introduction  6hrs
1.1 Importance, Contribution by Henry Fayol and F.W. Taylor
1.2 Functions of management w.r.t its influence in construction management
1.3 Introduction to decision making and decision tree.

Unit 2: Project Management and Network Analysis  10hrs
2.1 Phases of project management, Bar chart, Gantt chart.
2.2 Work breakdown structure.
2.3 CPM

Network: Time estimate, Floats, Critical path. Network compression and updating
Unit 3: PERT  
3.1 Introduction, Time estimates, Floats, Project duration. Introduction to precedence network  
3.2 Study of Project Management Software.

SECTION II

Unit 4: Resource Management  
4.1 Objectives, Functions, Inventory control, ABC analysis, EOQ analysis. HML, VED, SDE.  
4.2 Resource allocation, Concept of smoothing and leveling

Unit 5: Engineering Economics  
5.1 Types of interests, Time value of money, Equivalence.  
5.2 Economic Comparison Methods: Present worth method, EUAC method, Capitalized cost method.  
5.3 Investment Criteria: Net present value, Rate of return, Benefit cost ratio, Payback period method, Concept of breakeven analysis

Unit 6: Advances in Management  
6.1 Concept of work study and method study, ISO 9000  
6.2 Site layout, Safety in construction - Personal protective equipment.

Term Work:  
1. One assignment per unit with minimum four questions in each assignment  
2. Planning and scheduling of any construction project by using Project management software.

Text Books:  
1. “Project planning and Control with PERT and CPM” - B.C.Punmia, Laxmi Publication.  
3. “Construction Engineering and Management” - Dr. S. Seetharaman, Umesh Publications  

Reference Books:  

Guidelines Regarding Question Paper Setting:  
1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6  
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

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Third Year B.Tech. (Civil) Semester - VI

Environmental Engineering – II

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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To describe wastewater, its sources, characteristics and collection systems.
2. To design the various treatment processes for wastewater treatment and low cost treatment methods.
3. To interpret various methods of wastewater disposal.
4. To explain various aspects of solid waste management.
5. To outline the effects of air pollution and its control measures.

Course Outcomes:
After successful completion of this course students will be able to:
1. Explain sources, characteristics and methods of wastewater collection.
2. Design the primary and secondary wastewater treatment units and describe low cost wastewater treatment units.
3. Understand various methods of wastewater disposal
4. Explain the necessity and importance of solid waste management.
5. Describe air pollution, its effect and controlling techniques.

SECTION I

Unit 1: Waste Water Treatment  8hrs
1.1 Components of wastewater flows, Wastewater sources and flow rate, Variations in flow rates and strength, Wastewater constituents, Characteristic of municipal waste water, Problems on B.O.D. calculations, Quantity of storm water.
1.2 Sewerage system, Types, Layout, Types of sewers, Collection system, Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems, Sewage and sludge pumping.

**Unit 2: Primary and Secondary Treatment** 8hrs
2.1 Screening, Comminuting, Grit removal, Oil and grease trap primary settling tank.
2.2 Secondary Treatment—Activated sludge process, Process, Design and operating parameters of ASP, Modification of ASP, Operational problems, Concept of trickling filter.

**Unit 3: Sludge Treatment and Disposal** 8hrs
3.1 Concept of anaerobic digestion, Types of reactors.
3.2 Low cost wastewater treatment methods—Principles of waste stabilization pond. Design and operation of oxidation pond, Operation of aerobic & anaerobic Lagoons, Oxidation ditch, Septic tank.

**SECTION II**

**Unit 4: Stream Pollution** 8hrs
4.1 Self-purification, DO sag curve, Streeter Phelp’s Equation, Stream classification
4.2 Disposal of waste water methods, Effluents standards for stream and land disposal as per MPCI and CPCB standards

**Unit 5: Solid Waste Management** 8hrs
5.1 Solid wastes definition, Types, Sources, Characteristics, Functional outlines—storage, Collection, Processing techniques
5.2 Methods of treatment of solid waste composting, Incineration, Pyrolysis and sanitary land filling.

**Unit 6: Air Pollution Noise Pollution and EIA** 8hrs
6.1 Air Pollution: Definition, Sources and classification of pollutants, Effects. Control of industrial air pollution—Settling chamber, Bag filter, Cyclone separator, Scrubbers, Electrostatic precipitators. Air quality standards
6.2 Noise Pollution: Noise characteristics and measurements, Levels of noise and standards, Control.

**Term Work:**
A. Characterization of municipal waste water (Any five of the following):
   1. pH
   2. Alkalinity
   3. Solids
   4. Chlorides
   5. DO
   6. BOD
   7. COD
   8. Sulphates
   9. Oil & grease
   10. Volatile acids

B. Design/analysis problems on sewerage system and treatment system
C. Visit to sewage treatment plant & visit report.
Text Books:
4. “Sewage Disposal and Air Pollution Engineering” - Garg S.K., Khanna Publishers
6. “Solid Waste Management in Developing Countries” - Bhide A.D. and Sundersen B.B., Indian National Scientific Documentation Centre, New Delhi

Reference Books:

Guidelines Regarding Question Paper Setting:
1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
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Third Year B.Tech. (Civil) Semester - VI

Geotechnical Engineering II

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ISE: In Semester Evaluation  
CIE: Continuous Internal Evaluation  
ESE: End Semester Examination

Course Objectives:
1. Know Various concepts of different soil/rock strata and use of this data for interpretation of bearing capacity.
2. Understand the importance and basics of foundation engineering in the civil engineering projects.
3. Evaluate the load bearing capacity and settlement of foundations by classical theories.
4. Analyze the geotechnical aspects of shallow and deep foundations.
5. Understand the concepts of the stability of slopes and study various methods of evaluating the stability of slopes.
6. Know the modern foundation techniques.

Course Outcomes:
After successful completion of this course students will be able to:
1. Use engineering science principles to develop foundation engineering knowledge.
2. Apply foundation engineering knowledge in the civil engineering projects.
3. Calculate bearing capacity theoretically as well as practically.
4. Calculate settlement and design shallow and deep foundation.
5. Apply basics concepts of slope stability on field.
6. Apply modern foundation techniques.
SECTION I

Unit 1: Soil & Rock Exploration

1.1 Necessity, Planning, No & depth of bore holes, Exploration methods- auger boring (hand and continuous flight augers), and wash boring, rotary drilling, percussion drilling.

1.2 Soil sampling- Disturbed and undisturbed, Rock drilling and sampling, Types of sampler.

1.3 Mechanical properties of rock, Behavior of rocks in uniaxial compression, Tensile strength of rocks

1.4 Types of rock failure, Core barrels, Core boxes, Core recovery, Rock quality designation

Unit 2: Bearing Capacity Evaluation

2.1 Definitions, Modes of failure, Terzaghi’s bearing capacity theory, Meyerhof’s bearing capacity, I.S. Code method of bearing capacity evaluation & computation (IS 6403)

2.2 Effect of various factors on bearing capacity (Size & Shape, Depth, WT)

2.3 Bearing capacity evaluation from Plate Load Test, S.P.T. (By I.S. Code method), Static cone penetration test and Menards pressure meter tests with detailed procedure.

Unit 3: Shallow Foundation and Foundation Settlement

3.1 Types and their selection, Minimum depth of footing, Assumptions & limitations of rigid design analysis. Design of isolated, combined, strap footing (Rigid analysis), raft foundation (elastic analysis), floating foundations (R.C.C. Design is not expected)

3.2 Immediate settlement- computations from I.S. 8009- 1976 (Part I) approach, Consolidation

3.3 Settlement computations, Concept of total settlement, Differential settlement and angular distortion.

SECTION II

Unit 4: Pile Foundation

4.1 Classification and their uses, Single pile capacity evaluation by static and dynamic methods for cohesive and cohesion less soil, Pile load test. Negative skin friction

4.2 Group action piles, Spacing of piles in group, Group efficiency.

4.3 Under reamed piles – equipment, construction and precautions.

Unit 5: Well Foundations, Coffer Dam and Ground Improvement Techniques

5.1 Element of wells, Types, Methods of construction, Tilt and shift, Remedial measures.

5.2 Pneumatic Caissons: Sinking method- Sand island method, Caisson disease. Types and material used for sheet piling

5.3 Common types of cofferdams, Braced cofferdam.

5.4 Stone columns, Vibroflotation, Preloading technique, Civil engineering application of geo synthetics, Geo textile & geomembrane

Unit 6: Analysis of Slope Stability
6.1 Slope classification, Slope failure, Modes of failure. Infinite slope in cohesive and cohesion less soil
6.2 Taylor’s stability number, Swedish slip method, Method of slices and concept of friction circle method, Landslide

Term Work:
1. Minimum one assignment on each unit with theory and minimum four numerical, (wherever applicable)
2. Any software-based project OR Foundation site visit with report

Text Books:
1. “Soil Mechanics in Engineering Practice” - Karl Terzaghi, Ralph B. Peck and Gholamreza Mesri, Wiley India Pvt. Ltd
5. “Geotechnical Engineering” - Dr. B. J. Kasmalkar, Pune Vidyarthi GrihaPrakashan.

Reference Books:
5. “Foundation Design Manual” -Dr. N.V. Nayak. Dhanpat Rai and Sons

Guidelines Regarding Question Paper Setting:
1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
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Open Elective-II (Soil and Water Conservation Techniques)  
(Offered by Faculty of Civil Engineering to All Faculties)

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ISE: In Semester Evaluation  
CIE: Continuous Internal Evaluation  
ESE: End Semester Examination

**Course Objectives:**
1. To understand the concept of soil and water conservation.  
2. To apply the knowledge of conservation for societal benefit.  
3. To evaluate the specific needs of soil and water conservation in given area.

**Course Outcomes:**
After successful completion of this course students will be able to:
1. Understand methods of soil and water conservation.  
2. Develop an integrated model for sustainable natural conservation.  
3. Explain the groundwater exploration techniques and its artificial recharge.  
4. Analyze the needs for protection of banks and preservation of soil.
SECTION I

Unit 1: Introduction

1.1 Concept of soil erosion and water conservation

Unit 2: Soil Conservation Methods

2.1 Introduction, Erosion due to water,
2.2 Terraces for water erosion control-Terraces and their design, Bench terracing, Types of bench terraces, Alignment of bench terraces,
2.3 Bunding Methods- Measures for water erosion control, Bunds (contour bunds, graded bunds), Construction of bunds
2.4 Gully Erosion - Classification of Gullies, Principles of Gully Control, Gully Control Measures;
2.5 Maintenance of Bench Terraces, bunding and gully.

Unit 3: Stream Bank Erosion and Protection

3.1 Introduction - Susceptible area to stream bank erosion, Process of stream bank erosion, Bank scour, Mass failure
3.2 Impacts of stream bank erosion - Causes of stream bank erosion, Control measures for stream bank erosion
3.3 Objectives and methods of river training works.

SECTION II

Unit 4: Water Harvesting Structures

4.1 Importance of water harvesting, Types of water harvesting
4.2 Water harvesting technique, Runoff vs. flood water harvesting
4.3 Performance of WHS - Check dams, Nala bund, MI tank, Percolation tank

Unit 5: Modeling of Watershed Process

5.1 Watershed model and modeling, Benefits of watershed modeling, Watershed models
5.2 Case study – Watershed, Modelling for soil and water conservation.

Unit 6: Groundwater Conservation

6.1 Introduction, Sources of ground water, Porosity and permeability, Types of aquifers, Zones of ground water
6.2 Ground water regulations, Ground water conservation techniques, Artificial recharge systems, Causes, effects and solutions of ground water depletion.

NOTE: One assignment on each unit.

Text Books:
1. “Soil and Water Conservation Engineering” - Dr. R. Suresh, Standard Publications
2. “Hydrology and Soil Conservation Engineering including Watershed Management” - Ghanshyam Das, PHI

Reference Books:
4. “Soil and Water Conservation in Semiarid Area” - Norman W. Handsom, United Book Prints
5. “Groundwater Hydrology” - D.K. Todd, Wiley Publication

Guidelines Regarding Question Paper Setting:
1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

End Semester Examination Paper Pattern

<table>
<thead>
<tr>
<th>Question No.</th>
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Third Year B.Tech. (Civil) Semester - VI

Open Elective-II (Disaster Risk Management)
(Offered by Faculty of Civil Engineering to All Faculties)

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ISE: In Semester Evaluation  CIE: Continuous Internal Evaluation  ESE: End Semester Examination

Course Objectives:
1. To provide basic conceptual understanding of disasters and its relationships with development.
2. To gain understand approaches of disaster preparedness, response and recovery.
3. To enhance awareness of Disaster Risk Management institutional processes in India
4. To build skills to respond to disasters.

Course Outcomes:
After successful completion of this course students will be able to:
1. Gain the ability to understand and categories the disaster.
2. Apply preparedness plans for disaster response.
3. Setting up of early warning systems for risk reductions
4. Application of Sphere Standards Indian context

SECTION I

Unit 1: Introduction 5 hrs
1.1 Concepts and definitions: Disaster, Hazard
1.2 Vulnerability, Risks severity, Frequency and details, Capacity, Impact
1.3 Prevention, Mitigation

Unit 2: Types of Disaster 6 hrs
2.2 Manmade Disasters: Industrial pollution, Artificial flooding in urban areas, Nuclear radiation, Chemical and biological spills, Transportation accidents (air, sea, rail and road), Terrorist strikes

Unit 3: Disaster Impacts 7 hrs
3.1 Environmental, Physical, Social, Ecological, Economic, Political
3.2 Health, Psycho-social issues
3.3 Demographic aspects (gender, age, special needs)
3.4 Global and national disaster trends
3.5 Climate change and urban disasters.

SECTION II

Unit 4: Disaster Risk Reduction (DRR) 6 hrs
4.1 Pre-Disaster: Risk assessment and analysis, Risk mapping, Zonation and micro zonation, Prevention, Mitigation, Early warning systems, Preparedness. Capacity assessment, Structural and non-structural measures
4.2 During-Disaster: Evacuation, Disaster communication, Search and rescue, Emergency operation centre, Incident command system, Relief and rehabilitation
4.3 Post-Disaster: Damage and needs assessment, Restoration of critical infrastructure, Early recovery, Environmental response (water, sanitation, food safety, waste management), Disease control, Security, Communications

Unit 5: Disasters, Environment and Development 6 hrs
5.1 Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land use changes, urbanization)
5.2 Sustainable and environmentally friendly recovery
5.3 Reconstruction and development methods
Unit 6: Disaster Management in India

6.1 Disaster Profile of India – Mega Disasters of India and Lessons Learnt Disaster Management Act 2005

6.2 Roles and responsibilities of government, Community, Local institutions, NGOs and other stakeholders

6.3 Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority

6.4 Applications of Science and Technology - Geo-informatics in Disaster Management (RS, GIS, GPS and RS)

**NOTE:** One assignment on each unit.

**Text Books:**
2. “Disaster Management” - Ghosh G.K., APH Publishing Corporation
3. “Manual on natural disaster management in India” - M C Gupta, NIDM, New Delhi
7. “Disaster Management Act 2005”, Publisher by Govt. of India

**Reference Books:**
6. “World Disasters Report, 2009”, International Federation of Red Cross and Red Crescent, Switzerland

**Guidelines Regarding Question Paper Setting:**
1. Section I - Q. No. 1 to 3 and Section II - Q. No. 4 to 6
2. All questions are compulsory.
3. Internal optional questions are allowed, weightage of optional question should not be more than 30% of total marks i.e. 21 marks out of 70 marks.

**End Semester Examination Paper Pattern**

<table>
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<tr>
<th>Question No.</th>
<th>Based on Unit No.</th>
<th>Marks</th>
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**Third Year B.Tech. (Civil) Semester - VI**

**Structural Design and Drawing-I**

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</table>
**Course Objectives:**
1. To analyze and design steel structures.
2. To prepare the working drawing for various structural elements.

**Course Outcomes:**
After successful completion of this course students will be able to:
1. Analyze and design different types of bolted & welded connections
2. Demonstrate the knowledge of common sections subjected tension and compression members & its design,
3. Analyze and design of steel column, flexural members and its elements.
4. Aware of application of software in structural analysis and design.
5. Prepare the working drawing as per requirement of project execution.

**Term Work:**
Detailed structural design and drawing of the following steel structure along with necessary drawings by limit state method analysis. (Max group size should not exceed four students)
1. Design of industrial building including roof truss, purlin, bracings, gantry girder, column, column base and connections. Preparation of all working drawings.
2. Analysis and Design of building frame manually and by using any FEM based software. Preparation of all working drawings.

**Text Books:**

**Reference Books:**
1. “LRFD Steel Design” - William T. Segui, PWS Publishing
6. “Steel Structure” - Controlling Behaviour Through Design, Englekirk, WILEY.

**I.S. Codes:**
1. IS: 800 – 2007
2. IS: 875 (part I, II and III)
3. SP6 (1) & SP 6 (6),
4. IS: 816
5. IS: 808.
## Third Year B.Tech. (Civil) Semester - VI

### Seminar

<table>
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**Course Objectives:**
1. To understand, develop research ability & present the knowledge gained from curriculum/field etc.
2. To study the recent trends, technological innovations in civil engineering & interdisciplinary areas.
3. To enhance presentation skills.

**Course Outcomes:**
After successful completion of this course students will be able to:
1. Summarize the present status and make literature review on the selected topic with current issues to give a state of an art of technological progress in the past through technical report.
2. Deliver seminar presentation using modern tools highlighting the distinguishing features of the studies conducted.
3. Prepare the technical report of seminar work in given format.

**Term Work:**
1. Selection of topic from curriculum/field in civil engineering /interdisciplinary areas on current issue.
2. Minimum three presentations as follows,
   a. Synopsis presentation
   b. Literature review presentation
   c. Final presentation
3. Preparation of final report in hard and soft format.

**Text Books:**
Relevant textbooks on selected topic of seminar.

**Reference Books:**
Relevant reference books, journal publications, conferences publications, magazines, open web site sources on selected topic of seminar.

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**Guidelines about Field Training (SI-CV707):**

1. On site/office field training for 2 weeks during winter and 3 weeks during summer vacation of T.Y. B.Tech.
2. College has to provide field book containing 35 pages about daily report of field training to students.
3. Each page of field book should contain the signature of site supervisor/office engineer.
4. College has to allot site/office to students and students should strictly do the field training at allotted site/office.
5. After successful completion of field training students should bring satisfactory report from allotted firm.
6. The evaluation of field training should be done in semester VII under course Field Training having course code SI-CV707.
7. If possible, external practicing examiner should be called for evaluation of term work of Field Training.
SHIVAJI UNIVERSITY,
KOLHAPUR

REVISED SYLLABUS AND STRUCTURE
THIRD YEAR (C.B.C.S.) BACHELOR OF TECHNOLOGY
IN
Computer Science and Engineering

To be introduced from the academic year 2020-21
(w. e. f. June 2020) onwards
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CIE - Continuous Internal Evaluation

ESE – End Semester Examination
Candidate contact hours per week: 30 Hours (Minimum)

- Total Marks for T.Y. Sem V & VI: 800 + 800 = 1600

- Theory and Practical Lectures: 60 Minutes Each

- Total Credits for T.Y. Sem V & VI: 50 (SEM-V: 25 + SEM-VI: 25)

- In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.

- There shall be separate passing for theory and practical (term work) courses.

Note:
1. **PCC-CS**: Professional Core Course – Computer Science and Engineering are compulsory.
2. **HM-CS**: Humanities and Management – Computer Science and Engineering are compulsory.
3. **PW-CS**: Domain Specific Mini Project – Computer Science and Engineering are compulsory.
4. **#OEC-CS**: Open Elective Course – To be offered to Inter departmental students.
   # - 60% of the students from other branches to be chosen on merit.
   - 40% of the students may be from the same branch based on merit.
   - Number of students to be allowed should be 72 (Max.) for the branch with intake of 60 students.
   - The above ratio should be followed in proportionate to the sanctioned intake.

**OPEN ELECTIVE COURSE-I**

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<th>Name of the Subject</th>
<th>Name of the concern Branch</th>
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<td>1</td>
<td>i) Computer Graphics &amp; Multimedia</td>
<td>Computer Science and Engineering</td>
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<td>ii) Internet of Things</td>
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**OPEN ELECTIVE COURSE-II**

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<td>1</td>
<td>i) E-Commerce &amp; Digital Marketing</td>
<td>Computer Science and Engineering</td>
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1. Information Security (PCC - CS501)

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<td>Term work : 50 Marks</td>
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<td>Practical: 2 Hrs./Week</td>
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**Course Objectives**

1. To introduce the principles of Crypto-Systems.
2. To expose students to various security services and mechanisms used.
3. To make the students aware of the security features of PGP, S/MIME, Digital Signatures, IPSec & SSL.
4. To make the students understand the system level security issues concerning threats, intruders and use of firewalls and trusted systems.
5. To make students to explore non-cryptographic and software vulnerabilities.

**Course Outcomes**

Upon successful completion of this course, the students will be able to:

1. Understand principles of Crypto-systems.
2. Compare and analyze various security services and mechanisms.
3. Apply and use the features of PGP, S/MIME, DSA, IPSec, SSL in their profession.
4. Take precautions of their personal computing system from possible threats and attacks.
5. Explore newer vulnerabilities and provide the solutions to them.

**Pre-requisites:** Computer Network, Modular Arithmetic & Number Theory, C / C++.
Term Work

• Minimum of 10 Experiments to be performed from the list given below.
• Practical should include the implementation and use of the following mechanisms/Algorithms/Tools /Techniques
• Implementation can be in C/C++ Programming Language

Experiment List

1. GCD Using Euclidean algorithm/Computing Multiplicative inverses/ Prime number and modular arithmetic operations.
2. Substitution/Transposition/ Product Cipher and their Analysis
3. Single round of DES algorithm/Double DES/ Triple DES and its analysis
4. RSA Algorithm to provide Confidentiality and Authentication services or any other Public-Key Algorithm.
5. Diffie–Hellman or any other key exchange Algorithm.
7. Generation and use of Digital Signature for real world situation.
10. Demo and usage of network traffic analysis tools.
12. Experimentation on identifying software Vulnerabilities using various tools/techniques and their analysis.
13. Any other Implementation/Demo/Experimentation based on the topics of syllabus.

**Text Books**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cryptography and Network Security</td>
<td>William Stallings</td>
<td>Pearson Edition</td>
<td>(Unit I to V)</td>
</tr>
<tr>
<td>2</td>
<td>Network Security and Cryptography</td>
<td>Bernard Menezes</td>
<td>Cengage Learning</td>
<td>Unit -VI</td>
</tr>
</tbody>
</table>

**Reference Books**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cryptography and network security</td>
<td>Atul Kahate</td>
<td>TMGH</td>
</tr>
<tr>
<td>2</td>
<td>Cryptography and Network Security</td>
<td>B. A. Forouzan</td>
<td>TMGH</td>
</tr>
<tr>
<td>3</td>
<td>Network Security Know it All</td>
<td>Joshi et. al</td>
<td>Morgan Kaufmann</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Publisher</td>
</tr>
</tbody>
</table>
T. Y. B. Tech (Computer Science and Engineering) Sem –V

2. System Programming (PCC - CS502)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory : 3 Hrs./Week</td>
<td>Theory : ESE 70 Marks</td>
</tr>
<tr>
<td></td>
<td>CIE  30 Marks</td>
</tr>
<tr>
<td>Tutorial : -----</td>
<td>Term work: 50 Marks</td>
</tr>
<tr>
<td>Practical: 2 Hrs./Week</td>
<td>Oral : 25 Marks</td>
</tr>
</tbody>
</table>

**Pre-requisites:** Basics of OS and Basics Microprocessor.

**Course Objectives**

1. To expose the students to the fundamentals of languages and processing
2. To make students to learn design of grammars, assemblers and compilers
3. To provide hands on experience to the students on simulation of linkers, loaders and software tools for UIs

**Course Outcomes**

1. Student will be able to identify the role of system programs and application programs.
2. Student will be able to understand the basics of system programs like editors, compiler, assembler, linker, loader, interpreter and debugger.
3. Students able to describe the various concepts of assemblers and macro - processors.
4. Students able to understand the various phases of compiler and compare its working with assembler.
5. Students understand how linker and loader create an executable program from an object module created by assembler and compiler.
6. Students will be able to create graphical user interfaces for basic programs and learn about terminal input/output through the termios libraries.

<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT NAME &amp; DETAILS</th>
<th>NO. OF LECTURES</th>
</tr>
</thead>
</table>
| 1.       | **Language Processors:**
|          | Introduction, Language processing activities, Fundamentals of language processing,   | 7              |
|          | Fundamentals of language, Specification, Language Processing Development Tools: LEX  |                |
|          | and YAC                                                                             |                |
| 2.       | **Assemblers:**
|          | Elements of assembly language programming, A simple assembly scheme, pass structure  | 5              |
|          | of assemblers, Design of a two pass assemble                                        |                |
| 3.       | **Macros and Macro Processors:**
|          | Macro definition and call, Macro expansion, Nested macro calls, Advanced macro      | 7              |
|          | facilities, Design of macro pre-processor: Design Overview, Data structure of Macro  |                |
|          | pre-processor with and Example                                                       |                |
4. **Compilers and Interpreters:**
   Aspects of compilation, Memory allocation: Static and Dynamic memory allocation, Memory Allocation in block Structure language. Compilation of expressions, Code optimization: Local and Global optimization and Optimization technique, Interpreters

5. **Linkers:**
   Introduction, Relocation and linking concepts, Self- relocating programs, linking for overlays, Loaders

6. **Software tools:**
   Introduction, Software tools for program development, Editors, Debug Monitors, Programming Environments, and User Interface

---

**Term Work**

Minimum of 5 experiments on LEX and 5 case-studies each on Assembler, Compiler, Macro Preprocessor, Linker and Loaders

---

**Oral Exam**

Orals can be conducted over the syllabus contents and Term Work assignments.

---

**Text Books**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>System Programming and operating systems</td>
<td>D. M. Dhamdhere</td>
<td>2nd Edition (TMGH)</td>
<td>All Units</td>
</tr>
<tr>
<td>2.</td>
<td>Lex &amp; Yacc Publisher:</td>
<td>Doug Brown, John Levine, Tony Mason</td>
<td>2nd Edition O'Reilly Media</td>
<td>For Practical</td>
</tr>
</tbody>
</table>

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T. Y. B. Tech (Computer Science and Engineering) Sem – V

3. Object Oriented Modeling and Design (PCC - CS503)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory : 3 Hrs./Week</td>
<td>Theory : ESE 70 Marks</td>
</tr>
<tr>
<td></td>
<td>CIE 30 Marks</td>
</tr>
<tr>
<td>Tutorial : -----</td>
<td>Term work : -----</td>
</tr>
<tr>
<td>Practical : -----</td>
<td>Oral : -----</td>
</tr>
</tbody>
</table>

**Pre-requisites:** Software Engineering & Object Oriented Concepts.

**Course Objectives**

1. To Understand the Object Based View of the System
2. To design Problems using Object Oriented Analysis and Design Techniques
3. To Understand UML notations and compare with OMT
4. To inculcate necessary skills to handle complexities in Software Design

**Course Outcomes**

1. Ability to analyze and model software systems
2. Ability to construct OO view of the system
3. Ability to design a Software System using OMT design techniques.
4. Ability to design a Software System using UML design techniques.

<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT NAME &amp; DETAILS</th>
<th>NO. OF LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction: Ability to analyze and model software systems Object oriented themes, modeling as a design technique. <strong>Object Modeling:</strong> Object, classes, Link &amp; association, advanced link &amp; Association concepts, generalization &amp; Inheritance, grouping constructs, aggregation, abstract classes, generalization as extension &amp; restriction, multiple inheritance, metadata, candidate key &amp; constraints.</td>
<td>8</td>
</tr>
<tr>
<td>Section</td>
<td>Topic</td>
<td>Pages</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>2.</td>
<td><strong>Dynamic &amp; Functional Modeling:</strong></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td><strong>Dynamic modeling:</strong> Events &amp; states, operations, nested state</td>
<td></td>
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<tr>
<td></td>
<td>diagrams, concurrency, advanced dynamic modeling concepts</td>
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<tr>
<td></td>
<td>&amp; simple dynamic model, relation of object dynamic models.</td>
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<tr>
<td></td>
<td><strong>Functional Modeling:</strong> functional model, data flow diagrams,</td>
<td></td>
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<tr>
<td></td>
<td>specifying operations, constriction, a simple functional model,</td>
<td></td>
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<td></td>
<td>relation of functional to object &amp; dynamic model.</td>
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<tr>
<td>3.</td>
<td><strong>Design Methodology:</strong> OMT methodology, Impact of an object-oriented</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>approach, analysis, system design with examples, combining</td>
<td></td>
</tr>
<tr>
<td></td>
<td>models, design algorithms, design optimization, implementation</td>
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<td></td>
<td>of controls, design association &amp; physical packaging.</td>
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<tr>
<td>4.</td>
<td><strong>Introducing the UML:</strong> An overview of the UML, Conceptual Model of</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>UML, Architecture of UML</td>
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<td></td>
<td><strong>Structure modeling Using UML:</strong> Classes, Relationship, Diagrams,</td>
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<tr>
<td></td>
<td>Class Diagrams.</td>
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<tr>
<td>5.</td>
<td><strong>Behavioral Modeling:</strong> Interactions, Use Cases, Use Case Diagram,</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Interaction diagrams, Activity diagrams, Events &amp; Signals,</td>
<td></td>
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<tr>
<td></td>
<td>State Machines, Process &amp; Threads, Time &amp; Space, State chart</td>
<td></td>
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<tr>
<td></td>
<td>diagrams.</td>
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</tr>
<tr>
<td>6.</td>
<td><strong>Architectural Modeling:</strong> Components, Deployment, Collaboration,</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Patterns &amp; frameworks, component diagrams, Deployment diagrams.</td>
<td></td>
</tr>
</tbody>
</table>
### Text Books

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Object-orientated Modeling &amp; Design: (Unit 1 to 3)</td>
<td>James Rambaugh, Michael Blaha, William Premerlani, Frederick Eddy, William Lorensen</td>
<td>PHI</td>
<td>Unit 1 to 3</td>
</tr>
<tr>
<td>2</td>
<td>The Unified Modeling Language User Guide</td>
<td>Grady Booch, James Rambaugh, Lyar Jacobson</td>
<td>Addison Wesley</td>
<td>Unit 4 to 6</td>
</tr>
</tbody>
</table>

### Reference Books

<table>
<thead>
<tr>
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<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Object oriented analysis &amp; design using UML</td>
<td>H. Srimathi, H. Sriram, A. Krishnamoorthy</td>
<td>SCITECH PUBLICATION 2nd Edition</td>
</tr>
<tr>
<td>2</td>
<td>Object Oriented analysis &amp; Design</td>
<td>Andrew High</td>
<td>TMG</td>
</tr>
<tr>
<td>3</td>
<td>Practical Object Oriented Design with UML</td>
<td>Mark Priestley</td>
<td>McGraw-Hill Education</td>
</tr>
<tr>
<td>4</td>
<td>Threat first Object oriented analysis &amp; design</td>
<td>Breet McLaughline, Garry Police &amp; Devide West</td>
<td>OREILLY</td>
</tr>
</tbody>
</table>

Course Objectives

1. To introduce algorithm design methods / techniques with analysis
2. To devise algorithm for given problem statement
3. To introduce complex computational problems
4. Introducing parallel algorithms

Course Outcomes

Upon Completion of this course, students will be able to:

1. Understand and demonstrate algorithm design methods with analysis
2. Devise algorithm for given problem statement and analyze its space and time complexity by using recurrence relation
3. Categorize the problem to determine polynomial and non-polynomial based on its nature
4. Understand and demonstrate basic concepts of parallel algorithms

<table>
<thead>
<tr>
<th>UNIT NO.</th>
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</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>The Greedy Method: The general method, Knapsack problem, Job sequencing with deadlines, minimum-cost spanning trees – Prim’s and Kruskal’s Algorithms, Optimal storage on tapes, Optimal merge Patterns, Single source shortest paths.</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td>Dynamic Programming: The general method, Multistage graphs, All pair shortest paths, 0/1 knapsack, Reliability design, Traveling Sales person problem.</td>
<td>7</td>
</tr>
<tr>
<td>4.</td>
<td>Basic Traversal and Search Techniques and Backtracking: Techniques for Binary Trees, Game Tree; Techniques for Graphs – Breadth First Search &amp; Traversal, Depth First Search</td>
<td>13</td>
</tr>
</tbody>
</table>
4. Traversal, AND/OR graphs; Connected components and Spanning Trees; Bi-connected components and depth first search. Backtracking - The general method, 8-queen problem, sum of subsets, Knapsack Problem, Hamiltonian Cycle, and Graph Coloring.

5. **NP Hard and NP Complete Problems:**
   Basic Concepts, Introduction to NP Hard Graph Problems.

6. **Introduction to Parallel Algorithm:**
   Computational Model and Fundamental Techniques and Algorithms – PRAM, MESH and HYPERCUBE.

### Term Work

It should consist of minimum 10-12 assignments based on following guidelines
- A batch of students will be assigned different algorithms and expected to analyze the algorithms in terms of time and space complexity
- Solve different exercise problems in text book mentioned in syllabus
- Student need to perform at least 6 programs from the syllabus. Perform Priori Analysis and Posteriori Measurement on the same.

### Text Books

<table>
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### Reference Books

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<th>Publication &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fundamentals of Algorithmics</td>
<td>Gilles Brassard, Paul Bratley</td>
<td>Pearson Education</td>
</tr>
<tr>
<td>2</td>
<td>Mastering Algorithms with C</td>
<td>Kyle Loudon</td>
<td>SPD O’Reilly</td>
</tr>
<tr>
<td>3</td>
<td>Computer Algorithms- Introduction to Design and Analysis</td>
<td>Sara Baase, Allen Van Gelder</td>
<td>Pearson Education</td>
</tr>
</tbody>
</table>
Course Objectives

1. To provide knowledge to the students about basics of computer graphics and different display devices.
2. To expose students to the various 2D & 3D transformation & projection techniques.
3. To provide knowledge to the students about basics of Illumination models, surface rendering methods.
4. To make the students aware of multimedia system & Multimedia Authoring, Compression techniques.

Course Outcomes

Upon successful completion of this course, the student will be able to -

1. Express basic ideas of computer graphics and different display devices.
2. Understand & apply various transformation, projection and rendering techniques on graphical objects.
3. Identify & apply the intensity of light on graphical objects using different illumination models.
4. Understand multimedia system & use of Multimedia Authoring & Compression techniques on graphical objects.

<table>
<thead>
<tr>
<th>Unit No.</th>
<th>Unit Name and Contents</th>
<th>No. of Lectures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic of Computer Graphics</td>
<td>5</td>
</tr>
<tr>
<td>2</td>
<td>Transformations –</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Basic 2D &amp; 3D transformations - Translation, Scaling, Rotation, Reflection, Shearing, Multiple Transformations, Rotation about an axis parallel to a coordinate axis, Rotation about an arbitrary axis in space, Affine and Perspective Geometry, Orthographic projections and Axonometric projections.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Illumination models and surface rendering methods</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Light sources, Basic illumination models, Displaying light intensities, Polygon Rendering methods, Ray tracing methods, Radiosity lighting.</td>
<td></td>
</tr>
</tbody>
</table>
Introduction to Multimedia

Multimedia Authoring & Compression

Computer Animation

Text Books:
1. Procedural elements for Computer Graphics - David F. Rogers (MGH International) (For Units 1)
2. Mathematical elements for Computer Graphics - David F. Rogers, J. Alan Adams (MGH Int.) (Unit 2)
4. Multimedia systems: Algorithms, Standards & Industry Practice-Parag Havaldar & Gerard Medioni, Cengage Learning (Unit 4, 5)
5. Computer Graphics- Rajesh Maurya (WILEY India) (Unit 6)
6. Virtual & Augmented reality - Paul Mealy (Kindle Edition) (Unit 6)

Some assignments on following topics can be given and its evaluation should be considered for CIE
1. Introduction to computer graphics, OPEN GL, GLUT, GLU
2. Design 2D & 3D objects by using graphics primitives
3. Apply the different transformation techniques on 2D & 3D graphical objects
4. Create graphics design using any software(Picasa, Autodesk Maya, Sketch Up, Solid works)
5. Perform rendering using Blender or Lux Core Render Software
6. Create 2D & 3D animated object using Synfig or Blender Software.
T. Y. B. Tech (Computer Science and Engineering) Sem – V

5. Open Elective Course - I (OEC - CS506)

Internet of Things (OEC - CS506)

<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT NAME &amp; DETAILS</th>
<th>NO. OF LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Introduction:</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>IoT, Objects / Things, IoT definitions, IoT frame work, Identification technologies, Internet in Iot.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Fundamental of IoT mechanisms: Identification of IoT objects and services, Traffic characteristics, scalability and interoperability, security and privacy, Communication capabilities, Mobility support and device power, Sensor technology, RFID technology and satellite technology.</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>Radio Frequency Identification Technology: RFID, IoT objects and services, principles of RFID, Components of an RFID system, RFID reader, Tags, middleware, Sensor nodes, connecting nodes, networking nodes.</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>IoT systems:</td>
<td>8</td>
</tr>
</tbody>
</table>
### 5. Communication Technologies:
WPAN Technologies: Introduction to IEEE 802.15.4 standard, Bluetooth, Zigbee, IEEE 802.15.6; WBANS, NFC, IEEE 802.11 WLAN, Cellular and mobile technologies.

### 6. IoT Application Examples:
Smart Metering, advanced metering infrastructure, e-health / Body Area Network, City Automation (Smart City), Automotive Application, Environmental Applications, Home Automation, Control Applications.

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#### Text Books

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<thead>
<tr>
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<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The Internet of Things - Connecting objects to the web</td>
<td>Hakima Chaouchi</td>
<td>Wiley Publications</td>
</tr>
<tr>
<td>2</td>
<td>Building the Internet of Things</td>
<td>Daniel Minoli</td>
<td>Wiley Publications</td>
</tr>
<tr>
<td>3</td>
<td>Raspberi Pi Beginner's Guide</td>
<td>Gareth Halfacree</td>
<td>Raspberi Press</td>
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</tbody>
</table>

#### Reference Books

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<tr>
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<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raspberry Pi for Dummies</td>
<td>Sean McManus, Mike Cook</td>
<td>A Wiley Brand</td>
</tr>
<tr>
<td>2</td>
<td>Architecting the Internet of Things</td>
<td>Bernd Scholz, Reiter</td>
<td>Springer</td>
</tr>
</tbody>
</table>
T. Y. B. Tech (Computer Science and Engineering) Sem – V

6. Java Programming (PCC - CS507)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory: 3 Hrs./Week</td>
<td>Theory: -----------</td>
</tr>
<tr>
<td>Tutorial: -----</td>
<td>Term work: 50 Marks</td>
</tr>
<tr>
<td>Practical: 4 Hrs./Week</td>
<td>Oral: 50 Marks</td>
</tr>
</tbody>
</table>

**Pre-requisites:** C++ and html.

**Course Objectives**

1. To introduce the concept of object-oriented programming using java.
2. To learn how to implement reliable and secure application using exception handling and package concept.
3. Have the ability to write program to perform file operations.
4. To understand how to design components with java Swing API and present mechanism of multithreading.
5. To familiarize database connectivity through JDBC and learn the collection framework.
6. To explore the concept of networking and web programming using java servlet and jsp.

**Course Outcomes**

1. Students will be able to articulate the principle of object-oriented problem solving & programming.
2. Students will be able to illustrate code reusability, security and abstraction using inheritance, package and interface.
3. Students will be able to develop reliable and user-friendly applications using exception handling and file handling.
4. Students will be able to create desktop apps using SWING and event handling and also illustrate multithreading concepts.
5. Students will be able to use JDBC & collection framework.
6. Students will be able to apply network programming concept & develop web applications using servlet and jsp.
<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT NAME &amp; DETAILS</th>
<th>NO. OF LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Fundamental Programming in Java:</strong>&lt;br&gt;The Java Buzzwords, The Java Programming Environment- JVM, JIT Compiler, Byte Code Concept, Hotspot, A Simple Java Program, Source File Declaration Rules, Comments, Data Types, Variables, Operators, Strings, Input and Output, Control Flow, Big Numbers, Arrays-Jagged Array.</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td><strong>Objects and Classes:</strong> Object-Oriented Programming Concepts, Declaring Classes, Declaring Member Variables, Defining Methods, Constructor, Passing Information to a Method or a Constructor, Creating and using objects, Controlling Access to Class Members, Static Fields and Methods, this keyword, Object Cloning, Class Design Hints,</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td><strong>Inheritance, Interface and Packaging:</strong>&lt;br&gt;Inheritance: Definition, Super classes, and Subclasses, Overriding and Hiding Methods, Polymorphism, Inheritance Hierarchies, Super keyword, Final Classes and Methods, Abstract Classes and Methods, casting, Design Hints for Inheritance, Nested classes &amp; Inner Classes, finalization and garbage collection.&lt;br&gt; Interfaces: Defining an Interface, Implementing an Interface, Using an Interface as a Type, Evolving Interfaces, and Default Methods.&lt;br&gt; Packages: Class importing, Creating a Package, Naming a Package, Using Package Members, Managing Source and Class Files. Developing and deploying (executable) Jar File.</td>
<td>7</td>
</tr>
<tr>
<td>3.</td>
<td><strong>Exception and I/O Streams:</strong>&lt;br&gt;<strong>Exception:</strong> Definition, Dealing with Errors, The Classification of Exceptions, Declaring Checked Exceptions, Throw an Exception, Creating Exception Classes, Catching Exceptions, Catching Multiple Exceptions, Re-throwing and Chaining Exceptions, finally clause, Advantages of Exceptions, Tips for Using Exceptions.&lt;br&gt; <strong>I/O Streams:</strong> Byte Stream – Input Stream, Output Stream, Data Input Stream, Data Output Stream, File Input Stream, File Output Stream, Character Streams, Buffered Stream, Scanner, Random File Access File.</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td><strong>Graphical User Interfaces using Swing and Multithreading</strong>&lt;br&gt;Introduction to the Swing, Swing features, Swing Top Level Containers-Creating a Frame, Positioning a Frame, Displaying Information in a Panel, The Model-View-Controller Design Pattern, The JComponent Class.&lt;br&gt; <strong>Layout Management:</strong> Introduction to Layout Management, APIs for Border Layout, Flow Layout, Grid Layout</td>
<td>6</td>
</tr>
</tbody>
</table>
## Event Handling
- Basics of Event Handling, The AWT Event Hierarchy, Semantic and Low-Level Events in the AWT, Low-Level Event Types

## User Interface Components
- Text Input, Choice Components, Menus, Dialog Boxes Setting the Look and Feel of UI, Introduction to JApplet

## Multithreading
- Processes and Threads, Runnable Interface and Thread Class, Thread Objects, Defining and Starting a Thread, Pausing Execution with Sleep, Interrupts, Thread States, Thread Properties, Joins, Synchronization

### Collection and Database Programming
**Collections:** Collection Interfaces, Concrete Collections- List, Queue, Set, Map, the Collections Framework

**Database Programming:** The Design of JDBC, The Structured Query Language, JDBC Installation, Basic JDBC Programming Concepts, Query Execution, Scrollable and Updatable Result Sets, Metadata, Row Sets, Transactions

### Networking and Web
**Networking:** Overview of Networking, Networking Basics, Working with URLs, Creating a URL, Parsing a URL, Reading Directly from a URL, Connecting to a URL, Reading from and Writing to a URL Connection, Sockets, Reading from and Writing to a Socket, Writing the Server Side of a Socket, Datagram, Writing a Datagram Client and Server.

**Servlet and JSP:** Introduction to Servlet, The servlet Lifecycle, Retrieving Information and Sending Information, Database Connectivity using servlet, Introduction to JSP, Writing Scriplets, The jsp Lifecycle, Retrieving Information and Sending Information, Database Connectivity using jsp

### Term Work
1. 25 marks for performance in practical and experiments as part of continuous evaluation
2. 25 marks for Two Practical Tests and oral (Each of 25 Marks) to be conducted during the semester.

### Practical List
- Minimum 15 experiments should be conducted based on above topics and covering following list. At least two experiments should be conducted on each unit in the syllabus.

1. Create a class called Employee that includes three pieces of information as instance variables- first name, a last name and a monthly salary. Your class should have a constructor that initializes the three instance variables. Provide a set and a get method for each instance variable. If the monthly salary is not positive, set it to 0.0. Write a test application named EmployeeTest that demonstrates class
Employee's capabilities. Create two Employee objects and display each object's yearly salary. Then give each Employee a 10% raise and display each Employee's yearly salary again.

2. Create class SavingsAccount. Use a static variable annualInterestRate to store the annual interest rate for all account holders. Each object of the class contains a private instance variable savingsBalance indicating the amount the saver currently has on deposit. Provide method calculateMonthlyInterest to calculate the monthly interest by multiplying the savingsBalance by annualInterestRate divided by 12; this interest should be added to savingsBalance. Provide a static method modifyInterestRate that sets the annualInterestRate to a new value.

Write a program to test class SavingsAccount. Instantiate two savingsAccount objects, saver1 and saver2, with balances of Rs 2000.00 and Rs 3000.00, respectively. Set annualInterestRate to 4%, then calculate the monthly interest and print the new balances for both savers. Then set the annualInterestRate to 5%, calculate the next month's interest and print the new balances for both savers.


4. Create abstract class Shape which has instance variables side, area and perimeter. And methods calculateArea(), calculatePerimeter() as abstract methods and display() as concrete method. Write subclasses which extend Shape class like Triangle, Rectangle, Circle, Cube and Squere and override abstract methods and display methods in subclass take instance variable if needed as per the formula. And use parameterized constructor to initialize instance variables using “this” reference variable.

Write Test class and Create a reference variable of Shape which will hold the objects of all the sub classes and calculate respective area, perimeter and display the results.

5. Create the interface stack which has variable size, abstract methods push(), pop(), display(), overflow() and underflow(). We need to implement 3 subclasses IntegerStack, StringStack and DoubleStack respectively by implementing interface. All the methods in interface are declared for string. And in subclass for integerStack convert string to integer. Same thing to all other. Create one test class and check for the working of all the classes.

6. Develop a mathematical package for Statistical operations like Mean, Median, Average, Standard deviation. Create a sub package in the math package -convert. In “convert” package provide classes
to convert decimal to octal, binary, hex and vice-versa. Develop application program to use this package, and build executable jar file of it.

7. Develop application which can handle any 5 combination of predefined compile time and runtime exceptions using multiple catch blocks. Use throws and finally keywords as well.

8. Develop a BankAccount class which should contain all methods of Bank i.e. balanceEnquiry(), withdraw(), transfer() and deposit(). You should create at least two objects of BankAccount using array and do all operations mentioned above. Also generate user defined exception LowBalanceException, NegativeNumberException and PasswordMismatchException whenever required. To transfer amount from one account to another use two BankAccount objects.

9. Take file name as input to your program through command line, if file exists the open and display contents of the file. After displaying contents of file ask user – 1.do you want to add the data at the end of file or 2.replace specified text in file by other text. Based on user’s response, then accept data from user and append it to file. If file in not existing then create a fresh new-file and store user data into it. Also, User should type exit on new line to stop the program. Do this program using Character stream classes.

10. Take Student information such as name, age, weight, height, city, phone from user and store it in the file using DataOutputStream and FileOutputStream and Retrive data using DataInputStream and FileInputStream and display the result. Use Serialization concept and Bytestream classes.

11. Develop a Swing GUI based standard calculator program. Use event handling, Layout of swing package.


13. Write a program to read a text file one line at a time. Read each line as a String and place that String object into a LinkedList. Print all of the lines in the LinkedList in reverse order.

14. Fill a HashMap with key-value pairs. Print the results to show ordering by hash code. Extract the pairs, sort by key, and place the result into a LinkedHashMap. Show that the insertion order is maintained.

15. Write a GUI based program to create a student registration and Login. Store Registration data in Database and take Login information from Database.

16. Create GUI Based chat application using TCP or UDP.

17. Design a student registration form which contains all the registration details and after registration display success page which should display all the entered details. And also design login form , home page and logout form using servlet.

18. Write a program to store the above form information in database. And while login check with database. Display all student names in home page. Give one search field and button to search for
particular student record and display all his information as search result using servlet and jsp using MVC.

**Text Books**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
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<th>Units Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Core Java- Volume I Fundamentals</td>
<td>Cay Horstmann and Gary Cornell</td>
<td>Pearson, Eight edition</td>
<td>Unit 1 to Unit 4</td>
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<tr>
<td>2</td>
<td>Core Java- Volume II Advanced Features</td>
<td>Cay Horstmann and Gary Cornell</td>
<td>Pearson, Eight edition</td>
<td>Unit 5 and Unit 6</td>
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<tr>
<td>3</td>
<td>Java Servlet Programming</td>
<td>Jason Hunter</td>
<td>O'Reilly Publication, 2nd Edition</td>
<td>Unit 6</td>
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<tr>
<td>4</td>
<td>Core-Servlet and Java Server Pages Volume – 1</td>
<td>Marty Hall, Larry Brown</td>
<td>Pearson Education</td>
<td>Unit 6</td>
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<tr>
<td>2</td>
<td>Head First Java</td>
<td>Eric Freeman, Elisabeth Robson, Bert Bates, Kathy Sierra</td>
<td>O'Reilly Publication</td>
<td>3rd edition</td>
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<tr>
<td>3</td>
<td>Head First Servlets and JSP</td>
<td>Bryan Basham, Kathy Sierra, Bert Bates</td>
<td>O'Reilly Publication</td>
<td>2nd Edition</td>
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</table>
7. Business English (HM - CS508)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
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<tbody>
<tr>
<td>Theory: -----</td>
<td>Theory: -----</td>
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<tr>
<td>Tutorial: 2 Hrs./Week</td>
<td>Term work: 25 Marks</td>
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<tr>
<td>Practical: -----</td>
<td>Oral: 25 Marks</td>
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</tbody>
</table>

**Pre-requisites:**

1) Knowledge of functional grammar and vocabulary in English
2) Knowledge of the importance of business English in their career path
3) Knowledge of linguistic competence and understand intricacies involved in technical communication

**Course Objectives**

1. Develop basic skills to deal with people in business situations
2. Increase their knowledge of key business concepts worldwide
3. Write and read basic business reports, letters, e-mails etc
4. Expand vocabulary related to general business situations
5. Develop confidence to deal with people and basic issues in the business world

**Course Outcomes**

1. Learn to communicate with others in practical, business oriented situations
2. Learn to express themselves in English with greater fluency, accuracy and confidence
3. Learn to handle themselves in English in a variety of business contexts, from negotiating, to using the telephone, to making presentations, to socialising
4. Enhance the skills of listening, speaking, pronunciation skills, as well as business vocabulary
5. Acquire the communicative competencies crucial for appropriate workplace behavior
<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT NAME &amp; DETAILS</th>
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<td></td>
<td>Getting acquainted with professional culture:</td>
</tr>
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<td>- First day at work</td>
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<td></td>
<td>- Induction program</td>
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<td>- Company hierarchy</td>
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<td>- Behavior pruning</td>
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<td></td>
<td>Vocabulary building and Reading comprehension:</td>
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<tr>
<td>2.</td>
<td>- Reading techniques and comprehension skills</td>
</tr>
<tr>
<td></td>
<td>- Synonyms and antonyms</td>
</tr>
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<td>- One-word substitution</td>
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<td></td>
<td>- Prefixes and Suffixes</td>
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<td></td>
<td>- Idioms and phrases</td>
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<td></td>
<td>- Homonyms and homographs</td>
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<td></td>
<td>- Irregular verbs like (write, wrote, written)</td>
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<td></td>
<td>- Situational vocabulary</td>
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<td></td>
<td>Effective vocal Communication:</td>
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<tr>
<td>3.</td>
<td>- Effective Meetings</td>
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<td>- Video Conferencing</td>
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<td>- Effective Telephonic Communication</td>
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<td>- Breaking Bad news</td>
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<td></td>
<td>Effective written Communication:</td>
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<td>4.</td>
<td>- Business letters</td>
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<td>- Resume Writing</td>
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<td>- E-mail writing</td>
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<td>- Report writing</td>
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<td>- Minutes of meeting</td>
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<td>- Memo writing</td>
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<td></td>
<td>Public speaking and Presentation Skills:</td>
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<td>5.</td>
<td>- Preparing and conducting presentation</td>
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<td>- Body language</td>
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<td>- Overcoming stage fear</td>
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<td>- Best practices</td>
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<td>- Interviewing and being interviewed</td>
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<td>Miscellaneous:</td>
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<td>6.</td>
<td>- Group Discussion</td>
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<td></td>
<td>- Handling Complains</td>
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<td></td>
<td>- Negotiation Skills</td>
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<td></td>
<td>- Business Etiquettes</td>
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</tbody>
</table>
Term Work

- Individual Performance or Presentation to be Evaluated Continuously
- Group Activity Performance to be Evaluated in the Batch
- Assignments or Write up (Minimum 10)

Assignment List

1. Case study of organizational hierarchy
2. Match the following on antonyms & synonyms
3. Irregular verb list (like choose, chose, chosen)
4. Word building by using prefixes suffixes (eg. ir-regular, im-possible)
5. Minutes of Meeting – writing
6. Report writing (any report)
7. Comprehension/paragraph writing
8. Business letter / resume writing / email writing
9. PPT presentation on any non-technical topic. PPT handout should be attached
10. Do’s & Don’t’s of group discussion & Business etiquettes

Textbooks / Reference Books

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Technical Communication</td>
<td>Ashraf Rizvi</td>
<td>Tata McGraw Hill, 2005</td>
<td>1, 2, 3, 4, 6</td>
</tr>
<tr>
<td>2</td>
<td>Effective Business Communication</td>
<td>M. V Rodriques</td>
<td>Concept Publishing Company Pvt. Ltd. 2013</td>
<td>1, 2, 3, 4, 6</td>
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<tr>
<td>4</td>
<td>Technical English</td>
<td>Dr. M. Hemamalini</td>
<td>Wiley, 2014</td>
<td>2, 3, 4, 5</td>
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<tr>
<td>5</td>
<td>Business English</td>
<td>T. Thomson</td>
<td>Heinle &amp; Heinle 2004</td>
<td>1, 3, 5, 6</td>
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<tr>
<td>5</td>
<td>Business Communication; The Real World and Your Career</td>
<td>Senguin J</td>
<td>South-Western 1999</td>
<td>1, 3, 4, 6</td>
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</table>
T. Y. B. Tech (Computer Science and Engineering) Sem – VI

1. Compiler Construction (PCC - CS601)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
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<tr>
<td>Theory : 3 Hrs./Week</td>
<td>Theory : ESE 70 Marks</td>
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<td>CIE 30 Marks</td>
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<tr>
<td>Tutorial : ------</td>
<td>Term work : 25 Marks</td>
</tr>
<tr>
<td>Practical : 2 Hrs./Week</td>
<td>Oral : ------</td>
</tr>
</tbody>
</table>

**Pre-requisites:** C, System Programming, Data structures

**Course Objectives**

1. To introduce the fundamentals of compilers and their phases.
2. To design and implement phases of a compiler.
3. To expose the students to various tools like LEX and YACC.

**Course Outcomes**

1. Recall the compiler phases and compiler construction tools like LEX and YACC.
2. To design and implement Lexical Analyser for a simple language.
3. To design and implement Syntax analyser for a simple expression.
4. To apply Syntax directed translations and Syntax Directed definitions to generate intermediate code.
5. To identify appropriate code optimizing transformation for the given code.
6. To explain concept of code generation.

<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT NAME &amp; DETAILS</th>
<th>NO. OF LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Introduction:</strong></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Compilers, Phases of a compiler, Compiler construction tools, cousins of the compiler.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td><strong>Lexical Analysis:</strong></td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Role of a Lexical analyzer, input buffering, specification and recognition of tokens, finite automata implications, designing a lexical analyzer generator.</td>
<td></td>
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<tr>
<td>3.</td>
<td><strong>Syntax Analysis:</strong></td>
<td>7</td>
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<tr>
<td></td>
<td>Role of Parser, Writing grammars for context free environments, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers</td>
<td></td>
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<tr>
<td>4.</td>
<td><strong>Syntax Directed Translation and Intermediate Code Generation:</strong></td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Syntax directed definitions, construction of syntax tree, S-attributed definitions, L-attributed definitions, Intermediate languages, assignment statements, back patching.</td>
<td></td>
</tr>
</tbody>
</table>
5. **Code Optimization**:
   Principle sources of optimization, optimization of Basic Blocks, loops in flow graphs, Peephole optimization

6. **UNIT 6 - Code Generation**:
   Issues in design of a code generator and target machine, Run time storage management, Basic blocks and flow graphs, Next use information and simple code generator, Issues of register allocation, code generation from Dags.

---

**Term Work**

Minimum of 10 to 12 experiments should be carried out based on the following experiments based on following list.

**Practical List**

Minimum of 10 to 12 experiments should be carried out based on the following experiments.

1. Design of preprocessor for C program.
2. Design a complete lexical analyzer for C language.
3. Program to create a symbol table generator.
4. Design a syntax analyzer for simple expression in C language using top down parsing.
5. Program to create a syntax tree for simple expression in C language using recursive descent parsing.
6. To implement intermediate code generator for Boolean expression in three address code format.
7. Implement intermediate code generator for the conditional statements in three address code format.
8. Implement any one bottom up parsing [LR, SLR, LALR, Operator precedence] technique.
9. To implement a program for code generator from labeled tree.

**Text Books**

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>1.</td>
<td>Compiler construction</td>
<td>D.M. Dhamdare</td>
<td>Mc-Millan</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>LEX &amp; YACC</td>
<td>Dong Brown, John Levine, Tony Mason</td>
<td>O’Reilly 2nd Edition</td>
<td>Refer for Practical’s</td>
</tr>
</tbody>
</table>
**T. Y. B. Tech (Computer Science and Engineering) Sem –VI**

**2. Operating System -II (PCC - CS602)**

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
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<tbody>
<tr>
<td>Theory : 4 Hrs./Week</td>
<td>Theory : ESE 70 Marks</td>
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<td>CIE 30 Marks</td>
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<tr>
<td>Tutorial : -----</td>
<td>Term work: 25 marks</td>
</tr>
<tr>
<td>Practical: 2 Hrs./Week</td>
<td>Practical : -----</td>
</tr>
</tbody>
</table>

**Pre-requisites:** Data Structures, Concepts of Process, deadlock and System calls.

**Course Objectives**

1. Fundamental architecture of UNIX operating system kernel.
2. Detail algorithms of buffer cache management.
3. Internal File system organizations and related algorithms in UNIX.
4. System calls for UNIX file system.
5. Process structure, creation and management in UNIX.
6. Architecture and algorithms of process scheduling and memory management.
7. I/O subsystem architecture and algorithms.

**Course Outcomes**

**Upon Completion of this course, students will be able to:**

1. To understand UNIX kernel, its architectural components like file subsystem, process control subsystem, memory management.
2. To understand a concrete way (UNIX i-nodes) of organizing a file system on a physical storage medium.
3. To maintain UNIX directories, files, manage processes, manipulate data with proper use of pipes and file redirection, UNIX filters.
4. To implement and handle various UNIX system calls.
5. To explain the principles of paging, virtual memory (VM) and describe the data structures and components (both hardware and software) that are necessary to implement it.
6. To perform shell programming involving decision control, looping and control flow statements on UNIX based machines.
<table>
<thead>
<tr>
<th>UNIT NO.</th>
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<th>NO. OF LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Internal Representation of Files: I-nodes, Structure of the Regular File, Directories, Conversion of a Pathname to I-node, Super Block, I-node Assignment to a New File, Allocation of Disk Blocks, Other File Types.</td>
<td>8</td>
</tr>
<tr>
<td>6.</td>
<td>Memory management and I/O Subsystem: Swapping, Demand Paging, A Hybrid System with Demand Paging and Swapping. Driver Interfaces, Disk Drivers, Terminal Drivers, Streams.</td>
<td>8</td>
</tr>
</tbody>
</table>

**Term Work**

- It should consist of minimum 10-12 experiments based on the above topics and covering the following list of assignments. (Reference book – Linux System Programming by Robert Love may be referred for the assignments listed below.)

1. Demonstration of how the Linux Kernel implements and Manages files.
2. Implement User Buffer I/O using ‘C’ program.
3. Study & Implement file management using low level file access system calls.
4. Implementation of various operations on Files (Create, Open, Read, Write, Append, Fstat, Dup etc.)
5. Implementation of various system call (OPEN, READ, WRITE) by reader & writer process.
8. Study & Implementation of signal () system call.
9. Study and demonstration of different Memory Management Techniques.
10. Study and Implement Time, Sleep and Clock Management.
12. Implementation of Shell Scripts.
13. Implementation of system call for UNIX/Linux.
14. Study of boot loader like “Grub”
15. Study of compilation of Linux kernel.

**Text Books**

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The design of Unix Operating System</td>
<td>Maurice J. Bach</td>
<td>PHI</td>
<td>All Units</td>
</tr>
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</table>

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</thead>
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<tr>
<td>1</td>
<td>Linux System Programming</td>
<td>Robert Love</td>
<td>SPD, O’ REILLY</td>
</tr>
<tr>
<td>2</td>
<td>Unix concepts &amp; administration</td>
<td>Sumitabha Das</td>
<td>Tata McGrow Hill, 3rd Edition</td>
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</table>
T. Y. B. Tech (Computer Science and Engineering) Sem – VI

3. Database Engineering (PCC - CS603)

<table>
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<tr>
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<tr>
<td>Practical: 2 Hrs./Week</td>
<td>Practical : 50 Marks</td>
</tr>
</tbody>
</table>

Pre-requisites: Set Theory, Operating System, Data Structures.

Course Objectives

1. To understand fundamental concepts and algorithms of Database Systems.
2. To gain familiarity with SQL and DBMS.
3. To learn database design techniques.

Course Outcomes

1. Understand fundamentals of database management systems.
2. Represent logical design of database using E-R Diagram.
3. Analyze & construct good database design.
4. Apply SQL queries to design & manage the database.
5. Understand transactions, concurrency control and apply to database system.
6. Understand failures in database and appropriate recovery techniques.

<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT Name and Contents</th>
<th>NO. OF LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>INTRODUCTION TO DATABASES [Text Book 1]</td>
<td>8</td>
</tr>
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<tr>
<td>---</td>
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</tr>
<tr>
<td></td>
<td>Normal Form, Boyce-Codd Normal Form, Fourth Normal Form, Fifth Normal Form.</td>
<td></td>
</tr>
</tbody>
</table>
| 3. | **STRUCTURED QUERY LANGUAGE (SQL) [Text Book 1]**  
Overview of the SQL Query Language, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Aggregate Functions, Nested sub Queries, Modification of Databases, Join expression, Views. |
|   | 8 |
| 4. | **DATA STORAGE & INDEXING [Text Book 1]**  
Physical storage media, File Organization, Organization of records in File, Data Dictionary Storage, Database Buffer, Basic Concepts indexing & hashing, Ordered Indices, B+ Tree Index files, Multiple-Key Access, Static Hashing, Dynamic Hashing. |
|   | 8 |
| 5. | **TRANSACTION MANAGEMENT [Text Book 1]**  
|   | 9 |
| 6. | **RECOVERY SYSTEM [Text Book 1]**  
|   | 5 |

**Term Work**

Minimum 12 -14 Experiments based on the following topics.

1. Draw an E-R Diagram of any organization.
2. Reduce above mentioned E-R Diagram into tables.
3. Normalize any database from first normal form to Boyce-Codd Normal Form (BCNF).
4. Write a program of Database connectivity with any object oriented language.
5. Use DDL Queries to create, alter (add, modify, rename, drop) & drop Tables.
6. Use DML Queries to insert, delete, update & display records of the tables.
7. Create table with integrity constraints like primary key, check, not null and unique.
8. Create table with referential integrity constraints with foreign key, on delete cascade and on delete set null.
9. Display the results of set operations like union, intersections & set difference.
10. Display the results of Join Operations like cross join, self join, inner join, natural join, left outer join, right outer join and full outer join.
11. Display the records using Aggregate functions like min, max, avg, sum & count. Also use group by, having clauses.
12. Display the results using String operations.
13. Create & Update views for any created table.
14. Write java program to implement dense and sparse indexing
15. Write java program to implement B+ tree indexing.
16. Write java program to implement static hashing.
17. Study of NoSql.

Text Books

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
</tr>
</thead>
</table>

Reference Books

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
</tr>
</thead>
</table>
4. Machine Learning (PCC - CS604)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theory : 3 Hrs./Week</td>
<td>Theory : ESE 70 Marks</td>
</tr>
<tr>
<td>Tutorial : 1 Hrs./Week</td>
<td>CIE 30 Marks</td>
</tr>
<tr>
<td>Practical : ------</td>
<td>Term work : 25 marks</td>
</tr>
<tr>
<td>Practical : ------</td>
<td>Practical : ------</td>
</tr>
</tbody>
</table>

**Pre-requisites:** Linear Algebra, Statistics, Probability Theory.

**Course Objectives**

1. To understand Machine Learning Aspects.
2. To understand primitives in learning process by Computer.
3. To understand nature of problems solved with Machine Learning.

**Course Outcomes**

**On completion of the course, student will be able to**

1. Explain Machine Learning concepts.
2. Analyze the Machine Learning model.
4. To tackle real world problems in domain of data mining, information retrieval, computer vision, linguistics and bioinformatics, etc.
<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT NAME &amp; DETAILS</th>
<th>NO. OF LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td><strong>Introduction to Machine Learning:</strong> Introduction to Probability and Statistics, <strong>Machine Learning:</strong> Definition, Terminology, Types of learning, Machine Learning Problem categories, Machine learning architecture, process, Lifecycle, Performance measures, tools and framework, data visualization.</td>
<td><strong>06</strong></td>
</tr>
<tr>
<td>2.</td>
<td><strong>Regression:</strong> <strong>Simple regression</strong> – hypothesis, cost function, parameter learning with gradient descent, learning rate, Gradient Descent for linear regression, examples, simple regression in matrix form. <strong>Multivariate Linear Regression</strong> – Multiple features, hypothesis functions, Gradient Descent for multiple variables, Feature scaling, polynomial regression</td>
<td><strong>06</strong></td>
</tr>
<tr>
<td>3.</td>
<td><strong>Classification- logistic regression &amp; Naïve Bayes:</strong> <strong>Logistic Regression</strong> – Definition, Hypothesis representation, decision boundary, cost function, Gradient Descent for Logistic Regression. Multiclass Classification, <strong>Regularization</strong> - Over fitting &amp; Under fitting, cost function, Regularized Linear Regression, Regularized Logistic Regression, Conditional probability and Naïve Bayes Classifier. Instance-based classifier – K- Nearest Neighbor Classifier, Bayesian Network, Hidden Markov Model.</td>
<td><strong>07</strong></td>
</tr>
<tr>
<td>4.</td>
<td><strong>Classification- Decision trees and Support Vector Machine:</strong> <strong>Decision trees:</strong> definition, terminology, the need, advantages, and limitations. Constructing and understanding Decision trees, common problems with Decision trees, Decision tree algorithms, random forest, examples. <strong>Support Vector Machine:</strong> What is SVM, Kernel Trick, Cost Function, Decision Trees vs. Support Vector Machine.</td>
<td><strong>06</strong></td>
</tr>
<tr>
<td>5.</td>
<td><strong>Unsupervised learning:</strong> Clustering, K Means clustering, Hierarchical clustering, Association Rule mining.</td>
<td><strong>04</strong></td>
</tr>
<tr>
<td>6.</td>
<td><strong>Neural Network &amp; Recommendation System:</strong> <strong>Neural Networks</strong>- Neuron representation and model, Hypothesis for neuron, cost function, solution of a problem using single neuron. Gradient descent for a neuron. Neural network, Multiclass classification with neural network. Learning in neural network-back propagation algorithm <strong>Recommendation System:</strong> Popularity based recommender engines, Content based recommendation engines, Classification based recommendation engine, Collaborative filtering.</td>
<td><strong>07</strong></td>
</tr>
</tbody>
</table>
**Term Work**

- It should consist of minimum 10-12 assignments based on the above topics.

**Text Books**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
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<tbody>
<tr>
<td>1</td>
<td>Machine Learning with Python- an approach to applied ML</td>
<td>Abhishek Vijayvargia</td>
<td>BPB Publications</td>
<td>All Units</td>
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<td>2</td>
<td>Practical Machine Learning</td>
<td>Sunila Gollapudi</td>
<td>Packt Publishing Ltd</td>
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<td>3</td>
<td>Machine Learning</td>
<td>Tom M. Mitchell</td>
<td>McGraw Hill Education; First Edition</td>
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**Reference Books**

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<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
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<tr>
<td>1</td>
<td>Machine Learning for dummies</td>
<td>John Paul Muller</td>
<td>Willey Publication</td>
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<td>2</td>
<td>Introduction to Machine Learning</td>
<td>EthemAlpaydin</td>
<td>PHI 2nd Edition-2013</td>
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<td><a href="http://neuralnetworksanddeeplearning.com/">http://neuralnetworksanddeeplearning.com/</a></td>
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</table>
T. Y. B. Tech (Computer Science and Engineering) Sem –VI

5. Open Elective Course - II (OEC- CS605)

E- Commerce & Digital Marketing (OEC - CS605)

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<th>Theory</th>
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<td>Tutorial</td>
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<td>Practical</td>
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Course Objectives:

1. To get the knowledge about business advantages of the e-commerce and digital marketing and its importance
2. To develop a digital marketing plan and to make SWOT analysis
3. To get introduced with various digital channels, business tools in social networking
4. To understand the optimization of a Web site and SEO optimization

Course Outcomes:

1. Students will be able to identify the importance of the e-commerce and digital marketing for business success
2. Students will be able to create a digital marketing plan, starting from the SWOT analysis and defining a target group
3. Students will be able to identifying digital channels, business tools used in social networking
4. Students will be able to demonstrate the optimization of web site using business tools.

UNIT NO. | UNIT NAME & DETAILS | NO. OF LECTURES
--- | --- | ---
1. | Introduction to E-commerce, frameworks & architectures | (4)
   | **Introduction:** The term “E-Commerce”, Business models related to E-Commerce, Technical and economic challenges
   | **Frameworks and architectures:** Actors and stakeholders, Fundamental sales process, Technological elements
   | **B2B business:** The process model and its variants, B2B software systems
<table>
<thead>
<tr>
<th></th>
<th>Introduction to Digital Marketing</th>
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<tr>
<td>3.</td>
<td>How digital technologies transformed marketing?, Definitions-digital marketing and multichannel marketing- Paid, owned and earned media, the growing range of digital marketing platform, digital marketing strategy-key features of digital marketing strategy, applications of digital marketing, benefits of digital marketing, alternative digital business models, difference between e-commerce and e-business, challenges in developing and managing digital marketing strategy.</td>
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<tr>
<th></th>
<th>Online marketplace analysis &amp; macro environment</th>
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| 4. | **Introduction:** situation analysis for digital marketing, the digital marketing environment, understanding customer journeys, online consumer behavior and implications for marketing, business models for e-commerce.  
**Online macro environment:** Technological forces, economic forces, political forces, Legal forces, social forces and cultural forces. |

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<th>Digital Marketing Strategy and relationship marketing</th>
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| 5. | **Digital Marketing strategy development:** how to structure digital marketing strategy, strategy implementation.  
**Relationship marketing using digital platforms:** Introduction, the challenge of customer engagement, customer lifecycle management. |

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<th></th>
<th>Marketing Communications</th>
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</table>
| 6. | Marketing Communications using digital media channels: Introduction, search engine marketing, online public relations, e-mail marketing and mobile text messaging, social media and viral marketing, offline promotion techniques.  
**Case study:** How the ministry of food processing took to social media or world food India 2017. |
Text Books:


Reference Books:


It should consist of assignments on following topics within group of 4-5 students & its evaluation will be considered for CIE

1. Define a target group (working in groups)
2. Creating web sites, MS Expression (working in groups)
3. Writing the SEO content (working in groups)
4. Google AdWords (working in groups)
5. CRM strategy (working in groups)
5. Open Elective Course - II (OEC - CS606)

Cyber Security (OEC - CS606)

**Prerequisite:** Fundamental knowledge of Data Communication, Networking and Information Security.

**Course Objectives:**

1. To gain knowledge about securing both clean and corrupted systems, protect personal data, and secure computer networks
2. To examine secure software development practice
3. To understand key terms and concepts in I.T. ACT
4. To incorporate approaches for incident analysis and response

**Course Outcomes:**

On completion of the course, student will be able to

1. Explain the cyber security concepts.
2. Describe the cyber security vulnerabilities and prevention techniques.
3. Explain the different rules and regulations under I.T. ACT.
4. Explain the concepts of digital forensics & incident management

<table>
<thead>
<tr>
<th>UNIT NO.</th>
<th>UNIT NAME &amp; DETAILS</th>
<th>NO. OF LECTURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Computer and Network Security</td>
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<tr>
<td>2.</td>
<td>Cyber Frauds, DoS, Viruses:</td>
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<tr>
<td></td>
<td>Cyber Stalking, Fraud, and Abuse: Introduction, How Internet Fraud Works, Identity Theft, Cyber Stalking, Protecting Yourself</td>
<td>06</td>
</tr>
</tbody>
</table>

### 3. Techniques Used by Hackers:
- Introduction, Basic Terminology, The Reconnaissance Phase, Actual Attacks, Malware Creation, Penetration Testing

### 4. Computer Security Technology:
- Introduction, Virus Scanners, Firewalls, Antispyware, IDS, Digital Certificates, SSL/TLS, Virtual Private Networks, Wi-Fi Security

### 5. I.T. ACT:
- Introduction, Cyber Security Regulations, Roles of International Law, the state and Private Sector in Cyberspace, Cyber Security Standards. The INDIAN Cyberspace, I.T. Act

### 6. Introduction to Forensics:

**Text Books:**


**Reference Books:**

5. Ethical Hacking, Thomas Mathew, OSB Publisher, 2003.
T. Y. B. Tech (Computer Science and Engineering) Sem – VI

6. C# Programming (PCC - CS607)

<table>
<thead>
<tr>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
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</thead>
<tbody>
<tr>
<td>Theory : 2 Hrs./Week</td>
<td>Theory : -----</td>
</tr>
<tr>
<td>Tutorial : -----</td>
<td>Term work : 25 marks</td>
</tr>
<tr>
<td>Practical : 2 Hrs./Week</td>
<td>Practical : 50 marks</td>
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</tbody>
</table>

Pre-requisites: C++, Java, HTML

Course Objectives

1. Understand code solutions and compile C# projects within the .NET framework
2. Demonstrate knowledge of object-oriented concepts using C#.NET application
3. Create and manipulate GUI components in C# and interact with database using ADO.NET in window based application
4. Create network based and multithreaded applications using C#
5. Creating ASP.Net applications using standard .net controls
6. Maintain session and controls related information for users in multi-user web applications

Course Outcomes

1. Students will be able to develop correct, well-documented programs using the C# programming language.
2. Students will be able to learn to develop object-oriented programs using C# classes and objects
3. Students will be able to learn to use Windows Forms and WPF to create GUI-based programs
4. Students will be able to build networking and multithreading based programs using C#
5. Students will be able to design web applications using ASP.NET using ASP.NET controls in web applications.
6. Students will be able to debug and deploy ASP.NET web applications and create database driven ASP.NET web applications.

UNIT NO. | UNIT NAME & DETAILS |
---------|---------------------|
1.       | .Net architecture and C# Basics: |
<table>
<thead>
<tr>
<th></th>
<th><strong>Object oriented programming in C#</strong></th>
<th><strong>Arrays, Operators and casts and strings</strong></th>
<th><strong>Windows Form &amp; Database with ADO.NET</strong></th>
<th><strong>Threading and Networking</strong></th>
<th><strong>Introduction to ASP.NET 4.5</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>2.</td>
<td>Classes and Structs, Class Members, Anonymous Types, Structs, Partial Classes, Static Classes, The Object Class, Extension Methods, <strong>Inheritance</strong>: Types of Inheritance, Implementation Inheritance, Modifiers, Interfaces</td>
<td><strong>Arrays</strong>: Simple Arrays, Multidimensional Arrays, Jagged Arrays, Array Class, Array and Collection Interfaces, Enumerations <strong>Operators and casts</strong>: Operators, Type Safety, Comparing Objects for Equality, Operator Overloading, User-Defined Casts, <strong>String</strong>: System. String, Building Strings, String Builder Members, Format Strings, Regular Expressions</td>
<td><strong>Introduction to GUI application &amp; components –add data control programatically, Link data to control, process all control, track the visible forms, Find all MDI child forms, Save configuration setting for form, Force list box to scroll items, Restrict text box, Use of auto complete combo-box ,Sort a list view, Database with ADO.NET-Overview of Ado.NET, Data components in Visual Studio .NET.</strong></td>
<td><strong>Threading</strong>: Overview, Asynchronous Delegates, the Thread Class and Thread Pools, Threading Issues, Synchronization, and Timers. <strong>Networking</strong>: Networking-Obtain information about Local network, Detect changes in network, Download data over HTTP or FTP, Download a File &amp; Process using Stream, Respond to HTTP request from your application.</td>
<td><strong>ONE ASP.NET</strong>: Introducing One ASP.NET, Simplifying a Complex Ecosystem, How Do You Benefit? <strong>ASP.NET web form structure</strong>: Application Location Options, The ASP.NET Page Structure Options, ASP.NET 4.5 Page Directives, ASP.NET Page Events, Dealing with Post backs, Cross-Page Posting ,ASP.NET Application Folders, Compilation, Build Providers, Global.aspx</td>
</tr>
</tbody>
</table>
Term Work

1. It should consist of 10 to 12 experiments based on the above syllabus covering following list of assignments
2. 50% of the experiment should be console based & 40 % experiment should be windows form application. and 10% should be web-based application

Practical List:

1. Language Introduction (Includes console-based application, creation of DLL, running a program without IDE) calling a method from another program.
2. OOPS concepts in C#-Class, Implementation Inheritance, Extension methods (Use any application).
3. Develop DLL file and use it in application program. (Use Any application)
5. Implementation of Multidimensional & Jagged array (Use Any application).
6. Use of properties in any application.
8. String manipulation using String & String builder (Any application)
10. Design a Windows Form based application for different controls.(Any application)
11. Design a Windows Form based MDI application with different controls.(Any application)
12. Design a Windows Form based application for field validation.(Any application)
13. Design a any Windows Form based application with Database connectivity with all field validation.(Any application)
14. Develop a Win1dows Form application that performs SELECT, INSERT, UPDAE & DELETE queries and also displays the List of Books available in a Library System by fetching the details from a database. The C# application must also contain the filter capability.
15. Implement console-based networking application to obtain information of network & detect changes in network.
17. Simple ASP.NET web application deployment in IIS server
18. Design simple login and registration page using client-side validation controls in ASP.NET
19. Do the server-side validation by using database connectivity for above problem and display all the records of database when successfully logged in using ASP.NET.
# Text Books

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
<th>Units Covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>A Programmer’s Guide to ADO.Net in C#</td>
<td>Mahaesh Chand</td>
<td>Apress Publication</td>
<td>Unit 3 Windows app and ADO.NET</td>
</tr>
<tr>
<td>3</td>
<td>Visual C# 2010 Recipes- A Problem-Solution Approach</td>
<td>Allen Jones, Adam Freeman, Matthew MacDonald, Rakesh Rajan</td>
<td>Apress Publication</td>
<td>Unit 3 Windows app and ADO.Net and Unit 4 networking</td>
</tr>
<tr>
<td>4</td>
<td>Professional ASP.NET 4.5 in C# and VB</td>
<td>John Wiley &amp; Sons Inc.</td>
<td>WROX publication</td>
<td>Unit 4 ASP part and Unit 5 and 6</td>
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</tbody>
</table>

# Reference Books

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Title</th>
<th>Author(s) Name</th>
<th>Publication &amp; Edition</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>ASP.NET 4.5-Black book</td>
<td>Kogent</td>
<td>Dreamtech Publication</td>
</tr>
</tbody>
</table>

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T. Y. B. Tech (Computer Science and Engineering) Sem – VI

7. Domain Specific Mini-project (PW - CS608)

<table>
<thead>
<tr>
<th></th>
<th>TEACHING SCHEME</th>
<th>EXAMINATION SCHEME</th>
</tr>
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<tbody>
<tr>
<td>Theory</td>
<td>-----</td>
<td>Theory</td>
</tr>
<tr>
<td>Tutorial</td>
<td>-----</td>
<td>Term work</td>
</tr>
<tr>
<td>Practical</td>
<td>2 Hrs./Week</td>
<td>Practical</td>
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<tr>
<td></td>
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<td>25 marks</td>
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<td>50 marks</td>
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</tbody>
</table>

Pre-requisites:
1. Software Engineering Concepts
2. Object Oriented Concepts

Course Objectives
1. To expose the students to use engineering approach to solve domain specific real time problem.
2. To use the appropriate and newer technologies while developing the project.
3. To learn the skills of team building and team work.

Course Outcomes
Upon successful completion of this course, the student will be able to –
1. Identify specific problem statement from a selected domain.
2. Analyze the problem and prepare SRS and design document.
3. Write code and carry out testing.
4. Write a report covering details of the project and give presentation on a project.

Contents
The students should form group of 4 to 5 students and every group is supposed to choose a specific domain (preferably from Smart India Hackathon problem statement) to do the mini project. Further the group should identify the relevant problem in the selected domain and propose the solution, which can be implemented as a mini-project using suitable technology. The mini-project work should be evaluated by a team of teachers appointed by the department. The evaluation and marking should include Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) during which the group should give presentation and demonstration of their work done. Care should be taken to avoid out-sourcing of the work.
SHIVAJI UNIVERSITY KOLHAPUR

REVISED SYLLABUS AND STRUCTURE
THIRD YEAR (B. Tech.)

MECHANICAL ENGINEERING

To be introduced from the academic year 2020-21 (i.e. from June 2020) onwards
<table>
<thead>
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<th>Credits</th>
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1. BSC : Basic Science Courses are compulsory.
2. HM : Humanities and Management are compulsory.
3. ESC : Engineering Science Course: ESC – P courses (subjects) are mandatory for **Physics** group, while ESC – C courses (subjects) are mandatory for **Chemistry** group.
4. There will be two groups for Sem I & II Physics and Chemistry. The Candidate’s those opting Physics group in Sem I shall appear for Chemistry group in Sem II and Vice-versa.
5. ESC-W: Engineering Science Course-Workshops are compulsory.
## SECOND YEAR MECHANICAL ENGINEERING – CBCS PATTERN

### SEMESTER - III

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- Candidate contact hours per week: 30 Hours (Minimum)
- Total Marks for S.E. Sem III & IV: 1650
- Theory/Tutorial Duration: 60 Minutes and Practical Duration: 120 Minutes
- Total Credits for S.E. Sem III & IV: 50
- In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.
- There shall be separate passing for theory and practical (term work) courses.

**Note:**

1. Basic Science Courses - Mechanical Engineering (BSC-ME) are compulsory.
2. Professional Core Courses - Mechanical Engineering (PCC-ME) are compulsory.
3. Mandatory Course (MC-ME) Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.
## COURSE CODE AND DEFINITION

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## Third Year Mechanical Engineering – CBCS Pattern

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**Total:** 18 18 18 1 1 1 6 12 12 600 50 175

### Examination Scheme

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**Term Work:**

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• Candidate contact hours per week: 30 Hours (Minimum)
• Total Marks for T.E. Sem V & VI: 1650
• Theory/Tutorial Duration: 60 Minutes and Practical Duration: 120 Minutes
• Total Credits for T.E. Sem V & VI: 50
• In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.
• There shall be separate passing for theory and practical (term work) courses.
• Sem V & Sem VI: Open Elective Course has 3 credits for one course. Each department/branch has to run at least one Open Elective Course in Sem-V and Sem-VI from the list of Elective Course. It is compulsory.

Note:
1. Professional Core Courses-Mechanical Engineering (PCC-ME) are compulsory.
2. Open Elective Course-Mechanical Engineering (OEC-ME) is compulsory.
3. PCC-ME**(Audit Course):- Students has to complete audit course as compulsory.

Semester V

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Code No.</th>
<th>Subject</th>
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<tbody>
<tr>
<td>1.</td>
<td>PCC-ME 301</td>
<td>Control Engineering</td>
<td>4</td>
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<tr>
<td>2.</td>
<td>PCC-ME 302</td>
<td>Theory of Machines – II</td>
<td>4</td>
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<td>3.</td>
<td>PCC-ME 303</td>
<td>Heat and Mass Transfer</td>
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<td>PCC-ME 304</td>
<td>Machine Design – I</td>
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<td>PCC-ME 305</td>
<td>Manufacturing Engineering</td>
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<td>OEC-ME 306</td>
<td>Open Elective-I</td>
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<td>PCC-ME 307</td>
<td>CAD/CAM Laboratory</td>
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## Semester VI

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<tr>
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<td>PCC-ME 311</td>
<td>Industrial Management and Operations Research</td>
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<td>2.</td>
<td>PCC-ME 312</td>
<td>Industrial Fluid Power</td>
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<td>PCC-ME 313</td>
<td>Metrology and Quality Control</td>
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<td>PCC-ME 314</td>
<td>Machine Design – II</td>
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<td>PCC-ME 315</td>
<td>Internal Combustion Engines</td>
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<td>OEC-ME 316</td>
<td>Open Elective-II</td>
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<td>PCC-ME 317</td>
<td>Computer Integrated Manufacturing Lab</td>
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<td>PCC-ME 318</td>
<td>Workshop Practice –VI</td>
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<td>9.</td>
<td>PCC-ME 319** (Audit Course)</td>
<td>Professional Skill Development**</td>
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**SEMESTER – VIII**

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**FINAL YEAR MECHANICAL ENGINEERING – CBCS PATTERN**

**TEACHING SCHEME**

**EXAMINATION SCHEME**

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CIE - Continuous Internal Evaluation
ESE – End Semester Examination
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<td>Theory/Tutorial Duration : 60 Minutes and Practical Duration : 120 Minutes</td>
<td>Total Credits for B.E. Sem VII &amp; VIII : <strong>50</strong></td>
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<td>In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.</td>
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<td>There shall be separate passing for theory and practical (term work) courses.</td>
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**Note:**

1. Professional Core Courses-Mechanical Engineering(PCC-ME) are compulsory.
2. Professional Core Electives -MechanicalEngineering (PCE-ME) are compulsory.
3. Summer Internship -Mechanical Engineering (SI-ME) is compulsory.
4. Project Work Mechanical Engineering (PW-ME) is compulsory.
5. **PCC-ME***** - Online Certificate Course based on Project topic.
### Semester VII

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### Semester VIII

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<td>Energy and Power Engineering</td>
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<td>PCC ME 410</td>
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SUBJECT NAME: Control Engineering
SUBJECT CODE: PCC-ME 301

Teaching Scheme: | Examination Scheme:
---|---
Lectures: 03Hrs.perweek | ESE: 70Marks
Practical: 02Hrs.perweek | CIE: 30Marks
Credit: 04 | Term Work: 25 Marks

Pre-requisites: Electrical Technology, Engg. Mathematics

Course Objectives:
1. Student should be able to understand control system, its types and applications.
2. Student should be able to model physical system.
3. Student should be able to determine system stability and system response.
4. Student should be able to use MATLAB software to analyze control system.

Course Outcomes: At the end of this course, student will be able

1. To understand control system, its type and applications
2. To model physical system.
3. To determine system stability and system response.
4. To understand various control actions.
5. To use MATLAB software to analyze control system

Unit 1 Introduction to Automatic Control [6]


Unit 2 Representation of control system [7]

Linearization of non linear functions, Linearization of operating curves, Block Diagram Algebra, Rules for Reduction of Block Diagram.

Unit 3 Transient Response [7]

General Form of Transfer Function, Concept of Poles and Zeros, Distinct,
Repeated and Complex Zeros. Response of systems (First and Second Order) to Various Inputs (Impulse, Step, Ramp & Sinusoidal). Damping Ratio and Natural Frequency, Transient Response Specification

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<table>
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<th><strong>Unit 5</strong></th>
<th>Frequency Response Analysis</th>
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<tbody>
<tr>
<td></td>
<td>Frequency Response Log Magnitude Plots and Phase angle Plots, Gain Margin, Phase Margin, Evaluation of Gain ‘K’.</td>
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<table>
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<tr>
<th><strong>Unit 6</strong></th>
<th>State Space Analysis</th>
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<tbody>
<tr>
<td></td>
<td>System Representation, Direct, Parallel, Series and General Programming.</td>
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</table>

**TERM WORK / LIST OF EXPERIMENTS / LIST OF ASSIGNMENTS:**

3. One numerical assignment on each unit.
4. Assignment based on use of Software ‘MATLAB’ on Unit 3, 4, 5, 6.

**REFERENCE BOOKS:**

<table>
<thead>
<tr>
<th><strong>Write Title of Book, Authors Name, Publication &amp; Edition</strong></th>
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</thead>
<tbody>
<tr>
<td>7. Modern Control Engineering K. Ogata Pearson Education</td>
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</table>
SUBJECT NAME: Theory of Machines - II
SUBJECT CODE: PCC-ME 302

Teaching Scheme:  | Examination Scheme:
--- | ---
Lectures: 3Hrs.perweek | ESE: 70Marks
Practical: 2Hrs.perweek | CIE: 30Marks
Credit: 04 | Term Work: 25 Marks
 | Practical/Oral : 25 Marks

Course Objectives:

1. understand the basic theory on gears.
2. analyze the various types of gear trains used for transmission of motion and power.
3. study the gyroscopic effect on different vehicles, aero plane and ship.
4. study and analyze the problems on balancing of rotary masses.
5. study the force analysis of simple mechanisms.
6. study turning moment diagram.

Course Outcomes: At the end of this course, student will be able to

1. Identify the various types of gears.
2. Select a gear drive for practical purpose.
3. Analyze the gyroscopic effects for practical life.
4. Solve a balancing problem.
5. Do the balancing of practical devices to reduce vibration.
6. Do force analysis of mechanisms.

Unit 1 | Toothed Gearing: [07]
--- | ---
Geometry of motion, Gear geometry, Types of gear profile- Involute & cycloidal, Theory of Spur gear, Interference in Involute tooth gears and methods for its prevention, Path of contact, Contact ratio.

Unit 2 | Gear Trains [07]
--- | ---
Types of Gear trains - Simple, Compound, Reverted, Epicyclic gear train, Tabular method for finding the speeds of elements in epicyclic gear train, Torque in epicyclic gear train, Differential gear box.
### Unit 3: Gyroscope

Gyroscope


### Unit 4: Static and dynamic Force analysis of Mechanisms

Velocity and acceleration of slider crank mechanism by analytical method, Inertia force and torque, D’Alembert’s principle, Dynamically equivalent system, force analysis of reciprocating engine mechanism and four bar chain mechanism.

### Unit 5: Balancing

Static and Dynamic balancing of rotary masses. Number of masses rotating in single plane and different planes.

### Unit 6: Flywheel

Turning moment diagrams, Fluctuation of energy, Coefficient of fluctuation of speed, Rimmed flywheel

### TERM WORK /LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:

Any nine of following

2. Experiment on Torque Measurement in epicyclical Gear Train.
3. Experiment on Gyroscope.
4. Determination of M.I. using bifilar suspension system.
5. Determination of M.I. using Trifilar Suspension system.
6. Experiment on Balancing of rotary masses (Static and Dynamic).
7. Problems on balancing of reciprocating masses. (Minimum 3)
8. Determination of M.I. of connecting rod by Compound pendulum method.
9. Assignment on Flywheel.
10. Computer aided force analysis of any one of following
    a. Slider crank mechanism
    b. Four bar mechanism

### TEXT BOOKS:

1. Theory of Machines by Rattan S.S. (Tata McGraw Hill)
3. Theory of Machines by Dr. V.P.Singh, Dhanpat Rai Publications
5. Theory of Machines by Ballaney, Khanna Publications.
**REFERENCE BOOKS:**

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<th>Author(s) / Publisher</th>
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<tr>
<td>1</td>
<td>Theory of Machines &amp; Mechanisms by Shigley (Tata McGraw Hill)</td>
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<td>2</td>
<td>Theory of machines by Thomas Beven (Pearson, Edition 3rd)</td>
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<td>Theory of Machines by Jagdishlal, Metropolitan Publi.</td>
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</tr>
<tr>
<td>4</td>
<td>Mechanisms and Dynamics of machines by J. Srinivas (SciTech Publications)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Kinematics, Dynamics and Design of Machinery by Walidron, Wiley India Publi.</td>
<td></td>
</tr>
</tbody>
</table>
SUBJECT NAME: Heat & Mass Transfer  
SUBJECT CODE: PCC-ME 303  

Teaching Scheme:                                      Examination Scheme:  
Lectures: 03 Hrs. per week                             ESE: 70 Marks  
Practical: 02 Hrs. per week                            CIE: 30 Marks  
Credit: 04                                             Term Work: 25 Marks  
                                                    Practical/Oral: 25 Marks  

Pre-requisites: Fluid Mechanics, Basic Thermodynamics, Engineering Mathematics  

Course Objectives:  

1. Students will learn about what is heat transfer, what are the modes of heat transfer and their basic laws, and analysis of heat transfer problems in conduction, convection, radiation and combined modes.  
2. They will also learn general or differential equations for conduction and radiation as well as governing equations of convection so that students can solve real time heat transfer problem.  
3. Students will learn about design and analysis of heat exchanger devices by using LMTD and NTU approach.  

Course Outcomes: At the end of this course, student will be able to  

1. Formulate basic equations for heat transfer problems.  
2. Apply heat transfer principles to design and evaluate performance of thermal systems.  
3. Calculate the effectiveness and rating of heat exchangers.  
4. Calculate heat transfer by radiation between objects with simple geometries.  
5. Calculate and evaluate the impact of boundary conditions on the solutions of heat transfer problems.  
6. Evaluate the relative contributions of different modes of heat transfer.
<table>
<thead>
<tr>
<th>Unit 1</th>
<th>Introduction to Heat and Mass Transfer</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Basic</strong> concepts:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modes of heat transfer, Basic laws of heat transfer, Introduction to combined modes of heat transfer, Thermal conductivity and its variation with temperature for various Engg. Materials (Description only), Introduction to mass transfer, Modes of mass transfer, Analogy between heat, mass and momentum transfer, Fick’s law of diffusion, Derivation of Generalized differential equation of heat conduction in Cartesian co-ordinates, its reduction to Fourier, Laplace and Poisson’s equations, Generalized Heat conduction equation in cylindrical and spherical coordinates (no derivation).</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>One dimensional steady state heat conduction without heat generation:</strong> Reduction of Generalized differential equation of Heat Conduction to one dimension (1D), Heat conduction through planewall; cylinder; sphere, electrical analogy, concept of thermal resistance and conductance, compositeslab, composite cylinder and compositesphere, critical radius of insulation for cylinder and sphere.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit 2</th>
<th>Heat Conduction with Heat Generation and Unsteady State Heat Conduction</th>
<th>06</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>One dimensional steady state heat conduction with heat generation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One dimensional steady state heat conduction with uniform heat generation for planewall; cylinder; and sphere (with numerical on plane wall and cylinder)</td>
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<tr>
<td><strong>One dimensional unsteady state heat conduction:</strong> Lumped Heat capacity Analysis, Biot and Fourier number and their significance, (Numerical based on Lumped Heat capacity Analysis)</td>
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<thead>
<tr>
<th>Unit 3</th>
<th>Extended Surfaces</th>
<th>06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types and application of fins, Heat transfer from rectangular and pin fins, Fine effectiveness and efficiency, Analysis of fin with insulated end and infinite long fin, Error estimation in temperature measurement in thermo well (No numerical on error estimation).</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Unit 4  
**Convection**

Mechanism of natural and forced convection. Concept of Hydrodynamic and thermal boundary layer, Local and average convective coefficient for laminar and turbulent flow for flat plate and pipe.

**Natural convection:**
Dimensional analysis, Physical significance of dimensionless numbers, correlations for natural convection over vertical plate, cylinder, & sphere and flow patterns.

**Forced convection:** Dimensional analysis, Physical significance of dimensionless numbers, Reynolds analogy for laminar flow, Correlations for forced convection over flat plate and closed conduits.

### Unit 5  
**Radiation**

Nature of thermal radiation, absorptivity, reflectivity, transmissivity, emissive power and emissivity, spectral and total concept, black body, gray body, and white body, Kirchhoff’s law, Wein’s law, Planck’s law, and deduction of Stefan-Boltzmann law, Lambert cosine rule, Intensity of radiation. Energy exchange by radiation between two black surfaces with non-absorbing medium in between and in absence of radiating surfaces. Shape factor and its characteristics.

Energy exchange by radiation between two gray surfaces without absorbing medium, concept of radiosity and irradiation, Radiation network method, network for two surfaces which see each other and nothing else, radiation shields.

### Unit 6  
**Heat Exchangers & Phase change phenomenon**

**Heat Exchangers:**
Classification and types of heat exchangers, Fouling factor, and Overall heat transfer coefficient, Heat Exchanger analysis using LMTD and NTU methods for parallel and counterflow, Design consideration of Heat exchangers and introduction to design standards like TEMA, Boiling & Condensation:
TERM WORK /LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:

Any 8 Experiments based on following list.

1. Determination of thermal conductivity of insulating powder.
2. Determination of thermal conductivity of a metal rod.
3. Determination of thermal resistance and temperature distribution in a composite wall.
4. Determination of thermal conductivity of insulating material in a lagged pipe.
5. Determination of local and average heat transfer coefficient in natural convection heat transfer from a vertical cylinder.
6. Determination of heat transfer coefficient under forced convection into air through a pipe.
7. Determination of emissivity of a non-black surface.
8. Determination of Stefan Boltzmann Constant.
10. Study and demonstration of heat pipe.

TEXT BOOKS:

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<tbody>
<tr>
<td>4</td>
<td>“Heat and Mass transfer”, M.M. Rathod, Laxmi Publications</td>
</tr>
</tbody>
</table>
REFERENCE BOOKS:

SUBJECT NAME: Machine Design-I
SUBJECT CODE: PCC-ME304

Teaching Scheme:  
Lectures: 03 Hrs. per week  
Tutorial: 01 Hrs. per week  
Credit: 04

Examination Scheme:  
ESE: 70 Marks  
CIE: 30 Marks  
Term Work: 25 Marks  
Practical/Oral: 00 Marks

Pre-requisites:  
Elementary knowledge of Mechanics, Mathematics and Science.

Course Objectives:

1. Study basic principles of machine design.
2. Understand the principles involved in evaluating the dimensions of a component to satisfy functional and strength requirements.
3. Learn use of catalogues and design data book.

Course Outcomes: At the end of this course, student will be able to

1. Apply basic principles of machine design
2. Design machine elements on the basis of strength concept.
3. Use design data books and standard practices.
4. Select machine elements from Manufacturer’s catalogue.

Unit 1 | Fundamentals of Machine Design | [05]
--- | --- | ---
### Unit 2: Design of Mechanical Elements

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<tbody>
<tr>
<td>a)</td>
<td>Design of machine elements under static loading- Knuckle joint, Turn buckle and bell crank lever. (Numerical on Knuckle Joint and Bell crank Lever).</td>
</tr>
<tr>
<td>b)</td>
<td>Forms of threads, Terminology of threads, Trapezoidal and Acme thread, Design of power screw and nuts, Introduction to Recirculating ball Screw. (Numerical on Power Screw with Square thread).</td>
</tr>
</tbody>
</table>

### Unit 3: Design of Shaft, Keys, and Couplings

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<tbody>
<tr>
<td>Design of solid and hollow shafts, splined shafts, ASME code for shaft design, Types and Design of Keys, Types of Couplings, Rigid Coupling, flexible bushed pin type flanged coupling.</td>
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</table>

### Unit 4: Design of Joints

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<tbody>
<tr>
<td>Design of bolted joints subjected to following conditions- 1) Joints in shear 2) joints subjected to load perpendicular to the axis of bolt. Design of welded joints- 1) Strength of transverse and parallel fillet welds 2) Eccentric load in the plane of weld 3) Welded joint subjected to bending moment. Riveted Joint (Theoretical treatment only).</td>
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</table>

### Unit 5: Design of Springs

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<tbody>
<tr>
<td>Types of springs and their applications, Styles of end, Design of Helical Compression Spring subjected to static loading.</td>
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</table>

### Unit 6: Design of Pulley and Selection of Belts

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<tbody>
<tr>
<td>Design of Pulley- flat and V belt pulley, Selection of flat belt, V belt as per the standard manufacturer’s catalogue, Introduction to timing belts.</td>
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</table>

### TERM WORK /LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:

1) Case study of components (include selection of materials for various components showing their IS codes, composition and properties).

2) Design and Drawing of Knuckle joint.
3) Design and Drawing of flexible bushed pin type flanged coupling.
4) Case study each joint.
5) Design of helical compression spring subjected to static load.
6) Selection of Belts as per the manufacturer’s catalogue.

NOTE:
1) A detail report of design procedure calculation and sketches should be submitted along with drawing Sheet containing details and assembly.
2) All the assignments should be solved by using standard design procedure using design data book such as PSG Design Data Book.

TEXT BOOKS:

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REFERENCE BOOKS:

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<tbody>
<tr>
<td>3</td>
<td>PSG Design data Book.</td>
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</tbody>
</table>
SUBJECT NAME: Manufacturing Engineering
SUBJECT CODE: PCC-ME305

Teaching Scheme:  
Lectures: 03 Hrs. perweek  
Practical: 02 Hrs. perweek  
Credit: 04

Examination Scheme:  
ESE: 70 Marks  
CIE: 30 Marks  
Term Work: 25 Marks

Pre-requisites: Machine Tools Processes

Course Objectives:

1. Study of metal cutting technology including the process, measurements.
2. Design and selection of various cutting tools and their industrial specifications
3. Study of Geometry of various cutting tools.
4. Introduce the students to design practices of toolings (Jigs and Fixtures)
5. Study of various press working tools
6. Study of various aspects of CNC machine technology and its tooling.

Course Outcomes: At the end of this course, student will be able to

1. Understand various metal cutting technology including the process and measurement etc.
2. Identify and select proper cutting tool with respect to work piece materials
3. Identify parameters of single and multipoint cutting tools.
4. Design and Draw Jig and Fixture.
5. Select and design dies for press working operations.
6. Understand and apply CNC Technology

Unit 1  
Theory of Metal Cutting  
Wedge action, Concept of speed, Feed and depth of cut, orthogonal and oblique cutting. Mechanics of metal cutting-Chip formation, Types of chips, cutting ratio, shear plane and shear angle, velocity relationships, force measurement by tool dynamometers.
<table>
<thead>
<tr>
<th>Unit 2</th>
<th>Tool Life and Tool geometry</th>
<th>[06]</th>
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</table>

<table>
<thead>
<tr>
<th>Unit 3</th>
<th>Tool geometry</th>
<th>[04]</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Tool geometry Parts, angles and types of single point cutting tools, tool geometry of single point cutting tool, tool geometry of multipoint cutting tools.-drills, milling cutters, reamers.</td>
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</tbody>
</table>

<table>
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<tr>
<th>Unit 4</th>
<th>Drilling Jigs and Milling Fixtures</th>
<th>[12]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Applications, basic elements, principles and types of locating, clamping and indexing elements, auxiliary elements like tenon, setting block etc. Type of Drilling jigs and Milling fixtures-Design consideration of Jigs and fixtures with respect to different operations.</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit 5</th>
<th>Press Tools</th>
<th>[06]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dies, punches, types of presses, clearances, types of dies, strip layout, calculation of press capacity, center of pressure, Design consideration for die elements (Theoretical treatment only). Problems on Blanking and Piercing operations</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit 6</th>
<th>CNC Technology and Tooling</th>
<th>[06]</th>
</tr>
</thead>
</table>
TERM WORK /LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:

1) Study of Theory of metal Cutting
2) Study of cutting Tools (Tool Life, Tool Materials etc.)
3) Study of Tool Geometry (Single and Multipoint cutting Tools)
4) Design and drawing of any one Drilling jig.
5) Design and drawing of any one Milling fixture.
6) Assignment on Press Tools (Numerical Based)
7) Study and Demonstration of tools used in CNC machining.
8) Industrial visit to study jig and fixtures, sheet metal.

TEXT BOOKS:


REFERENCE BOOKS:

2. “Metal Cutting Theory and Tool design” Mr. Arshinnov, MIR Publication.
<p>| | |</p>
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<tr>
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<tbody>
<tr>
<td><strong>8.</strong></td>
<td>“Jigs and Fixtures”, Kempster, ELBS.</td>
</tr>
</tbody>
</table>
SUBJECT NAME: Enterprise Resource Planning

SUBJECT CODE: OEC-ME 306

Teaching Scheme:                                   Examination Scheme:
Lectures: 03 Hrs. per week                        ESE: 70 Marks
Practical: --                                     CIE: 30 Marks
Credit: 03

Pre-requisites:

Course Objectives:

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<tbody>
<tr>
<td>1.</td>
<td>Know the basics, evolution, importance of ERP</td>
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<tr>
<td>2.</td>
<td>Correlate ERP and related technology</td>
</tr>
<tr>
<td>3.</td>
<td>Understand manufacturing perspectives of ERP</td>
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<tr>
<td>4.</td>
<td>Know business modules of ERP</td>
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<td>5.</td>
<td>Understand the key implementation issues and some popular products in ERP</td>
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<tr>
<td>6.</td>
<td>Understand implementation of ERP package</td>
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Course Outcomes: At the end of this course, student will be able to

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<tbody>
<tr>
<td>1.</td>
<td>Understand the structure of an ERP system and know how process chains in Materials management, production, controlling and sales are implemented in an ERP system</td>
</tr>
<tr>
<td>2.</td>
<td>Implementation and customize an ERP system using the appropriate modeling methods, that are Entity Relationship Modeling (ERM) and Event-Driven Process Chains (EPC)</td>
</tr>
<tr>
<td>3.</td>
<td>Understand the customization of an ERP system and customize essential parts of materials management, production, controlling and sales in SAP ECC</td>
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<tr>
<td>4.</td>
<td>Understand software design issues in state-of-the-art business software and realize the importance of project management in an ERP implementation project</td>
</tr>
<tr>
<td>5.</td>
<td>Understand what to expect, and not to expect, from a consultant implementing an ERP system</td>
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<tr>
<td>6.</td>
<td>Understand the importance of IT governance in long-term relationships with a</td>
</tr>
</tbody>
</table>
### Unit 1 | Introduction to ERP | [05]
---|---|---

### Unit 2 | ERP and Related Technologies | [06]
---|---|---
Data warehousing, Data mining, OLAP, Business Process Reengineering (BPR), Management Information System (MIS), Supply Chain Management (SCM), Decision Support System (DSS), Executive Information System (EIS), Customer relationship management (CRM).

### Unit 3 | A Manufacturing Perspective | [03]
---|---|---
CAD/CAM, MRP, MRP II, Distribution Requirement Planning (DRP), Product Data Management (PDM).

### Unit 4 | ERP Modules | [05]
---|---|---
Introduction and study of Business modules like Finance, Mfg. and Production, HR, Plant maintenance, Quality and Material Management, Sales and Distribution.

### Unit 5 | ERP Implementation Life Cycle | [05]
---|---|---
Introduction, Pre-evaluation Screening, Package evaluation, Project planning, Gap Analysis, Reengineering, Configuration, Team training, Testing, End user training and Post-implementation phases, Expanding ERP boundaries, Service oriented architecture, Enterprises application integration.
Unit 6 | ERP Market and Case Studies | [04]
<table>
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<tbody>
<tr>
<td>Brief account of ERP market, various ERP packages like SAPAG, Oracle, PeopleSoft, etc. Indian scenario for ERP implementation, Case studies based on implementation of ERP for various areas in mfg., Marketing and other businesses, E-commerce, cloud based ERP system.</td>
<td></td>
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</table>

**TEXT BOOKS:**


**REFERENCE BOOKS:**

SUBJECT NAME: Optimization Techniques
SUBJECT CODE: OEC-ME 306

Teaching Scheme:  
Examination Scheme:
Lectures: 03Hrs.perweek  
ESE: 70Marks
Practical: 00Hrs.perweek  
CIE: 30Marks
Credit: 03  
Term Work: --

Pre-requisites: Engg. Mathematics

Course Objectives:

1. To Provide students with the basic mathematical concepts of optimization.
2. To Provide students with the modeling skills necessary to describe and formulate optimization problems
3. To Provide students with the skills necessary to solve and interpret optimization problems in engineering
4. To Enhance students’ skills related to optimization in engineering, open-ended problem solving, critical thinking and life-long learning

Course Outcomes: At the end of this course, student will be able

1. To understand importance of optimization of industrial process management
2. To apply basic concepts of mathematics to formulate an optimization problem
3. To analyse and appreciate variety of performance measures for various optimization problems
4. To recognition of the need for, and an ability to engage in life-long learning

Unit 1  
Introduction  
Concept of optimization – classification of optimization – problems.

Unit 2  
Linear Programming  

Unit 3  
Queuing Theory  
Queuing Model, poison and exponential distributions - Queues with combined arrivals and departures-random and series queues.
### Unit 4 | Unconstrained Optimization | 07
--- | --- | ---

### Unit 5 | Constrained Optimization | 07
--- | --- | ---

### Unit 6 | Dynamic Programming | 06
--- | --- | ---

**TEXT BOOK(S)**


**REFERENCE BOOKS:**


Course Objectives: The course aims to:

5. Understand Parametric Modeling Fundamentals and Procedure
6. Develop an ability to create constrained 2-D Sketches.
7. Create Solid Models of machine components.
8. Create assembly model with drafting.
9. Create solid models using surfacing technique.

Course Outcomes: At the end of this course, student will be able to:

6. Understand and read engineering Drawings.
7. Prepare solid and surface models from 2D drawings.
8. Prepare assemblies and BOM.
10. Know the process of CAD data exchange between the software.
11. Understand the basics of Computer Aided Manufacturing.
1. Introduction to Assembly modeling.
2. Top down and Bottom up method of assembly.
3. Creation of exploded view, ballooning & BOM.
4. Drafting and GD & T

### Unit 4
**Introduction to CAM**

<table>
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<tbody>
<tr>
<td>1.</td>
<td>Introduction to CAM</td>
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<tr>
<td>2.</td>
<td>Various CAM Software to generate Tool path</td>
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</tbody>
</table>

**TERM WORK /LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:**

1. Solid Modeling- Four exercises (Print outs on A4 size sheet)
2. Surface modeling-Two exercises (Print outs on A4 size sheet)
3. Drafting-Two exercises (Print outs on A4 size sheet)
4. Assembly (with Minimum 5 components) (Print outs on A3 size sheet)

**TEXT BOOKS:**


**REFERENCE BOOKS:**

2. CATIA V5R20 for Engineers and Designers, Prof. Shyam Tickoo and Deepak Maini, DreamTech Press.

4. Respective Software manuals.

5. CAD/CAM/CAE Chougule N.K SCITECH PUBLICATION.
SUBJECT NAME: WORKSHOP PRACTICE – V  
SUBJECT CODE: PCC-ME308

<table>
<thead>
<tr>
<th>Teaching Scheme:</th>
<th>Examination Scheme:</th>
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<tbody>
<tr>
<td>Lectures: 00 Hrs. per week</td>
<td>ESE: 00 Marks</td>
</tr>
<tr>
<td>Practical: 02 Hrs. per week</td>
<td>CIE: 00 Marks</td>
</tr>
<tr>
<td>Credit: 01</td>
<td>Term Work: 25 Marks</td>
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Course Objectives:

<table>
<thead>
<tr>
<th>The course aims to:</th>
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<tbody>
<tr>
<td>1. Understand and perform the various machining operations.</td>
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<tr>
<td>2. Implement principles of metrology.</td>
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<tr>
<td>3. Design the sequence of various processes required to manufacture the components.</td>
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</tbody>
</table>

Course Outcomes: At the end of this course, student will be able to

| 1. Select the suitable machining operations and prepare process sheet to manufacture a Component and implement the same. |
| 2. Control key dimensions on a component using principles of metrology and assembly To make any one assembly / sub-assembly comprising of minimum three components in Workshop Practice V and Workshop Practice VI |

Syllabus

To make any one assembly / sub-assembly comprising of minimum three components in Workshop Practice V and Workshop Practice VI

A. To prepare process sheets with working drawings of all components.
B. To manufacture the components as per the drawing requiring following operations
   i) Turning, ii) Facing iii) Step turning iv) taper turning v) knurling vi) threading vii) Drilling
C. A visit report based on the industrial visit to study the following machining processes
   i) Broaching, ii) Slotting iii) Grinding iv) Milling

TERM WORK / LIST OF EXPERIMENTS / LIST OF ASSIGNMENTS:

Assignments

Write any three assignments out of following.
1. Study and demonstration of Lathe machine.
2. Study and demonstration of grinding machine.
3. Study and demonstration of drilling machine.
4. Study of Broaching machine. (Theoretical treatment only.)

**TEXT BOOKS:**

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<tr>
<td>4.</td>
<td>2. “Production Technology”, HMT handbook</td>
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</table>
T.Y.B.TECH (MECHANICAL ENGINEERING) Semester-VI  
SUBJECT NAME: Industrial Management and Operations Research  
SUBJECT CODE: PCC-ME 311

Teaching Scheme:          Examination Scheme:  
Lectures: 03Hrs.perweek   ESE: 70Marks  
Tutorial: 01Hrs.perweek   CIE: 30Marks  
Credit: 04               Term Work: 25 Marks

Pre-requisites:

Course Objectives:

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<tbody>
<tr>
<td>1</td>
<td>State various functions of management.</td>
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<tr>
<td>2</td>
<td>Know Production and marketing functional area of management.</td>
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<td>3</td>
<td>Aware about norms of SSI, Industrial safety, MIS.</td>
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<tr>
<td>4</td>
<td>Apply Various Models of Operation Research Such as Linear Programming Model, Assignment Model, Transportation Model, Network Model and Sequencing Model.</td>
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</table>

Course Outcomes: At the end of this course, student will be able to

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<tbody>
<tr>
<td>1</td>
<td>Apply the concepts of Industrial management and operations research approaches. Know various functional areas of management.</td>
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<tr>
<td>2</td>
<td>They will analyses issues in Managing operations and projects and various approaches to resolve those issues.</td>
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<tr>
<td>3</td>
<td>Formulate and solve a wide variety of applications and problems that can be addressed using Operations Research techniques as Linear programming problems.</td>
</tr>
<tr>
<td>4</td>
<td>Formulate and solve a wide variety of applications and problems that can be addressed using Operations Research techniques as Transportation and Assignment problems.</td>
</tr>
<tr>
<td>5</td>
<td>Apply the various techniques of Project Management such as Network Model and Sequencing Model.</td>
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</table>

Unit 1  
Functions of Management  

Leading – Leadership style, Communication process, Barriers, remedies, Motivation, importance Herzberg’s theory, Maslow’s theory, McGregor’s theory.  
Controlling–Process, Requirement for control management
<table>
<thead>
<tr>
<th>Unit 2</th>
<th>Functional areas of Management</th>
<th>[7]</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Unit 3</th>
<th>Entrepreneurship Development</th>
<th>[5]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Types of small scale industries (SSI), stages in starting SSI, Qualities required to be Entrepreneur, Government policies for SSI, Problems of SSI, Feasibility Report writing, Industrial Safety, Management Information System.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Unit 4</th>
<th>Introduction to Operations Research and Linear Programming Problems</th>
<th>[6]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>History and development of OR, Applications, OR models and their Applications, Formulation of LPP problem, Graphical solution of LPP, Simplex procedure for maximization, Simplex procedure for minimization, Duality concept.</td>
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<thead>
<tr>
<th>Unit 5</th>
<th>Assignment Model and transportation model</th>
<th>[7]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Assignment Model- Mathematical statement, Methods to solve balanced assignment problems, Unbalanced assignment problems, Maximization problems, Assignment with restrictions. Transportation model- Mathematical formulation, methods to obtain initial basic feasible solution (IBFS) - NWCR, LCM and VAM, Conditions for testing optimality, MODI method for testing optimality of solution of balanced problems and unbalanced problems</td>
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<thead>
<tr>
<th>Unit 6</th>
<th>Network model and sequencing</th>
<th>[7]</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CPM- Construction of network, Critical path, forward and backward Path, Floats and their significance. PERT- construction of networks, Time estimates, Probability of completing project by given date. Sequencing- Sequencing of n jobs &amp; 2 machines, Sequencing of n jobs &amp; 3 machines</td>
<td></td>
</tr>
</tbody>
</table>

**TERM WORK / LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:**

Term Work: case studies on:
1) Recruitment procedure
2) Market Research/ Market Segmentation
3) MIS
4) Office communication
5) Line Balancing.

Content Assessment Tool
1. Case studies on above topic
2. Case studies on above topic
3. Case studies on above topic
5. Assignment on Assignment Problems, Assignment on Transportation Problems.
6. Assignment on Sequencing Problems, Development of PERT/CPM Network for any live project involving at least seven activities

**TEXT BOOKS:**


**REFERENCE BOOKS:**

SUBJECT NAME: Industrial Fluid Power

SUBJECT CODE: PCC-ME 312

Teaching Scheme: |
Lectures: 03Hrs.perweek |
Practical: 02Hrs.perweek |
Credit: 04 |

Examination Scheme: |
ESE: 70Marks |
CIE: 30Marks |
Term Work: 25 Marks |

Pre-requisites:  
Basic Mechanical Engineering, Fluid power, Manufacturing Processes.

Course Objectives:

1. To impart knowledge about the fundamentals of hydraulic and pneumatic system
2. To prepare the students to study different pumps and compressors in hydraulic and pneumatic system.
3. To educate the students about hydraulic fluids and characteristics of fluids.
4. To impart knowledge about various control valves and its functions
5. To enable the students to design components of hydraulic and pneumatic system

Course Outcomes: At the end of this course, student will be able to

1. Do analysis of performance of hydraulic and pneumatic system
2. Demonstrate hydraulic and pneumatic system
3. Apply hydraulic and pneumatic system fundamentals to industrial applications
4. Demonstrate knowledge about the fundamentals of hydraulic and pneumatic system

Unit 1 Introduction to Fluid Power [08]

a) Classification, general features, applications in various fields of engineering, various hydraulic and pneumatic ISO/JIC Symbols, transmission of power at static and dynamic states, advantages and disadvantages  
b) Principle of hydraulic system, Types of hydraulic fluids and their properties, selection of fluid, effect of temperature on fluids  
c) Introduction and Application of pneumatics, Physical properties, Principles, basic  
Requirement of pneumatic system, comparison with hydraulic system.
### Unit 2  Hydraulic System Elements  [08]

a) Classification, types of seals, sealing material, pipes, hoses, compatibility of seal with fluid, sources of contamination and its control, strainer, filter, heat-exchanger, reservoir.
b) Pumps-types, selection of pumps from Gear, vane, piston, screw, ball pump etc. for various applications.
c) Actuators-linear and rotary, hydraulic motors, types of hydraulic cylinders and their mountings.
d) Accumulators, intensifier and their applications.

### Unit 3  Control of Fluid Power Elements  [08]

a) Requirements of Pressure control, direction control and flow control valves.
b) Principle of pressure control valves, directly operated and pilot operated pressure relief valve, pressure reducing valve, sequence valves, counter balance valve.
c) Principles and Types of direction Control valves-2/2, 3/2, 4/2, 4/3, 5/2. Open center, close center, tandem center, manual operated, mechanical operated solenoid, pilot operated direction control valves, check valves.
d) Principles of flow control valves, temperature compensated, pressure compensated, temperature and pressure compensated flow control valve.
e) Hydraulic servo system for linear and rotary motion.

### Unit 4  Elements of Pneumatic System  [08]

a) Air compressor-Types, selection criteria, capacity control, piping layout, fitting and connectors, Pneumatic controls, Direction control valves (two way, three way, four way), check valves, flow control valves, pressure control valves, speed regulators, quick exhaust valves, time delay valve, shuttle valve and twin pressure valve. Solenoid operated, pilot operated valves, Pneumatic actuators, Rotary and reciprocating cylinders-types and their mountings, Air motor – types, Comparison with hydraulic and electric motor.
b) Serving of compressed air – types of filters, regulators, lubricators (FRL unit), mufflers, dryers.
c) Maintenance, troubleshooting and safety of hydraulic and pneumatic system.

### Unit 5  Hydraulic Circuits and its Application  [04]

i. Speed control circuits – Meter-in, Meter-out, Bleed off, Regenerative, Fast approach and slow traverse.
ii. Sequence circuits – Travel dependent and Pressure dependent
iii. Synchronizing circuit.
iv. Regenerative circuit.
Unit 6  | Pneumatic Circuits and its Application.
--------|-----------------------------------------
i. Speed control circuits
ii. Impulse operation circuit.
iii. Sequence circuits.
iv. Time delay circuit.

TERM WORK /LIST OF EXPERIMENTS / LIST OF ASSIGNMENTS:
1. Study and Demonstration of basic hydraulic and pneumatic system.
2. Study and Demonstration of ISO/JIC Symbols for hydraulic and pneumatic systems.
3. Study and Demonstration of different types of valves used in hydraulic and pneumatic system.
4. Study and Demonstration of accumulators/actuators/intensifiers/hydraulic and pneumatic power brakes.
5. At least five circuit preparations on hydraulic trainer kit.
6. At least five circuit preparations on pneumatic trainer kit.
7. At least two Circuit preparations using Fluid Simulation Software.
8. Industrial visits are recommended for applications of pneumatic and hydraulic system and their reports.

TEXT BOOKS:

REFERENCE BOOKS:
SUBJECT NAME: Metrology and Quality Control
SUBJECT CODE: PCC-ME 313

Teaching Scheme: | Examination Scheme:
---|---
Lectures: 03 Hrs.perweek | ESE: 70 Marks
Practical: 02 Hrs.perweek | CIE: 30 Marks
Credit: 04 | Term Work: 25 Marks

Pre-requisites: Machine Drawing.

Course Objectives:

1. Understand the use of standards in measurement, gauges and tolerances
2. Understand the principle/s, construction, working and use of comparators and angle measuring instruments.
3. Study the advanced methods in metrology and measurement of surface roughness
4. Study the methods used for the measurement of screw threads and gears.
5. Understand the concept of quality control and SQC techniques.
6. Apply knowledge of measuring instruments in actual industry practice.

Course Outcomes: At the end of this course, student will be able to

1. Identify and use various measuring instruments and select appropriate instrument for particular feature measurement.
2. Distinguish and understand quality assurance and quality control. They can use control charts and sampling plans to manufacturing and service sector problems.
3. Learn advanced techniques of metrology in various industrial applications.
4. Prepare and understand drawings with general dimensions, tolerances and surface finish.

Unit 1 | Linear measurement and Limits fits and tolerances. [08]
---|---
Need of measurement, International standards of length, line and end measurement, errors in measurement, slip gauges. Importance of limits system in mass production, IS specifications of limits, Unilateral and bilateral tolerances, Types of Fits, Design of gauges (Numerical treatment).

Unit 2 | Compactors and Angle Measurement [06]
---|---
Classification of Comparator, Mechanical comparator (dial indicator, Sigma and Johansson mikrokator. Pneumatic comparator (Solex and differential), Bevel
protractor, sine bar, sine center, clinometers. Use of angle dekkor, auto collimator for straightness and flatness measurement.

<table>
<thead>
<tr>
<th>Unit 3</th>
<th>Advancements in Metrology and surface roughness</th>
<th>[07]</th>
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<table>
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<tr>
<th>Unit 4</th>
<th>Metrology of Screw Threads and Gears</th>
<th>[07]</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Different errors in screw threads, Measurement of forms of thread with profile projector, Pitch measurement, Measurement of thread diameters with standard wire, screw thread micrometer. Errors in gears, Measurement of Spur Gears, Run out checking, Pitch measurement, Profile checking, Backlash checking, Tooth thickness measurement.</td>
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<tr>
<th>Unit 5</th>
<th>Quality Control</th>
<th>[06]</th>
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<tr>
<td></td>
<td>Concept of Quality, Quality control and quality assurance, Specification of quality, Factors controlling quality of design and conformance, Cost of quality, Balance between cost and quality and value of quality, Seven QC tools.</td>
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</table>

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<tr>
<th>Unit 6</th>
<th>Statistical Quality Control and Acceptance Sampling</th>
<th>[06]</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Importance of statistical method in quality control, ND curve, Different types of control charts (Numerical treatment on X Bar, R, P and C charts), their constructions and applications, process capability. Basic concept of sampling inspection, Single and double sampling plans, Operating characteristic curves.</td>
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</tbody>
</table>

**TERM WORK /LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:**

Minimum eight experiments/assignments from the following list including quality control should be performed.

1) Study and use of Linear Measuring Instruments.
2) Study and Use of Comparators (practical use of pneumatic/Mechanical comparator).
3) Study and Use of Angle Measuring Instruments.
4) Screw Thread Measurement.
5) Spur Gear Measurement.
6) Study and use of Optical Flat.
7) Use of Tool Makers Microscope.
8) Use of Optical Profile Projector.
9) Assignment on Control Charts.
10) Industrial case study on geometric features by using industrial component drawing.
**TEXT BOOKS:**

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<tr>
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<tbody>
<tr>
<td>2</td>
<td>“Engineering Metrology”, R.K. Jain, Khanna Publisher.</td>
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<tr>
<td>4</td>
<td>“Engineering Metrology and Measurements”, N.V. Raghvendra and L. Krishnamurthy</td>
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<td>Oxford University Press.</td>
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**REFERENCE BOOKS:**

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<tbody>
<tr>
<td></td>
<td>Edition.</td>
</tr>
<tr>
<td>3</td>
<td>“Metrology”, Taher ELBS.</td>
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<tr>
<td>6</td>
<td>I.S. 2709/1964.</td>
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<tr>
<td></td>
<td>Edition.</td>
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</table>
SUBJECT NAME: Machine Design-II
SUBJECT CODE: PCC-ME314

<table>
<thead>
<tr>
<th>Teaching Scheme:</th>
<th>Examination Scheme:</th>
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<tbody>
<tr>
<td>Lectures: 03 Hrs. per week</td>
<td>ESE: 70 Marks</td>
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<tr>
<td>Practical: 02 Hrs. per week</td>
<td>CIE: 30 Marks</td>
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<tr>
<td>Credit: 04</td>
<td>Term Work: 25 Marks</td>
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<td>Practical/Oral: 25 Marks</td>
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</tbody>
</table>

Pre-requisites:
Elementary knowledge of Mechanics, Mathematics and science, Machine Design-I

Course Objectives:

1. Design machine elements subjected to fluctuating loading.
2. Study effect of wear considerations and their relevance to design.
3. Study and select rolling contact bearings used for mechanical systems.
4. Design hydrodynamic bearing using Raimondi and Boyd’s method and heat balance.
5. Design various types of gears using strength and wear considerations.

Course Outcomes: At the end of this course, student will be able to

1. Design machine elements subjected to fluctuating loading
2. Understand effect of tribological considerations on design
3. Select rolling contact bearings from manufacturer’s catalogue.
4. Design sliding contact bearings used in various mechanical systems
5. Design various types of gears such as spur, helical, bevel and worm gear

Unit 1 | Design for Fluctuating Loads | [06]
|--------------------------------|--------------------------|
| Stress concentration - causes and remedies, Fluctuating stresses, S-N. diagram under fatigue load, Endurance limit, Notch sensitivity, Endurance strength- modifying factors, Design for finite and infinite life under reversed stresses, Cumulative damage in fatigue failure, Goodman diagram, Modified Goodman diagram, Fatigue design for components under combined stresses such as shafts, Thin pressure vessels, Beams subjected to point loads etc.

Unit 2 | Design of Rolling Contact Bearings | [07]
### Unit 3: Design of Sliding Contact Bearings

| i. Introduction to Tribological consideration in design Friction, Wear, Lubrication. |
| ii. Sliding Contact Bearing: Bearing material and their properties: Sintered bearing materials, bearing types and their construction details. |
| iii. Hydro-Dynamic Lubrication: Basic theory, Thick and thin film lubrication, Reynolds’s equation (*No Derivation*), Sommerfield Number, Design consideration in hydrodynamic bearings, Raimondi and Boyd method relating bearing variables, Heat balance in journal bearings, Temperature rise |

### Unit 4: Design of Spur Gear

| a) **Introduction to Gears:**  
Gear terminology, Material selection, Types of gear failure.  
| b) **Spur Gear:**  
Tooth loads, No. of teeth, Face width, Strength of gear teeth, Static beam strength (Lewis equation) Barth equation, Dynamic tooth load (spot’s equation and Buckingham equation), Wear strength (Buckingham’s equation), Estimation of module based on beam strength and wear strength. Gear design for maximum power transmission capacity, Methods of gear lubrication. |

### Unit 5: Design of Helical and Bevel Gears

| a) **Helical Gears:**  
Formative number of teeth in helical gears, Force analysis, Beam and wear strength of helical gears, Effective load and design of helical gear.  
| b) **Bevel Gear:**  
Straight tooth bevel gear terminology and geometrical relations, Guidelines for selection of dimensions and minimum number of teeth, Force analysis, Mounting of bevel gear and bearing reactions, Beam and wear strength, Dynamic tooth load, Design of straight tooth bevel gears based on beam and wear strength. |

### Unit 6: Design of Worm Gears

| Terminology and geometrical relations. Standard dimensions and recommendation of worm gearing, Force analysis, Friction, Efficiency of worm gear drive, Design of |
TERM WORK /LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:

Note: Reference to Design Data Book is mandatory

**Term Work:**
A) Total two design project
   A detail design report and two sheets containing working drawing of details and assembly
   i) Spur gear/ Helical gear.
   ii) Bevel gear / Worm and Worm Wheel.
B) Assignments based on
   • Study of Ball bearing mountings and its selection preloading of bearings.
   • Industrial visit based on above syllabus (Optional).
   • Construction of gears such as hub, web, arm, rim type etc. Design considerations of gear box.

**TEXT BOOKS:**


**REFERENCE BOOKS:**

| 3. | PSG Design data Book |
| 6. | PSG Design Data Book |
SUBJECT NAME: Internal Combustion Engines
SUBJECT CODE: PCC-ME315

<table>
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<tr>
<th>Teaching Scheme:</th>
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<td>Lectures: 03 Hrs Per Week</td>
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<tr>
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<td>CIE: 30 Marks</td>
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<td>Credit: 04</td>
<td>Term Work: 25 Marks</td>
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<td>Practical/Oral: 25 Marks</td>
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**Pre-requisites:** Basic Mechanical Engineering, Applied Thermodynamics, Heat & Mass Transfer

**Course Objectives:** The course aims to

1. Study constructional details and various types of internal combustion engine.
2. Understand and analyze thermodynamic cycles of IC engines.
3. Understand combustion phenomenon in SI engine and CI engines.
4. Impart knowledge about various systems on the IC engines.
5. Impart knowledge about various engine performance characteristics and its testing.

**Course Outcomes:** Upon successful completion of this course, the student will be able to:

1. Demonstrate engine construction, function of various parts of the engine and classify I.C. Engines.
2. Demonstrate combustion mechanism.
3. Demonstrate importance and functions of various systems on the engine.
4. Demonstrate need and methods of engine testing.
5. Understand the impact of vehicular pollution and ways to reduce or control the pollution.

**Unit 1**

<table>
<thead>
<tr>
<th>Introduction to I.C. Engines</th>
<th>06</th>
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</thead>
<tbody>
<tr>
<td><strong>Introduction:</strong> Classification of I. C. Engines, applications, Selection of IC Engine for different applications, Engine specifications</td>
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</tr>
<tr>
<td><strong>Engine Cycles:</strong> Engine cycles (Carnot, Otto, Diesel), Only numericals on Air standard cycles (Otto and Diesel cycles only), Deviation of actual cycles from air standard cycles, Valve timing diagram for high and low speed engine, Port timing diagram.</td>
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<tr>
<td>Unit 2</td>
<td>Fuel Systems for SI and CI Engines</td>
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<td>Engine fuel requirements, complete carburetor, Derivation for calculation of A/F ratio, Calculation of main dimensions of carburetors (Only Approximate analysis numericals), Effect of altitude on Air fuel ratio. Electronic Petrol injection system (MPFI) – components such as sensors, ECU etc., merits and demerits Fuel Systems for C.I. Engines: Requirements of injection system, Types of injection systems – Individual pump, Common rail and Distributor systems, Unit injector, Types of fuel nozzles- single hole, multi hole, pintle, and pintaux, Formation of Spray, Atomization and penetration, Electronic diesel injection system. Calculations of main dimension of fuel injection system of diesel engine.</td>
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<tr>
<th>Unit 3</th>
<th>Combustion in S. I. Engines</th>
<th>06</th>
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<tbody>
<tr>
<td></td>
<td>Stages of combustion, Ignition lag, Flame propagation, Factors affecting flame speed, Abnormal combustion, Influence of engine design and operating variables on detonation, Fuel rating, Octane number, Fuel additives, HUCR, Requirements of combustion chambers of S.I. Engines and its types.</td>
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<tr>
<th>Unit 4</th>
<th>Combustion in C.I. Engines</th>
<th>06</th>
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<tr>
<th>Unit 5</th>
<th>Performance Testing of Engines</th>
<th>06</th>
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<tr>
<th>Unit 6</th>
<th>Engine Emission and Control</th>
<th>08</th>
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<tbody>
<tr>
<td></td>
<td>Introduction to Supercharging and Turbo-charging, S.I. engine emission (HC, CO, NOx) Control methods- Evaporative (ELCD), Thermal, Catalytic converters, C.I. Engines Emission (CO, NOx, Smog, Particulate), Control methods- Chemical, EGR, Standard pollution Norms like EURO, Bharat, Introduction to alternative fuels for I.C. engines.</td>
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**Practicals:**

**Study group:-**

2. Study and Demonstration of Engine systems: Air intake, Exhaust, Cooling, Lubrication systems.
3. Study and Demonstration of Ignition systems, startingsystems.
4. Study and Demonstration of Carburetor and Petrol injection system
5. Study and Demonstration of fuel injection system of diesel engine.

**Test group:- (Any Five)**

1. Test on four stroke Diesel Engine.
2. Test on four stroke Petrol Engine.
3. Test on two stroke Petrol Engine. (Variable Speed Test)
4. Morse Test on Multi Cylinder Engine
5. Visit to an engine manufacturing company / repairing unit
6. Test on computer controlled I.C. Engine
7. Test on variable compression ratio engine
8. Visit PUC centre and submit PUC certificate photocopy of your own vehicle.

**TEXT BOOKS:**

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<tbody>
<tr>
<td>1</td>
<td>“Internal Combustion Engines”, Maleev, CBS Publication and Distributors.</td>
</tr>
<tr>
<td>3</td>
<td>“Internal Combustion Engines”, Gills and Smith, Oxford and IBH Publishing Company</td>
</tr>
<tr>
<td>4</td>
<td>“Diesel and High Compression Gas Engines”, P. M. Kates.</td>
</tr>
<tr>
<td>6</td>
<td>“Engineering Fundamentals of the I.C. Engines”, W.W. Pulkrabek, Pearson Education</td>
</tr>
</tbody>
</table>
SUBJECT NAME: Computer Aided Design and Manufacturing

SUBJECT CODE: OEC-ME 316

Teaching Scheme: 
Lectures: 03Hrs.perweek
Practical: 00Hrs.perweek
Credit: 03

Examination Scheme:
ESE: 70Marks
CIE: 30Marks
Term Work:  --

Pre-requisites: NA

Course Objectives:

1. To Provide basic foundation in computer aided design / manufacturing
2. To Understand the fundamentals used to create and manipulate geometric models
3. To Get acquainted with the basic CAD software designed for geometric modeling
4. To Learn working principles of NC machines CNC control and part programming

Course Outcomes: At the end of this course, student will be able

1. To Compare and Represent 2-D and 3-D entities
2. To Apply transform techniques on 2-D and 3-D entities
3. To Examine CNC program for production of components
4. To Express the principles and methods of Rapid Prototyping

Unit 1 | Fundamentals of CAD/CAM | 04
--- | --- | ---
| Product cycle and scope of CAD/CAM/CIM in product cycle, Features of CAD/CAM Hardware and software, selection of software. CAD workstation configurations |

Unit 2 | Representation of Curves and surfaces | 08
--- | --- | ---
| Introduction to Analytic Curves, Synthetic Curves: Hermite Cubic Spline, Bezier Curve, B-Spline curve. Surface Representation: Synthetic Surfaces |

Unit 3 | Solid Modeling | 08
2D Vs 3D modeling, Comparison of Wireframe, surface and solid modeling techniques, Geometry Vs Topology, Requirements of Solid Modeling, Solid Modeling Methods: Constructive Solid Geometry (CSG), Boundary Representation (B-rep), etc.

<table>
<thead>
<tr>
<th>Unit 4</th>
<th>Geometric Transformation</th>
<th>06</th>
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</thead>
<tbody>
<tr>
<td>2D geometric transformations, Homogeneous co-ordinate representation, Composite transformations, 3D transformations, Inverse transformations, geometric mapping</td>
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<table>
<thead>
<tr>
<th>Unit 5</th>
<th>Computer Numerical Control and Part Programming</th>
<th>09</th>
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<tbody>
<tr>
<td>Introduction to NC/CNC/DNC machines, Classification of NC systems, Axis nomenclature, Interpolation, features of CNC controllers, Types of CNC machines, Construction features of CNC machines, Manual Part Programming, NC word format, Details of G and M codes, Canned cycles, subroutines and Do loops, Tool radius and length compensations</td>
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<table>
<thead>
<tr>
<th>Unit 6</th>
<th>Rapid Prototyping and Manufacturing</th>
<th>05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Rapid Prototyping, rapid tooling and rapid manufacturing, Process of rapid prototyping, Different techniques of Rapid prototyping and their applications</td>
<td></td>
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</table>

**Text Books:**


**Reference Books:**


SUBJECT NAME: Electric Vehicle

SUBJECT CODE: OEC-ME 316

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<tr>
<th>Teaching Scheme:</th>
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<td>Lectures: 03 Hrs.perweek</td>
<td>ESE: 70 Marks</td>
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<tr>
<td>Practical: 00 Hrs.perweek</td>
<td>CIE: 30 Marks</td>
</tr>
<tr>
<td>Credit: 03</td>
<td>Term Work: --</td>
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</table>

Pre-requisites: NA

Course Objectives:

1. To impart the basic knowledge of Electric Vehicle Technology
2. To make the student conversant with power sources of today's and future EV
3. To prepare the students for a career in the drastically changing automotive industry
4. To acquaint the student with prerequisite for higher studies in Electric Vehicle
5. To make the students aware with different areas of research in the field of Electric Vehicle

Course Outcomes: At the end of this course, student will be able

1. To understand the basic knowledge of electric vehicle technology.
2. To select power sources for electric vehicles.
3. To choose various configurations of an electric vehicle.
4. To configure power transmission system in electric vehicle.

Unit 1 | Introduction to Electric Vehicles | 05
---|---|---

Unit 2 | Batteries for Electric Vehicles | 07
---|---|---
Electrochemical Batteries – Reactions and Thermodynamic, Voltage, Specific power and Energy, Working of Pb-Acid batteries, Ni-Fe, Ni-Cd, Ni-MH Batteries, Li-Polymer, Li-ion, Battery selection for Electric Vehicle, Regenerative Braking for battery charging, Effects of Current Density and Heat on Battery Cycle and Life, Battery Storage, Battery Pack Design.
### Unit 3  
**Battery Charging Technology for Electric Vehicles**  
07  
Types of battery charging, Normal charging, Opportunity charging, Fast charging, Battery swapping, Battery Charging algorithms, Improve the charging efficiency, Reduce the charging time, enhancing the battery life, Protect the battery, Constant current and constant voltage Charging, Multistage charging (MSC), Pulse Charging, Trickle Charging (TC), Wire and Wireless charging, Charging station infrastructure.

### Unit 4  
**Electric Motors in Electric Vehicles**  
07  
Electric Motors used in electric vehicles, DC motors, Induction motors, Permanent Magnet motors, Switched Reluctance motors., Torque–speed characteristics of above mentioned motors, Comparison and its layout in EV, Selection of motor for EV, Motor location and drive from motor to wheels.

### Unit 5  
**Motor control in Electric Vehicles**  
07  
Power conversion required in EV. Principle of operation of power electronics devices like: SCR, TRIAC, DIAC, GTO, MOSFET, IGBT and power BJT, Battery to Motor with speed control, Regenerative Braking requirements, Bi-directional and multiple input to single output power conversion in EV. Power conversion required for DC charging and AC charging on board and off board.

### Unit 6  
**Safety, Norms and Testing of Electric Vehicles**  
07  
Type approval procedure for electric and hybrid electric vehicles, Government scheme, Electric vehicle conductive AC charging system, DC charging system, V2X technology like V2 home, V2Grid, Self-driving from level 1 to level 5, Autonomous driving.

### Recommended Books

SUBJECT NAME: Computer Integrated Manufacturing

SUBJECT CODE: PCC-ME 317

Teaching Scheme:  
<table>
<thead>
<tr>
<th>Lectures : 00 Hrs. per week</th>
<th>Examination Scheme:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical : 02 Hrs. per week</td>
<td>ESE : 00 Marks</td>
</tr>
<tr>
<td>Credit : 01</td>
<td>CIE : 00 Marks</td>
</tr>
<tr>
<td>Term Work : 25 Marks</td>
<td></td>
</tr>
</tbody>
</table>

Pre-requisites: Computer Integrated Manufacturing

Course Objectives:

1. Study role of CAD/CAM in CIM and CIM implementation issues
2. Apply various classification and coding system in group technology.
3. Study concepts of Computer Aided Production Planning and Control
4. To expose the students to the techniques of CNC programming and cutting tool path generation through CNC simulation software by using G and M codes

Course Outcomes: At the end of this course, student will be able to

1. Locate modern techniques for integrating CAD/CIM in CIM
2. Obtain an overview of computer technology in Production Planning and Control including Computers
3. Apply classification and coding in Group Technology.
4. Elaborate Computer Aided Production Planning and Control.
5. Generate CNC lathe part programming for turning, facing, step turning, taper turning.

Unit 1  Assignment on Introduction to CIM.  (1)
Meaning, Scope, Evolution, Architecture, Elements, Benefits, Limitations, Social Aspects, etc.

Unit 2  Assignment on Role of CAD/CAM in CIM.  (1)
Role of Computers in design and manufacturing, integration.

Unit 3  Exercise on Group Technology, Part Classification and Coding System.
OPITZ and MICLASS : one exercise on each.  (2)
### Unit 4
**Part Programming**

Introduction to manual Part programming buse of G and M Codes to generate part product on CNC, VMC, HMC etc. generation model on milling/turnning/Drilling using suitable CAM Software

<table>
<thead>
<tr>
<th>Unit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 4</td>
<td>Part Programming</td>
</tr>
<tr>
<td>Unit 5</td>
<td>Presentations (by group of minimum 2 and maximum 4 students).</td>
</tr>
<tr>
<td>Unit 6</td>
<td>Industrial Visit</td>
</tr>
</tbody>
</table>

#### TEXT BOOKS:


#### REFERENCE BOOKS:

SUBJECT NAME: Workshop Practice–VI
SUBJECT CODE: PCC-ME318

Teaching Scheme: | Examination Scheme:
---|---
Lectures: 00 Hrs. per week | ESE: 00 Marks
Practical: 02 Hrs. per week | CIE: 00 Marks
Credit: 01 | Term Work: 25 Marks

Course Objectives:

<table>
<thead>
<tr>
<th>The course aims to:</th>
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<tbody>
<tr>
<td>1 Understand and perform the various machining operations.</td>
</tr>
<tr>
<td>2 Implement principles of metrology.</td>
</tr>
<tr>
<td>3 Design the sequence of various processes required to manufacture the components.</td>
</tr>
</tbody>
</table>

Course Outcomes: At the end of this course, student will be able to

<table>
<thead>
<tr>
<th>Select the suitable machining operations and prepare process sheet to manufacture a Components and implement the same.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control key dimensions on a component using principles of metrology and assembly</td>
</tr>
</tbody>
</table>

Syllabus

A. To manufacture the components as per the drawing requiring at least four of the following operations
   vii) Slotting
B. To carry out assembly of all components.
C. A visit report based on the industrial visit to study at – least two of the following machining processes i.) CNC Turning / Milling, ii.) Honing, iii.) Thread Rolling

TERM WORK / LIST OF EXPERIMENTS/ LIST OF ASSIGNMENTS:

Assignments

Write any three assignments out of following.

1. Study and demonstration of Milling machine.
2. Study and demonstration of Shaping machine.
3. Study and demonstration of CNC machine.
4. Study of Slotting machine. (Theoretical treatment only.)
**TEXT BOOKS:**

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**REFERENCE BOOKS:**

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<tbody>
<tr>
<td>4.</td>
<td>“Production Technology”, HMT handbook</td>
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</tbody>
</table>
SUBJECT NAME: Professional Skill Development**

SUBJECT CODE: PCC-ME319**

(Audit Course)

<table>
<thead>
<tr>
<th>Teaching Scheme:</th>
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<tr>
<td>Lectures: 01Hrs.perweek</td>
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<tr>
<td>Practical: 00Hrs.perweek</td>
<td>CIE: 00 Marks</td>
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<tr>
<td>Credit: 00</td>
<td>Term Work: 00 Marks</td>
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</table>

Pre-requisites: NA

Course Objectives:

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<tbody>
<tr>
<td>1</td>
<td>Enable students to imbibe all those skills that are needed to be successful in their professional life</td>
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<tr>
<td>2</td>
<td>Develop behavioral competencies amongst students</td>
</tr>
<tr>
<td>3</td>
<td>Develop effective communication skills in business situations</td>
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<tr>
<td>4</td>
<td>Develop effective writing and presentation skills in business situations</td>
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<tr>
<td>5</td>
<td>Enhance team building and time management skills</td>
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<tr>
<td>6</td>
<td>Develop interpersonal skills</td>
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</table>

Course Outcomes: At the end of this course, student will be able to

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<tbody>
<tr>
<td>1</td>
<td>Effectively use techniques for self-awareness and self-development to increase confidence in abilities</td>
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<tr>
<td>2</td>
<td>Strengthen soft skills to achieve success in professional career</td>
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<tr>
<td>3</td>
<td>Smoothly transit from student life to professional life</td>
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<tr>
<td>4</td>
<td>Create professional documents using MS office tools</td>
</tr>
</tbody>
</table>

Unit 1 Technical Writing and Business Communication [02]

Informal and formal letter writing, quotations, purchase orders, enquiry letter, invitation and acceptance letter, notice of meeting, circular, agenda and minutes of meeting.

Unit 2 Report and Proposal Writing [02]
<table>
<thead>
<tr>
<th>Unit 3</th>
<th>The e-English</th>
<th>[02]</th>
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</thead>
<tbody>
<tr>
<td>Writing email to an unknown person, guidelines for continuing the conversation on emails, the top ten Do’s, Business emails, marketing emails.</td>
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</table>

<table>
<thead>
<tr>
<th>Unit 4</th>
<th>Team Building and Time Management</th>
<th>[02]</th>
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</thead>
<tbody>
<tr>
<td>Interpersonal skills, what is needed to form smart team. Different approaches to team building. Techniques of a time management: ABC analysis, Pareto analysis.</td>
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<thead>
<tr>
<th>Unit 5</th>
<th>Corporate Etiquettes</th>
<th>[02]</th>
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<tbody>
<tr>
<td>Business dress and grooming, office etiquettes, telephone etiquettes, dining etiquettes, meeting etiquettes, travel etiquettes.</td>
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</table>

<table>
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<tr>
<th>Unit 6</th>
<th>Working with Professional Documents</th>
<th>[04]</th>
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</thead>
</table>
| Creating professional quality documents using MS Office applications.  
MS Word: Create, store, organize. Font & paragraph formatting, inserting tables, smart art, page breaks.  
MS Excel: Creating, editing, saving and printing spreadsheets, functions & formulas, charts & graphs, filtering data.  
MS Power Point: Creating slides, applying auto layouts, adding animation, slide transitions, graphically representing data. |
TERM WORK / LIST OF ASSIGNMENTS:

1. Quotation and Purchase order for the Engineering goods.
2. Agenda, notice, and minutes of a meeting.
3. One report based on the literature review or comparison.
4. One page biodata.
5. Power Point presentation based on hobby or favorite topic.

TEXT BOOKS:

1. “Soft skills for managers”, Dr. T. KalyanaChatravarthi, Dr. T. LathaChatravarthi Biztantra.

REFERENCE BOOKS:

1. “Technical English”, Dr. M. Hemamalini, Published by Wiley India Pvt.ltd.
REVISED STRUCTURE AND SYLLABUS

THIRD YEAR (B. Tech) CBCS

ELECTRICAL ENGINEERING

To be introduced from the academic year 2020-21

(i.e. from June 2020) onwards
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Course (Subject Title)</th>
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<th>Course (Subject Title)</th>
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SHIVAJI UNIVERSITY, KOLHAPUR

CBCS STRUCTURE FOR T.Y.B. TECH. ELECTRICAL ENGINEERING

(Semester V and Semester VI)

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<th>Credits</th>
<th>No. of lectures</th>
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<td>1</td>
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<td>2</td>
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<tr>
<td>3</td>
<td>PCC-EE308/ EMD</td>
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CIE - Continuous Internal Evaluation
ESE – End Semester Examination

- Candidate contact hours per week : 30 Hours (Minimum)
- Total Marks for T.E. Sem V & VI : 1600
- Theory and Practical Lectures : 60 Minutes Each
- Total Credits for T.E. Sem V & VI : 50
- In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.
- There shall be separate passing for theory and practical (term work) courses.

Note:

1. **BSC-EE**: Basic Science Course - Electrical Engineering are compulsory.
2. **PCC-EE**: Professional Core course – Electrical Engineering are compulsory.
3. **OCE-EE**: Open Course Elective for the students from other discipline.
### Semester V

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Code No.</th>
<th>Subject</th>
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<tbody>
<tr>
<td>1</td>
<td>PCC-EE301</td>
<td>Digital Electronics And Micro Processor</td>
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<td>Open Elective – I</td>
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<td>3</td>
<td>PCC-EE302</td>
<td>AC Machines</td>
<td>4</td>
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<tr>
<td>4</td>
<td>PCC-EE303</td>
<td>Power System-II</td>
<td>4</td>
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<tr>
<td>5</td>
<td>PCC-EE304</td>
<td>Advanced Control System</td>
<td>4</td>
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<tr>
<td>6</td>
<td>PCC-EE305</td>
<td>Signals &amp; Systems</td>
<td>4</td>
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<tr>
<td>7</td>
<td>PCC-EE306</td>
<td>MATLAB</td>
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### Semester VI

<table>
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<th>Subject</th>
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<tbody>
<tr>
<td>1</td>
<td>PCC-EE307</td>
<td>Digital Signal Processing</td>
<td>4</td>
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<tr>
<td>2</td>
<td>OCE-EE302</td>
<td>Open Elective – II</td>
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<tr>
<td>3</td>
<td>PCC-EE308</td>
<td>Electrical Machine Design</td>
<td>6</td>
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<tr>
<td>4</td>
<td>PCC-EE309</td>
<td>Power System Stability And Control</td>
<td>5</td>
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<tr>
<td>5</td>
<td>PCC-EE310</td>
<td>Electrical Drives- I</td>
<td>4</td>
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<tr>
<td>6</td>
<td>PCC-EE311</td>
<td>Electrical Installations testing and maintenance</td>
<td>3</td>
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<td><strong>Total</strong></td>
<td><strong>25</strong></td>
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#### Open Elective – I (Any One)

1. Electrical Appliances And Luminaries
2. Domestic /Industrial Electrical Installation, Estimation And Costing

#### Open Elective – II (Any One)

1. Electrical Energy Audit And Conservation
2. PLC & SCADA
Objectives:
1. To make students understand Number Systems, Logic gates and Boolean Algebra.
2. To make students to understand K-Map and NAND, NOR Implementation
3. To make students to develop the skills in Design using Combinational and Sequential Logic
4. To develop basic knowledge of Microprocessors, Microcontrollers and their features.
5. To provide skills for programming microcontroller for basic applications.
6. The course aims to enable students to interface and program different peripherals to microcontrollers.

Course Outcomes:
After completion of this course students will be able to:
1) **Understand**², **Assess**⁵ and **solve**³ basic binary math operations Number System, Logic Gates, Theorems, Properties of Boolean Algebra.
2) **Understand**², **Solve**³ and **Analyze**⁴ 2, 3 and 4 variable K-Map
3) **Design** and **analyze** different types Adders, Subtractors, FlipFlops and Counters.
4) **Apply**³ Knowledge and Demonstrate various addressing modes and data transfer instructions.
5) **Analyze**⁴ assembly language programs select appropriate assemble into machine a cross assembler utility of a microcontroller
6) **Design**⁶ and **Analyze**⁴ different types of Interfacing.
SECTION I

Unit 1: Boolean algebra & logic [08 hrs]

Unit 2: Simplification of Boolean functions [05 hrs]
K – Maps, 2, 3 and 4 Variable Maps. Sum of Products and Product of Sums, Don’t Care Conditions, NAND-NAND and NOR-NOR Implementation

Unit 3: Combinational logic & Sequential logic [12 hrs]
Introduction, Binary Adders & Binary Subtractors, Binary to Gray, BCD to Binary, BCD to Excess-3 and Vice Versa, Binary Parallel Adder, Decimal/BCD Adder, Comparators, Decoders, Encoders, Multiplexers, Demultiplexers, Seven Segment Display using 7446/7447, Flip Flops, Shift Registers, Various Counters, Moore Model and Mealy Model.

SECTION II

Unit 4: 8051 Architecture and Instructions [10 hrs]
Unit 5: Assembly Programming Examples  

Copy Block, Shift Block, Count no. of Nulls, Find Checksum, Sum of Natural Numbers, Sum of a Series, Fibonacci Series, Generate a Series. Count 1s in a Byte, Find Largest/Smallest Integers of an Array. Bubble Sorting, Find Sum of Factorials. Compare with External Array, Reverse an Array. Sum of a Series, Generate Prime Numbers.

Unit 6: Interfacing  

Keyboard, External Memory, Display Devices, DC Motor, Stepper Motor, Servomotor DAC/ADC Interfacing.

General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

List of Experiments:

Minimum five experiments based on Hardware and five experiments based on Simulations and at least three experiments based on Interfacing.

Recommended Books:

2. Digital Logic and Computer Design, Morris Mano, PHI publications
4. Fundamentals of digital circuits, Anand Kumar, PHI
5. The 8051 Microcontroller and embedded systems, Muhammad Ali Mazidi, Pearson Education.

Reference Books:

2. Digital Systems- Principles and Design, Rajkamal, Pearson Education
AC MACHINES

<table>
<thead>
<tr>
<th>Course Code And Title</th>
<th>Teaching Scheme</th>
<th>Evaluation Scheme</th>
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<tr>
<td>PCC-EE-302 AC Machines</td>
<td>03</td>
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ISE: InSemesterEvaluation
MSE: MidSemesterEvaluation
ESE: End SemesterEvaluation

Objectives:

1. To give exposure to the students about the concepts of AC machines including the constructional details, principle of operation and performance analysis.
2. To learn the characteristics of induction machines and to learn how it can be employed for various applications.

Course Outcome:

At the end of this course, the students will be able to

1. Analyze the performance of 3-phase induction motors
2. Determine and analyze the Losses and efficiency and performance of alternators
3. Familiarize with principle of operation and application of 1-phase induction motors.
4. Analyze performance of special purpose motors and Make use of special designed motors for different applications
5. Analyze and Evaluate performance of different types of alternators
6. Analyze the performance of 3-phase induction motors
SECTION I

**Unit 1: Introduction of Three phase Induction Motor (09 Hrs)**

Construction & types of 3 ph. Induction motors, Rotor quantities (emf ,current, frequency, p.f), torque equation, starting torque, running torque (numerical treatment ), Factors affecting torque, condition of maximum torque ,torque slip characteristics, Need of starters for 3 phase. Induction motors, types of starters (DOL, autotransformer, star-delta, rotor resistance starter, Speed control methods from stator side (Stator voltage control Stator Frequency control, Pole changing) & rotor side (rotor resistance control), Applications of 3 ph. Induction motors

**Unit 2: Performance and Characteristics of Three phase Induction Motor (09 Hrs)**


**Unit 3: Single phase Induction Motors : (06 Hrs)**

Double field revolving theory, Construction and working of single phase induction motor (Split phase, capacitor start/run, shadedpole, repulsion type ,series motor, universal motor and hysteresis motor) Torque slip characteristics of all the above.

SECTION II

**Unit 4: Special Purpose Motors: (05Hrs)**

Construction and working of Synchronous Reluctance motor, switched reluctance motor, BLDC motor, Permanent magnet Synchronous motor, stepper motors, AC and Dc servo motors

**Unit 5: Three Phase Alternator(13 Hrs)**

Construction, principle of operation of three phase alternator, emf equation, parameters of armature winding, (resistance& leakage reactance), armature reaction (at unity, lagging zero and leading zero power factor), concept of synchronous reactance and synchronous impedance. Equivalent circuit of 3 phase alternator, alternator on load (resistive, inductive & capacitive) OC test & SC test on 3 Phase alternator, short circuit ratio, voltage regulation methods (emf, mmf, zero power factor and direct loading method) with numerical treatment, Losses and efficiency, power flow diagram, need of parallel operation, conditions for
parallel operation, synchronizing procedures, hunting and oscillations in alternators,

**Unit 6: Synchronous Motor (06 Hrs)**

Principal of operation of three phase synchronous motor, starting methods of three phase synchronous motors (using prime mover and damper winding, Phasor Diagram of three phase synchronous motor at Unity, lagging and leading power factor, Effect of excitation on power factor and armature current, V & inverted V Curves, Operation of Synchronous motor as Synchronous Condenser, Application of three phasesynchronousmotor.

**General Instructions:**

1. Batch wise tutorials are to be conducted. The number of students per batch should be as per the university pattern for practical batches
2. Minimum number of assignments should be 6 covering all topics.

**Recommended Books:**

- Electrical Machines, S. K. Bhattacharya, Tata Mc-Graw-Hill publication
- B. L. Theraja “A textbook of Electrical Technology” Volume II S. Chand Publishers, New Delhi

**Reference Books:**

- Electrical Machines, AshfaqHussain, DhanpatRai&Sons
- Electrical Machinery, P S Bhimbhra, Khanna Publications

**List of Experiments:**

Minimum eight experiments from the following list of experiments should be performed in the laboratory:

- Determination of efficiency & speed regulation of 3 phase SCIM by indirect loading method
- Determination of equivalent circuit parameters of 3 Ph SCIM by conducting No Load& Blocked
Rotor Test.

- Determination of efficiency & speed regulation of 3 phase slip ring induction motor by direct loading method.
- Determination of efficiency & speed regulation of 3 phase slip ring induction motor by indirect loading method.
- Study of starters for 3 Ph induction motors
- Performance of three phase induction motor under single phasing fault
- Speed control methods of 3 Ph. SCIM
- Speed control methods of 3 Ph. Slip ring I.M
- Determination of efficiency & speed regulation of 1 phases induction motor
- Determination of Voltage regulation of an alternator by EMF method
- Determination of Voltage regulation of an alternator by MMF method
- Determination of Voltage regulation of an alternator by ZPF method
- Determination of Xd and Xq by Slip test
- Performance of synchronous generator connected to infinite bus, under constant power and variable excitation & vice versa
- Determination of V and Inverted V curves of a synchronous motor
- Determination of efficiency of synchronous motor by indirect loading
- Determination of efficiency of synchronous motor by direct loading
- Determination of load sharing by parallel operation
- Determination of efficiency of Alternator by direct loading method
SHIVAJI UNIVERSITY, KOLHAPUR

THIRD YEAR B.TECH (ELECTRICAL) SEMESTER - V

POWER SYSTEM-II

<table>
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<th>Course Code And Title</th>
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ISE: InSemesterEvaluation  MSE: MidSemesterEvaluation  ESE: End SemesterEvaluation

Objectives:

1. Develop analytical ability for Power system.
2. Analysis of symmetrical and Unsymmetrical fault conditions
3. Demonstrate different computational methods for solving problems of load flow
4. Power factor improvement techniques and substation engineering

Course Outcomes:

After completion of this course students will be able to:

1. Understand the need of power factor improvement and substation layout.
2. Identify sequence components and to draw sequence network of different Power system component
3. Analyze power system in P.U and will be able to represent power system with its components
4. Evaluate system fault Analysis
SECTION I

**Unit 1: Power system Components** (6 Hrs)

Single phase representation of Balanced 3 phase Networks, OLD & Impedance & Reactance Diagram, Per Unit System- P.U. Representation of Transformer, P.U. Impedance Diagram of Power system, Steady State Model of Synchronous Machine, Representation of Loads, Numerical treatment expected

**Unit 2: Symmetrical Fault Analysis** (8 Hrs)

Short circuit transients on transmission line Short Circuit on Unloaded Synchronous machine, Short Circuit on loaded Synchronous machine ,Selection Checklist for circuit breaker, Short circuit MVA, Algorithm for Short circuit studies , Z- Bus Formulation, Numerical treatment expected

**Unit 3: Symmetrical Components** (8 Hrs)

Sequence Impedances Synchronous machine. Sequence Impedances Transformer, Construction of Sequence network of Power Systems, Numerical treatment expected

SECTION II

**Unit 4: Unsymmetrical Fault Analysis** (10 Hrs)

Symmetrical component analysis of Unsymmetrical Faults, Analysis of Single Line to Ground (LG) fault, Line-To-Line (LL) fault, Double-Line-To-Ground (LLG) fault, One conductor open fault, Bus Impedance Matrix for analysis of Unsymmetrical shunt faults, Numerical treatment expected

**Unit 5: Load Flow Analysis** (10 Hrs)


**Unit 6: Power Factor Improvement and Substation Engineering** (6 Hrs)

Causes, Disadvantages of low power factor and power factor improvement Methods, Substation Grounding, Direct Lightning stroke shielding of substations, Role of Substations in Smart Grids.
General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

List of Experiments

Minimum 10 experiments/simulations based on above curriculum should be performed.

Recommended Books:


Reference Books:

5. Power System Operation & Control, K. Uma Rao, Wiley Publication
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) – SEMESTER –V

ADVANCED CONTROL SYSTEM

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ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Course Objectives:

1. To make students understand the concept of control design techniques, Compensation Techniques, design in frequency domain and design of PID control system
2. To study the control system design by root locus method
3. To study the control system design by Bode plot method
4. To make students understand the concept of state space analysis
5. Demonstrate the design of state space
6. To study the digital control system Z-Transform and sampling, mapping between S-Plane & Z-Plane, stability analysis, transient & steady state analysis.

Course Outcomes:

1. The students will be able to design a compensation techniques like Lag, Lead and Lead-Lag Controllers in frequency domain, design of PID controller
2. Derive and Design a Lead, Lag, and Lead-Lag Compensation using Root Locus
3. Derive and Design a Lead, Lag, and Lead-Lag Compensation using Bode Plot
4. Analyse the state space representation of digital control system, derive state space equation, and its Transfer function
5. Design a state space using controllability, Observability, Pole Placement techniques for controller, Pole placement technique by Transformation method, Direct Substitution Method and by Ackermann’s formula
6. The students will be able to understand the digital control system of Z-Transform and sampling, mapping between S-Plane & Z-Plane, stability analysis, transient & steady state analysis.
SECTION I

Unit –I Basics of Control Systems [6 Hrs]
Classical Control Design Techniques Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, Design of PID control system.

Unit –II Control System Design by Root Locus [9Hrs]
Review of Root Locus, Cascade Lead compensation, cascade Lag compensation, cascade Lead-Lag compensation, Series and parallel compensation, Effect of addition of poles and zeros, Design of Lead compensation based on Root Locus approach, Design of Lag compensation based on Root Locus approach, Design of Lead-Lag compensation based on Root Locus approach, Root Locus of system with dead time.

Unit –III Control System Design by Bode Plot [9Hrs]

SECTION II

Unit –IV State Space Analysis [6 Hrs]
State space representation of digital control system, Solving state space equation, Pulse transfer function.

Unit –V State Space Design [9Hrs]
Review of State Space, Controllability, Observability (Kalman’s test & Gilbert's test), Pole placement technique for controller design, State Feedback Law, Pole placement technique by Transformation method, Direct Substitution Method and by Ackermann’s formula.

Unit –VI Digital Control System [9Hrs]
Review of Z-Transform, Z-Transform method for solving different equations, impulse sampling & data hold, pulse transfer function, Sampling theorem, mapping between S-Plane & Z-Plane, stability analysis, transient & steady state analysis
General Instructions:

**Term Work**- Minimum 8 to 10 MATLAB based experiments based on above syllabus should be performed.

**Text books:**

**Reference Books:**
SHIVAJI UNIVERSITY, KOLHAPUR  
THIRD YEAR B.TECH (ELECTRICAL) SEMESTER - V  

SIGNALS AND SYSTEMS

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ISE: InSemesterEvaluation  
MSE: MidSemesterEvaluation  
ESE: End Semester Evaluation

Objectives:

1. This course intends to provide basic knowledge of theoretical structure, formal representation, computational methods, notation, and vocabulary of linear models.
2. It is aimed to impart skills to perform signal analysis with reference to spectrum analysis of deterministic signals

Course Outcomes: After completion of this course students will be able to:

1. Define CT and DT signals mathematically and Classify systems based on their properties
2. Explain concept of LTI system and Evaluate convolution.
3. Make use of Laplacetransform to analyze CT signals and systems.
4. Make use of Z transforms to analyze DT signals and systems.
5. Determine Fourier transforms for CT & DT.
6. Explain sampling theorem in time domain and frequency domain.

SECTION I

Unit 1: Introduction to signals & systems (6 Hrs)

Continuous & discrete signal: size of signal, signal operations, classification of signals, standard test signals, singularity functions. Continuous & discrete systems: Classification of systems, system models of Electrical systems
Unit 2: Description and analysis of system (7 Hrs)

Continuous & discrete systems: zero state response, zero input response, convolution sum and convolution integral, graphical representation of convolution, block diagram representation of differential and difference equation, FIR and IIR systems

Unit 3: System Analysis using Laplace transform (6 Hrs)

Laplace transform: A brief introduction to Laplace transform its properties and inverse Laplace transform, transfer function analysis, solution of LTI differential equation.

SECTION II

Unit 4: System analysis using Z-transform (6 Hrs)

A brief introduction to Z-transform, its properties & inverse – Z transform, connection between Laplace transform and Z-transform, transfer function analysis, solution of LTI difference equation, and stability in Z-domain.

Unit 5: Fourier analysis of continuous & discrete signals (8 Hrs)

Periodic representation by trigonometric Fourier series, Fourier spectrum, Dirichlet’s condition, exponential Fourier series, exponential Fourier spectra, Parseval’s theorem, Fourier transform and its properties, Relation between Fourier and Laplace Transform, Fourier spectrum. DTFT, Properties and symmetrical properties of DTFT, Convergence of DTFT: Gibb’s Phenomenon.

Unit 6: Sampling (4 Hrs)

Representation of continuous time signals by its samples, The sampling theorem, Reconstruction of signals from its sample s using interpolation, The effect of under sampling, aliasing, Discrete time processing of continuous time signals, Sampling in the frequency domain.

General Instructions:

1. Minimum number of tutorials should be 8 covering all topics.
Text Books:

1. Linear systems and signals, B. P. Lathi, Oxford University Press, 2nd edition, 2005
2. Signals and systems, Simon Haykin, Wiley Publications

Reference Books:

5. Signals and Systems by Dr.D.D.Shaha and Dr.A.C.Bhagali, MPH.
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) SEMESTER - V

MATLAB

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ISE: InSemesterEvaluation  MSE: MidSemesterEvaluation  ESE: End Semester Evaluation

Objectives:

Students are expected to solve Electrical Engineering problems using any available software tools such as MATLAB/Simulink, C, C++, PSIM, ETAP, PSCAD, MIPOWER, Power World Simulator, SKM Power Tools, VISIO, AUTOCAD, PSPICE, LABVIEW etc. Sample tasks are enlisted below.

Minimum 12 tasks should be performed as a part of term work.

1. Programming of at least 3 numerical methods for solving nonlinear equations.
2. Simulation of Electrical Machines such as transformers, DC machines and AC machines and evaluation of their performance parameters.
3. Simulation of electrical R-L-C networks, resonant circuits, filter circuits and plotting their input-output waveforms.
4. Simulation of power system networks and its performance analysis (load flow analysis, short circuit analysis, transient analysis, stability analysis, relay coordination etc.)
5. Simulation of DC-DC, DC-AC, AC-DC and AC-AC converter circuits, plotting their input output waveforms and performing their analysis.
7. Simulation of hybrid power system (Wind, Solar, Solar Series/Parallel).
8. Design of typical control panel for industrial application.
General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.

Recommended Books:

4. L. Ashok Kumar, A. Kalaiarasi, Y. Uma, “Power Electronics with MATLAB” Cambridge University Press 2017
### Objectives:

1. To expose students to Different domestic appliances and luminaries.
2. To familiarize procedure of troubleshooting and maintenance of electrical appliances

### Course Outcomes:

After completion of this course students will be able to:

1. Apply Knowledge to maintain the different electrical appliances
2. Construct And repair domestic appliances
3. Design and troubleshooting of UPS and Inverters
4. Illustrate basic concepts of illumination.
5. Designing of lighting for domestic purpose
6. Designing of lighting for special purpose

### SECTION I

**Unit 1: Fundamentals of Domestic appliances (6 Hrs)**

Principle of heating appliances, motoring appliances, construction, **dismantling, reassembling, testing and repairing** of: electrical iron, electric kettle, electric emersion heater, electric geysers, electric toasters, electric fans, battery operated torch, coffee percolator and electrical mixer.

**Unit 2: Domestic appliances (6 Hrs)**

**construction, dismantling, reassembling, testing and repairing** of: heat convector(blower), room cooler, electric washing machine, hair dryer, electric vacuum cleaner, emergency light, domestic refrigerator, water cooler, air conditioner (window type)
Unit 3: Study of UPS and inverter (6 Hrs)
Introduction to UPS, Construction and operating principle of different UPS systems: Standby, line interactive standby ferro, standby online hybrid, double conversion online, delta conversion online, elements of UPS: Relay, transformer, battery, fuse/fuse holder, switches, sockets, panel indicator, meter
Introduction to inverter, working principle of inverter, Construction and operating principle of different inverters, classification of inverters, sine wave inverter and square wave inverter, testing and troubleshooting of inverters

SECTION II

Unit 4: Fundamentals of illumination (6 Hrs)
Basics of illumination, Laws of illumination, polar curves and its applications for designing the lamp, concept of photometry, measurement of illumination, lighting calculation methods: watt per meter square method lumens method point to point method

Unit 5: Types of Lamps (6 Hrs)
Incandescent lamp, fluorescent lamp, sodium vapour lamp, mercury vapour lamp metal halide lamp, neon lamps, LED, CFL, LASER Selection criteria for lamps.

Unit 6: Lighting for special applications (6 Hrs)
Factory lighting, street lighting, flood lighting, Railway lighting, lighting for advertisement/ hoarding lighting, agriculture and horticulture lighting, health care centers, hospitals, decorating purpose stage lighting, aquarium and shipyards lighting and special purpose lamps used in photography video films

General Instructions:
- The number of students per batch should be as per the university pattern for practical batches.
- Minimum number of assignments should be 6 covering all topics

Recommended Books:
- Study of Electrical Appliances and devices, K. B. Bhatia, Khanna Publishers

Reference books:
- Handbook of Industrial Lighting, Butterworths, Lyon Stanley
DOMESTIC /INDUSTRIAL ELECTRICAL INSTALLATION, ESTIMATION AND COSTING
(Open Elective – I)

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ISE: InSemesterEvaluation  MSE: MidSemesterEvaluation  ESE: End Semester Evaluation

Objectives:
7. This course is intended to provide basic knowledge of different material required for electrical installation
8. It intends to impart skills to select suitable electrical equipments for installation.
9. It develops ability of estimate and costing of electrical installation.

Course Outcomes: After completion of this course students will be able to:
7) Explain & Evaluate concept of domestic and industrial wiring
8) Define & Explain concepts of Estimating and concepts of contracting
9) Analyze & Design Estimating And Costing of Domestic And Industrial Wiring
10) Explain & Evaluate concept Estimating and Costing of Service Connection
11) Analyze & Design Estimation of Transmission line
12) Analyze & Design Estimation of Overhead and Underground Distribution System

SECTION I

**Unit 1: Electrical Wiring** (6 Hrs)
Different types of wires, wiring system and wiring methods, Comparison of different types of wiring, Specifications of Different types of wiring materials, Accessories Different types of wiring tools, Domestic and industrial panel wiring, different types of wiring circuits, I.E. rules for wiring, Electricity supply act-1948

**Unit 2: Elements of Estimating and concepts of contracting** (6 Hrs)
Introduction to estimation & estimation tools, Electrical Schedule of rates, catalogues, Survey and source selection, recording estimates. Determination of required quantity of material, Labor conditions, Determination of cost material and labor, Contingencies, Overhead charges, Profit, Purchase system, Purchase enquiry and selection of appropriate purchase mode, Comparative statement, Purchase orders, Payment of bills, Terms, conditions
types of contract system. Tendering procedure and preparation of simple tender, Procedure for
inviting and scrutinizing tender, Importance of Earnest Money Deposit, Security Deposit and
S.O.R. Indian Electricity Act and major applicable I.E rules.

**Unit 3: Estimating And Costing of Domestic And Industrial Wiring**  (8 Hrs)
Principles of circuit design in lighting and power circuits, Procedures for designing the circuits
and deciding the number of circuits, Method of drawing single line diagram, Selection of type
of wiring and rating of wires and cables, Load calculations and selection of size of conductor, Selection of rating of main switch, distribution board, protective switchgear ELCB and MCB and wiring accessories, Earthing of residential Installation, Sequence to be followed for preparing estimate, Preparation of detailed estimates and costing of residential installation, Important considerations regarding motor installation wiring, Determination of input power, input current to motors, rating of cables, rating of fuse, size of Conduit, size of distribution Board, main switch and starter. Preparation of detailed estimates and costing industrial installation, I.E. rules observed for above wiring.

**SECTION II**

**Unit 4: Estimating and Costing of Service Connection (Domestic and Industrial):**  (7Hrs)
Concept of service connection, Types of service connection and their features, Method of installation of service connection (1-phase and 3-phase), Lay out/ wiring diagram of service connection list of materials and accessories along with specifications required for given installation work, Estimation of service connection for domestic and industrial (1-phase and 3-phase) I.E. rules pertaining to above wiring.

**Unit 5: Estimation of Transmission line:**  (5Hrs)
Main components of overhead lines, Line supports, Factors governing height of pole, Conductor materials, Determination of size of conductor for overhead Transmission line, Cross arms, Pole brackets and clamps, Guys and Stays, Conductors configuration spacing and clearances, Span lengths, Overhead line insulators, Insulator materials Lightning Arrestors, Points to be considered at the time of erection of overhead lines, Erection of supports, Setting of stays, Earthing of lines, Guarding of overhead lines, Clearances of conductor from ground, Spacing between supports conductors, important specifications and sketches List of materials and accessories required for the given project estimate for material required I.E. rules pertaining to above project
Unit 6: Estimation of Overhead and Underground Distribution System (4 Hrs)

Survey work for estimation of overhead and underground distribution system. Planning and layout of project. List of materials and accessories required for the given project. Procedure for preparing estimate for 440 V, 3-phase, 4 wire or 3 wire overhead and underground distribution system. Necessary drawing/sketches of overhead and underground system. I.E. rules pertaining to above project.

General Instructions:

3. The number of students per batch should be as per the university pattern for practical batches.
4. Minimum number of assignments should be 6 covering all topics.

Term work:

Minimum 6 number of assignments should be covering all topics
1. Draw different types of wiring circuits
2. Prepare a tender for installation of distribution transformer and give procedure for inviting and scrutinizing tender
3. Prepare detailed estimates and costing of residential installation & draw layout of it
4. Draw wiring diagram of domestic and industrial service connection (1-phase and 3-phase)
5. Sketches List of materials and accessories required for installation of Transmission line
6. Prepare estimation of 440 V, 3-phase, 4 wire or 3 wire overhead and underground distribution system & draw layout of it

Recommended Books:

1. A course in Electrical Installation, Estimating and costing, JBGupta, S K Kataria and Sons.
2. Electrical Installation and Estimating, Surjit Singh, Dhanpatrai And Sons.

Reference Books:

Objectives:

1. Imparting Basic knowledge of Digital Signal Processing
2. To develop skills of filter design.
3. It is intended to learn basics of Digital Signal Processors
4. Overview of communication systems

Course Outcomes: After completion of this course students will be able to:

1. Explain & Evaluate concept of convolution, DFT & FFT
3. Analyze & Construct DSP filter.
4. Illustrate & Distinguish DSP processors
5. Define & Explain various modulation techniques

SECTION I

Unit 1: Discrete Fourier Transform (10 Hrs)


Unit 2: FIR Filter Design & Realization (8 Hrs)

phase and Linear phase), Cascade and Parallel realization

**Unit 3: IIR Filter Design & Realization (8 Hrs)**

Introduction to IIR Filters, IIR Filter Designing using Impulse Invariant method and Bilinear Transformation method, Butterworth Filter approximation, Frequency Transformation. IIR realization - Direct form I and II, Cascade and parallel realization

**SECTION II**

**Unit 4: DSP Processors (6 Hrs)**

Introduction, Architecture of DSP Processor, TMS320C67XX, Specifications, Comparison between general purpose and DSP Processors.

**Unit 5: Amplitude Modulation (8 Hrs)**

Base-band and carrier communication, amplitude modulation - DSB, AM, AM, SSB, VSB, carrier acquisition, super heterodyne AM receiver.

**Unit 6: Angle Modulation (8 Hrs)**

Concept of instantaneous frequency, band-width of angle modulated waves, generation of FM waves, demodulation of FM, Interference in angle modulated systems, FM receiver.

**General Instructions:**
Minimum number of assignments should be 8 covering all topics.

**Recommended Books:**

2. Digital Signal Processing Salivahanam, AVallavaraj, C. Guanapriya, TMH

**Reference Books:**
1. Digital Signal Processing, Tarun Kumar Rawat (Oxford)
2. Digital Signal Processing SanjeetMitra, MGH
3. Digital Signal Processing- Dr. A. C. Bhagali,MPH
5. Digital Signal Processing P. Ramesh Babu, Scitech publication
Objectives:

1. This course intends to provide basic knowledge of design process of simple Electrical machines.
2. It is aimed to impart skills to perform and apply basics of Electrical Engineering for design of Electrical machines.
3. It is aimed to impart knowledge of software applications for electrical machine design.

Course Outcomes: After completion of this course students will be able to:

1) Recognize the fundamentals and essential standards to design electrical machine
2) Design of entire transformer in detail
3) Design of armature, field winding and Commutator of DC machines
4) Design of stator core, stator winding and rotor bars of three phase induction motor
5) Design of different parts of synchronous machine
6) Design of transformer, induction motor, DC machines and synchronous machines using Computer application.

SECTION -I

Unit 1: Fundamentals of electrical Machine Design (08 Hrs)

General consideration in the design, limitations in the design, output coefficient and their standard values for various machines, effect of size & ventilation on specific electric and magnetic loading. Different Indian Standard Specifications (ISS).

i) Magnetic circuits – Formulae for air and iron parts, calculations for magnetic circuits of electric
machines, estimation of no load current, determination of leakage fluxes and reactance calculations, design of electromagnets.

**ii) Mechanical Design** – design of shafts, choice and types of bearings, determination of mechanical strength of rotors, design consideration of cooling fans and frames.

**Unit 2: Design of Transformer**  
(Classification of transformer (Core type, Shell type transformer), Comparison of core and Shell Type transformer, Single phase & 3 Phase transformer connections, Core Cross Section, Cooling of transformer, transformer Insulation using Oil & other materials. Output equation of transformer, Relation between Core Area & Weight of iron & copper, Design for minimum cost, Design for minimum loss or maximum efficiency, variation of Output & losses in transformer with linear Dimensions, Design of Core (rectangular core, Square & stepped Cores), Variation of Core Diameter, Selection of core areas & type of core, Choice of Flux Density, design of winding, Windows Space Factor, Windows Dimensions, Overall Dimensions, Simplified Steps for transformer Design. Resistance of Winding, Mechanical Forces, No load currents, No load current of 1ph transformer, No load current of 3phase transformer, Design of Tank with Tubes, Core Design, Winding Design, Window Area)

**Unit 3: Design of DC Machines**  

**SECTION -II**

**Unit 4: Design of Three Phase Induction Motor**  
(Main Dimension, stator Winding,(Turns Per Phase, Stator Conductors), Shapes of Stator Slots, No of Stator Slots, Area of stator Slots, Length Of Mean Turn, Stator Teeth, Stator Core, Rotor Design, length of air gap, Relation For Calculations of Length of air gap, No of Rotor Slots, (Rules For Selecting Rotor Slots, Reduction of Harmonic torques), Design of rotor bars & Slots, (Rotor Bar Currents, Area of Rotor Bar, shapes & Size Of Rotor Slots, Rotor Slot Insulations), Design of End Rings.)
**Unit 5: Design of Synchronous Machine**  
(8 Hrs)

Construction of water wheel and turbo alternators. Different parts and materials used for Synchronous machine, choice of electric and magnetic loadings, Output equation. Determination of diameter and length, effect of short circuit ratio on machine performance.

**Unit 6: Computer Applications in electrical machine design**  
(8 Hrs)

Benefits of computer in machine design, methods of approach, optimization and computer aided design of three phase transformer, three phase induction motor, DC Motor and synchronous machine

**Term work:**
1. The term work shall consist of six drawing sheets and four sheets should be drawn using suitable software

**Recommended Books:**

**Reference Books:**
2. Computer Aided Design for Electrical Machines, Vishnu Murthy, B.S. Publications
SHIVAJI UNIVERSITY, KOLHAPUR

THIRD YEAR B.TECH (ELECTRICAL) SEMESTER - VI

POWER SYSTEM STABILITY AND CONTROL

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ISE: InSemesterEvaluation MSE: MidSemesterEvaluation ESE: End Semester Evaluation

Objectives:
1. Perform fundamental computation and modeling of power system control and stability.
2. Develop skills to model control devices that can be incorporated in power system simulations.
3. Analyze dynamic behavior of power control systems subject to various disturbances from the aggregated behavior of the many dynamic devices.

Course Outcomes:
After completion of this course students will be able to:
2. To develop ability to analyze and use various methods to improve stability of power systems.
3. Evaluate Methods of Improving Stability
4. To illustrate the automatic frequency and voltage control strategies for single and two area case.
5. To understand formulation of unit commitment and economic load dispatch tasks and solve it using optimization techniques
SECTION I

Unit 1: Introduction to Power System Stability & Control (6 Hrs)

Unit 2: Power system Stability (10 Hrs)

Unit 3: Methods of Improving Stability (10 Hrs)
Transient Stability Enhancements:- High Speed Fault clearing, Reduction of transmission system reactance, regulated shunt compensation, dynamic Braking, Reactor Switching, Controlled system Separation & Load Shedding – High Speed Excitation & Control, Discontinuous Excitation Control, Small Signal Stability Enhancement-Power system Stabilizers, Supplementary Control of SVC.

SECTION II

Unit 4: Power System Control (10 Hrs)
Load frequency control (Single and two area case) modeling of generator, governor, prime mover, Load frequency control and economic dispatch, automatic generation control, steady state analysis and dynamics response of an isolated power systems, automatic voltage control, reactive power control.

Unit 5: Optimal Power System Operation (8 Hrs)
Load duration curve, load factor, diversity factor, plant capacity factor, plant utilization factor, Load Forecasting, Optimal Unit commitment, Economic load Dispatch [with/without Transmission line Losses & Generator Limits], NUMERICALS EXPECTED.

Unit 6: Power System Security (4 Hrs)
General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

List of Experiments

Minimum 10 experiments/simulations based on above curriculum should be performed.

Recommended Books:

3. Power System Operation and Control, Dr. K Uma Rao, Wiley India Publication

Reference Books:

Objectives:
1. To expose students to the operation, application and control of power conversion systems employing electric drive to cater to industrial needs.
2. To familiarize the operation principles, and design of starting, braking, and speed control converters arrangements for electric motors and their applications.
3. To provide strong foundation to assess performance of different industrial drives considering issues such as, energy efficiency, power quality, economic justification, environmental issues, and practical viabilities.

Course Outcomes:
After completion of this course students will be able to:
1. Understand the concept, classification, Parts and advantages of electrical drives with types of loads and conditions of dynamic and stability considerations.
3. Outline of Chopper operation, configuration and control techniques to control the DC Motor.
5. Appraise the rotor resistance control method of Induction motor drive in Rotor side control.
6. Appraise the speed and frequency control method of synchronous motor.
SECTION I

Unit 1: Introduction to Electrical drives: (4Hrs)
Concept of Electrical drive, Classification of Electrical drives, Parts of Electrical drive, Advantages of Electrical Drives, Types of loads and their characteristics, Motor load interaction, Dynamic conditions in Electrical drives, Stability considerations in Electrical drives

Unit 2: Control of DC motor (6Hrs)

a) Single Converters
Introduction, review of Classification of dc motors and their speed control, Electric braking of dc motors, Block Diagram of Electrical Drive, Single phase Controlled Converter for Separately Excited dc motor Drives, DC series Motor Drives, Introduction to 4 quadrant operation of dc motor, Single phase Dual Converter for Four Quadrant Operation

b) Three-Phase Converters

c) Chopper
Introduction, Principle of chopper Operation, Classification of Chopper Circuits (single quadrant and four quadrant operation of chopper), Performance of chopper Fed Separately Excited dc Motors, introduction to closed loop system

Unit 3: Induction Motor Drives: Stator side control: (8Hrs)

a) Stator voltage control:
Introduction, review of types of 3 phase Induction motors, Torque-speed characteristic of 3 phase Induction motor, Stator Voltage Control using different 3 phase AC voltage controllers, Introduction to closed loop control using stator voltage control

b) Stator Frequency control:
Introduction, Variable Frequency Characteristics, Block Diagram of Variable Frequency Speed Control, V/f control, Voltage Source Inverter (VSI) fed induction motor drive, Braking and multi quadrant operation of VSI fed induction motor drive, Variable Frequency Control From a current Source inverter (CSI), comparison of VSI and CSI drives, Introduction of Closed loop speed Control for VSI fed
Induction Motor Drives, Basic operation of Pulse Width Modulated Inverter Fed Induction motor Drive

SECTION II

Unit 4: Induction Motor Drives: (6Hrs)

Rotor side control:
Introduction, Conventional Rotor Resistance Control, Rotor Resistance Control using power converters, Slip Power Recovery Schemes (Static Kramer drive, Static Scherbius drive), Introduction to Vector control of Induction motor

Unit 5: Synchronous Motor Drives and Brushless DC Motor Drives: (6Hrs)

Unit 6: Special Drives: (6Hrs)

General Instructions:
1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

List of Experiments

Minimum eight experiments and two simulations based on above curriculum should be performed

Recommended Books:
1. Power Semiconductor Drives, S. Sivanagaraju, M. B. Reddy, A. M. Prasad, PHI, Delhi
3. Electric Drives, N. K. De, P. K. Sen

Reference Books:
1. Electrical Machines & Drives, A First course, Ned Mohan, Wiley Publications
ELECTRICAL INSTALLATIONS TESTING AND MAINTENANCE

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ISE: In Semester Evaluation
MSE: Mid Semester Evaluation
ESE: End Semester Evaluation

Objectives:

1. Identification of tools and equipment’s used for installation and maintenance of electrical equipment.
2. To understand practical aspects of condition monitoring and maintenance of various electrical equipment.
3. To make students aware of electrical safety and IERules
4. To increase interest towards electrical installation

Course Outcomes:

After completion of this course students will be able to:

1. Read and interprets electrical installation drawings
2. Understand and apply IERules
3. To learn testing methods of various electrical equipment
4. Describe corrective and preventive maintenance of electrical equipment’s.
SECTION I

Unit 1: Electrical Tools, Accessories, Electrical installations and IE rules : (06 Hrs.)
Tools, Accessories and Instruments required for Installation, Maintenance and Repair Work, Safety Codes
Causes and Prevention of Accidents, Artificial Respiration, Workmen’s Safety Devices, General requirements of
electrical installation, electrical engineering symbols, schematic, understanding of wiring diagram and its single
line representation, IE rules related to electrical installation. Earthing / Grounding, Necessity types of Earthing.

Unit 2: Maintenance Strategies, Dielectric Theory, Insulating Materials, Failure Modes, and
Maintenance Impact on Arc-Flash Hazards: (04 Hrs.)
Introduction, Why Maintain and Test, Overview of Electrical Maintenance and Testing Strategies, Planning an
EPM Program, Overview of Testing and Test Methods, Insulating Materials for Electrical Power Equipment,
Maintenance of Protective Devices and their Impact on Arc-Flash Hazard Analysis

Unit 3: Domestic Installation: (04 Hrs.)
Introduction, Testing of Electrical Installation of a Building, Testing of Insulation Resistance to Earth, Testing
of Insulation and Resistance between Conductors Continuity or Open Circuit Test, Short Circuit Test, Testing
of Earthing Continuity, Location of Faults, IE Rules for Domestic Installation.

SECTION - II

Unit 4: Maintenance of Cables: (04 Hrs.)
Cable Failures and Their Analysis, Field Testing of Medium-Voltage Cables, Latest Trends in Cable Condition
Monitoring and Aging Assessment, Cable Fault Locating Methods

Unit 5: Condition Monitoring and Testing of Electrical Equipment: (04 Hrs.)
Failure modes of transformer, Condition monitoring of oil as per the IS/IEC standards, Filtration/reconditioning
of insulating oil, Condition monitoring of transformer bushings, On load tap changer, dissolved gas analysis,
degree of polymerization. Induction motor fault diagnostic methods – Vibration Signature Analysis, Motor
Current Signature Analysis.

Unit 6: Industrial Installation: (05 Hrs.)
Industrial load, Design considerations of electrical installation in small industry/factory/workshop, selection of
size for wires, cables required for the machines and its controlling unit, length and size of cable required for the
every industrial load, ratings of wiring accessories, main switch, bus bar MCB, ELCB etc. for industrial load,
methods of earthing for industrial installation, list of material for industrial installation
General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

List of Experiments

1. Drawing of Electric symbols
2. Single line diagram of Domestic wiring (of one House)
3. Electrical load calculation of single house / apartment.
4. Operation of MCB and ELCB
5. Study of different methods of Earthing.
6. Study of electrical installation in small industry/factory/workshop
7. Preparation of Tender / Quotation
8. Preparation of Comparative statement
9. One visit to understand Electrical wiring and Installation.

Recommended Books:


Reference Books:

1. Testing, Commissioning, Operation and
OBJECTIVES:

1. Provides basic understanding of energy audit and conservation
2. Essential theoretical and practical knowledge about the concept of energy conservation.
3. Economic aspects of energy conservation project and energy audit
4. Different approaches of energy conservation in industries

COURSE OUTCOMES: After completion of this course students will be able to:
1) Prepare energy flow diagrams and energy audit report.
2) Carryout energy audit for Mechanical Systems.
3) Relevant tariff for reducing losses in facilities.
4) Interpret energy conservation policies in India.
5) Identify and evaluate the energy conservation opportunities in different electric system.
6) Identify and assess energy conservation opportunities in thermal system.

SECTION I

Unit I: Energy Audit system aspect (6 Hrs)
General philosophy, current practices, need of energy audit and its types, methodology of energy audit and approach, Energy audit (definition as per energy conservation act), specific energy consumption, Instruments for Audit and Monitoring Energy and Energy Savings, Types and Accuracy, energy flow diagram (Sankey), simple payback period, energy audit procedure (walk through audit and detailed audit), energy audit report format

Unit II: Energy Audit in mechanical (7 Hrs)

**Unit III: Tariff** (5 Hrs)
Types of tariff structure: LT and HT, special tariff, time-off-day tariff, Peak-of-day tariff, power factor tariff, maximum demand tariff, load factor tariff and availability based tariff (ABT), application of tariff system to reduce energy bill.

**SECTION II**

**Unit IV: Energy Conservation basic** (5 Hrs)
Energy scenario: Primary and secondary energy, energy demand and supply, national scenario, energy conservation and energy audit: concept and difference, energy conservation Act 2001: relevant clauses of energy conservation, BEE and its role, MEDA and its role, star labeling: Need and its benefits

**Unit V: Energy conservation in Electrical Machine** (6 Hrs)

**Unit VI: Energy Conservation in Mechanical System** (7 Hrs)
Potential energy, conservation forces, distinction between conservative and non-conservative forces, potential energy functions, spring potential energy, conservation of mechanical energy: gravitation, spring, conservative force and potential energy function, conservative force for a Hypothetical Potential Energy Function, energy diagram, gravitational potential energy, scape speed

General Instructions:
1. Minimum number of assignments should be 6 covering all topics.
2. Submit one Energy audit report.

Recommended Books:
3. Principle of power Systems by V K Mehta S chand Publication
4. Energy Management: W.R.Murphy, G.Mckay, Butterworths Scientific

Reference Books:
1. Energy Audit and Management, Volume-I, IECC Press
9. Energy Conservation guide book Patrick/Patrick/Fardo (Prentice Hall)

List of Experiment:
1. Computing efficiency of DC motor/Induction Motor/Transformer
2. Identify star labeled electrical apparatus and compare the data for various star rating.
3. Calculating the efficiency of boiler / blowers / compressors etc.
4. Study of APFC panel or Estimating the requirement of capacitance for power factor improvement.
5. Study of various energy efficient equipment like LED lighting devices, Energy Efficient motors, Electronics ballast etc.
6. Soft starting of an induction motor
7. Study of Variable frequency drive based IM speed control for energy conservation.
8. Industry visit with an aim of
   (i) Studying various energy Audit systems prevailing in a particular industry/Organization
   (ii) Identifying the various energy conservation methods useful in a particular industry
9. Studying the various energy conservation methods useful in power generation, transmission and distribution
10. Study of various measuring instruments used for energy audit : Lux meter, Power analyzer, flue gas analyzer
11. Prepare a technical report on energy conservation act 2003
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) SEMESTER –VI
PLC & SCADA
(Open Elective-II)

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ISE: InSemesterEvaluation MSE: MidSemesterEvaluation ESE: End Semester Evaluation

Objectives:
4. To expose students to PLC, Input/Outputs and I/O Processings.
5. To familiarize the Ladder and Functional Programming, IL,SFC, and ST Programming methods, Jump and call, Timers, Counters and Shift Registers
6. To expose students Introduction to SCADA, system components architecture and Applications.

Course Outcomes: After completion of this course students will be able to:
7. Describe architecture and hardware connections of PLC
8. Basics of I/O Processing, Ladder and Functional Block Programming, IL,SFC and ST Programming, Internal Relays
9. Outline of Jump and Call, Timers, Counters, and Shift Registers
10. To describe introduction, evaluation, communication SCADA.
11. To describe system components, HMI and applications of SCADA.
SECTION I

Unit 1: Introduction to PLC: (7Hrs)
Programmable logic controller hardware and internal architecture, PLC systems basic configuration and development, Input/output Devices, Examples of Applications, I/O Processing
Input/output units, Signal Conditioning, Remote Connections, Networks, Processing inputs, I/O Address

Unit 2: Ladder and Functional Block Programming (7Hrs)
Ladder Diagrams, Logic Functions Latching, Multiple Outputs, Entering Programs, Function Blocks, Program examples

IL, SFC and ST Programming Methods: Instruction Lists, Sequential Function Charts

Internal Relays: Internal Relays, Ladder Programs, Battery-Backed Relays, One-Shot Operation, Set and Reset, Master Control Relay

Unit 3: Jump & Call, Timers, Counters, Shift Registers (5Hrs)
Jump, Subroutines, Types of Timers, On-Delay Timers, Off-Delay Timers, Pulse Timers, Retentive Timers, Programming Examples, Forms of Counter, Programming, Up- and Down-Counting, Timers with Counters, Sequencer, Shift registers, Ladder Programs

SECTION II

Unit 4: Introduction to SCADA (7Hrs)
Introduction, Data Acquisition system (DAS)-single, double, sensors, signal conditioning, sample and hold circuit, ADC-integrating, successive approximation, Evaluation of SCADA, communication of SCADA, selection criteria of DAS.

Unit 5: SCADA system components (5Hrs)
Introduction, Remote Terminal Unit (RTU)-Evaluation, Architecture, Design standards, selection criteria, Intelligent Electronic devices (IED), PLC, Data concentrators and merging unit, Master control centers, Global positioning systems (GPS)-Relevance to SCADA, Human Machine Interface (HMI)

Unit 6: SCADA Architecture (5Hrs)
Introduction, Communication Architecture, communication philosophies, systems reliability and availability, Applications-Oil and Gas Industry, Automobile Industry, Water pumping stations.
**Recommended Books:**

5. Programming Logic Controller, Fifth Edition by W. Bolton, Published by Elsevier

6. Programming Logic Controller by Vijay R. Jadhav, Khanna Book Publishing-New Delhi

7. Programmable Logic Controllers, by Frank D. Petruzella, Mcgraw Hill Publications

8. Industrial Automation with SCADA by K.S. Manoj, Notion press publications.

**Reference Books:**


9. Programmable Logic Controllers: Programming Methods And Applications, 1e, Hackworth, Pearson Education
REVISED STRUCTURE AND SYLLABUS

THIRD YEAR (B. Tech) CBCS

ELECTRICAL ENGINEERING

To be introduced from the academic year 2020-21
(i.e. from June 2020) onwards
SHIVAJI UNIVERSITY, KOLHAPUR

CBCS STRUCTURE FOR T.Y.B. TECH. ELECTRICAL ENGINEERING

(Semester V and Semester VI)

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SHIVAJI UNIVERSITY, KOLHAPUR

CBCS STRUCTURE FOR T.Y.B. TECH. ELECTRICAL ENGINEERING

(Semester V and Semester VI)

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CIE- Continuous Internal Evaluation ESE – End Semester Examination

- Candidate contact hours per week : 30 Hours (Minimum)
- Total Marks for T.E. Sem V & VI :1600
- Theory and Practical Lectures : 60 Minutes Each
- Total Credits for T.E. Sem V & VI :50
- In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.
- There shall be separate passing for theory and practical (term work) courses.

Note:

1. **BSC-EE**: Basic Science Course- Electrical Engineering are compulsory.
2. **PCC-EE**: Professional Core course – Electrical Engineering are compulsory.
3. **OCE-EE**: Open Course Elective for the students from other discipline
Semester V

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Open Elective – I (Any One)

1. Electrical Appliances And Luminaries
2. Domestic /Industrial Electrical Installation, Estimation And Costing

Open Elective – II (Any One)

1. Electrical Energy Audit And Conservation
2. PLC & SCADA
Objectives:
1. To make students understand Number Systems, Logic gates and Boolean Algebra.
2. To make students understand K-Map and NAND, NOR Implementation
3. To make students develop the skills in Design using Combinational and Sequential Logic
4. To develop basic knowledge of Microprocessors, Microcontrollers and their features.
5. To provide skills for programming microcontroller for basic applications.
6. The course aims to enable students to interface and program different peripherals to microcontrollers.

Course Outcomes:
After completion of this course students will be able to:
1) Understand\(^2\), Assess\(^5\) and solve\(^3\) basic binary math operations Number System, Logic Gates, Theorems, Properties of Boolean Algebra.
2) Understand\(^2\), Solve\(^3\) and Analyze\(^4\) 2, 3 and 4 variable K-Map
3) Design and analyze different types Adders, Subtractors, FlipFlops and Counters.
4) Apply\(^3\) Knowledge and Demonstrate various addressing modes and data transfer instructions.
5) Analyze\(^4\) assembly language programs select appropriate assemble into machine a cross assembler utility of a microcontroller
6) Design\(^6\) and Analyze\(^4\) different types of Interfacing.
SECTION I

**Unit 1: Boolean algebra & logic** [08 hrs]

**Unit 2: Simplification of Boolean functions** [05 hrs]
K – Maps, 2, 3 and 4 Variable Maps. Sum of Products and Product of Sums, Don’t Care Conditions, NAND-NAND and NOR-NOR Implementation

**Unit 3: Combinational logic & Sequential logic** [12 hrs]
Introduction, Binary Adders & Binary Subtractors, Binary to Gray, BCD to Binary, BCD to Excess-3 and Vice Versa, Binary Parallel Adder, Decimal/BCD Adder, Comparators, Decoders, Encoders, Multiplexers, Demultiplexers, Seven Segment Display using 7446/7447, Flip Flops, Shift Registers, Various Counters, Moore Model and Mealy Model.

SECTION II

**Unit 4: 8051 Architecture and Instructions** [10 hrs]
**Unit 5: Assembly Programming Examples**  
[07 hrs]

Copy Block, Shift Block, Count no. of Nulls, Find Checksum, Sum of Natural Numbers, Sum of a Series, Fibonacci Series, Generate a Series. Count 1s in a Byte, Find Largest/Smallest Integers of an Array. Bubble Sorting, Find Sum of Factorials. Compare with External Array, Reverse an Array. Sum of a Series, Generate Prime Numbers.

**Unit 6: Interfacing**  
[06 hrs]

Keyboard, External Memory, Display Devices, DC Motor, Stepper Motor, Servomotor DAC/ADC Interfacing.

**General Instructions:**

1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

**List of Experiments:**

Minimum five experiments based on Hardware and five experiments based on Simulations and at least three experiments based on Interfacing.

**Recommended Books:**

2. Digital Logic and Computer Design, Morris Mano, PHI publications
4. Fundamentals of digital circuits, Anand Kumar, PHI
5. The 8051 Microcontroller and embedded systems, Muhammad Ali Mazidi, Pearson Education.

**Reference Books:**

2. Digital Systems- Principles and Design, Rajkamal, Pearson Education
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) – SEMESTER – V

AC MACHINES

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ISE: InSemesterEvaluation  MSE: MidSemesterEvaluation  ESE: End SemesterEvaluation

Objectives:

1. To give exposure to the students about the concepts of AC machines including the Constructional details, principle of operation and performance analysis.
2. To learn the characteristics of induction machines and to learn how it can be employed for various applications.

Course Outcome:

At the end of this course, the students will be able to

1. **Analyze** the performance of 3-phase induction motors
2. **Determine and analyze** the Losses and efficiency and performance of alternators
3. **familiarize** with principle of operation and application of 1-phase induction motors.
4. **Analyze** performance of special purpose motors and **Make use** of special designed motors for different applications
5. **Analyze** and **Evaluate** performance of different types of alternators
6. **Analyze** the performance of 3-phase induction motors
SECTION I

Unit 1: Introduction of Three phase Induction Motor (09 Hrs)

Construction & types of 3 ph. Induction motors, Rotor quantities (emf, current, frequency, p.f), torque equation, starting torque, running torque (numerical treatment), Factors affecting torque, condition of maximum torque, torque slip characteristics, Need of starters for 3 phase. Induction motors, types of starters (DOL, autotransformer, star-delta, rotor resistance starter, Speed control methods from stator side (Stator voltage control Stator Frequency control, Pole changing) & rotor side (rotor resistance control), Applications of 3 ph. Induction motors

Unit 2: Performance and Characteristics of Three phase Induction Motor (09 Hrs)


Unit 3: Single phase Induction Motors: (06 Hrs)

Double field revolving theory, Construction and working of single phase induction motor (Split phase, capacitor start/run, shadedpole, repulsion type, series motor, universal motor and hysteresis motor) Torque slip characteristics of all the above.

SECTION II

Unit 4: Special Purpose Motors: (05 Hrs)

Construction and working of Synchronous Reluctance motor, switched reluctance motor, BLDC motor, Permanent magnet Synchronous motor, stepper motors, AC and Dc servo motors

Unit 5: Three Phase Alternator (13 Hrs)

Construction, principle of operation of three phase alternator, emf equation, parameters of armature winding, (resistance& leakage reactance), armature reaction (at unity, lagging zero and leading zero power factor), concept of synchronous reactance and synchronous impedance. Equivalent circuit of 3 phase alternator, alternator on load (resistive, inductive & capacitive) OC test & SC test on 3 Phase alternator, short circuit ratio, voltage regulation methods (emf, mmf, zero power factor and direct loading method) with numerical treatment, Losses and efficiency, power flow diagram, need of parallel operation, conditions for
parallel operation, synchronizing procedures, hunting and oscillations in alternators,

**Unit 6: Synchronous Motor (06 Hrs)**

Principal of operation of three phase synchronous motor, staring methods of three phase synchronous motors (using prime mover and damper winding, Phasor Diagram of three phase synchronous motor at Unity, lagging and leading power factor, Effect of excitation on power factor and armature current, V & inverted V Curves, Operation of Synchronous motor as Synchronous Condenser, Application of three phasesynchronousmotor.

**General Instructions:**

1. Batch wise tutorials are to be conducted. The number of students per batch should be as per the university pattern for practical batches
2. Minimum number of assignments should be 6 covering all topics.

**Recommended Books:**

- Electrical Machines, S. K. Bhattacharya, Tata Mc-Graw-Hill publication
- B. L. Theraja “A textbook of Electrical Technology” Volume II S. Chand Publishers, New Delhi

**Reference Books:**

- Electric Machinery, A. E. Fitzgerald, Mc-Graw Hill publications VIdition
- Electrical Machines, AshfaqHussain, DhanpatRai&Sons
- Electrical Machinery, P S Bhimbhra, Khanna Publications

**List of Experiments:**

Minimum eight experiments from the following list of experiments should be performed in the laboratory:

- Determination of efficiency & speed regulation of 3 phase SCIM by indirect loading method
- Determination of equivalent circuit parameters of 3 Ph SCIM by conducting No Load& Blocked
Rotor Test.

- Determination of efficiency & speed regulation of 3 phase slip ring induction motor by direct loading method.
- Determination of efficiency & speed regulation of 3 phase slip ring induction motor by indirect loading method.
- Study of starters for 3 Ph induction motors
- Performance of three phase induction motor under single phasing fault
- Speed control methods of 3 Ph. SCIM
- Speed control methods of 3 Ph. Slip ring I.M
- Determination of efficiency & speed regulation of 1 phases induction motor
- Determination of Voltage regulation of an alternator by EMF method
- Determination of Voltage regulation of an alternator by MMF method
- Determination of Voltage regulation of an alternator by ZPF method
- Determination of Xd and Xq by Sliptest
- Performance of synchronous generator connected to infinite bus, under constant power and variable excitation & vice versa
- Determination of V and Inverted V curves of a synchronous motor
- Determination of efficiency of synchronous motor by indirect loading
- Determination of efficiency of synchronous motor by direct loading
- Determination of load sharing by paralleloperation
- Determination of efficiency of Alternator by direct loading method
SHIVAJI UNIVERSITY, KOLHAPUR

THIRD YEAR B.TECH (ELECTRICAL) SEMESTER - V

POWER SYSTEM-II

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ISE: InSemesterEvaluation  MSE: MidSemesterEvaluation  ESE: End SemesterEvaluation

Objectives:

1. Develop analytical ability for Power system.
2. Analysis of symmetrical and Unsymmetrical fault conditions
3. Demonstrate different computational methods for solving problems of load flow
4. Power factor improvement techniques and substation engineering

Course Outcomes:

After completion of this course students will be able to:

1. Understand the need of power factor improvement and substation layout.
2. Identify sequence components and to draw sequence network of different Power system component
3. Analyze power system in P.U and will be able to represent power system with its components
4. Evaluate system fault Analysis
SECTION I

Unit 1: Power system Components

Single phase representation of Balanced 3 phase Networks, OLD & Impedance & Reactance Diagram, Per Unit System- P.U. Representation of Transformer, P.U. Impedance Diagram of Power system, Steady State Model of Synchronous Machine, Representation of Loads, Numerical treatment expected

Unit 2: Symmetrical Fault Analysis

Short circuit transients on transmission line Short Circuit on Unloaded Synchronous machine, Short Circuit on loaded Synchronous machine ,Selection Checklist for circuit breaker, Short circuit MVA, Algorithm for Short circuit studies , Z- Bus Formulation, Numerical treatment expected

Unit 3: Symmetrical Components

Sequence Impedances Synchronous machine. Sequence Impedances Transformer, Construction of Sequence network of Power Systems, Numerical treatment expected

SECTION II

Unit 4: Unsymmetrical Fault Analysis

Symmetrical component analysis of Unsymmetrical Faults, Analysis of Single Line to Ground (LG) fault, Line-To-Line (LL) fault, Double-Line-To-Ground (LLG) fault, One conductor open fault, Bus Impedance Matrix for analysis of Unsymmetrical shunt faults, Numerical treatment expected

Unit 5: Load Flow Analysis


Unit 6: Power Factor Improvement and Substation Engineering

Causes, Disadvantages of low power factor and power factor improvement Methods,Substation Grounding, Direct Lightning stroke shielding of substations, Role of Substations in Smart Grids.
General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

List of Experiments

Minimum 10 experiments/simulations based on above curriculum should be performed.

Recommended Books:


Reference Books:

5. Power System Operation & Control, K. Uma Rao, Wiley Publication
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) – SEMESTER – V

ADVANCED CONTROL SYSTEM

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ISE: In Semester Evaluation MSE: Mid Semester Evaluation ESE: End Semester Evaluation

Course Objectives:

1. To make students understand the concept of control design techniques, Compensation Techniques, design in frequency domain and design of PID control system
2. To study the control system design by root locus method
3. To study the control system design by Bode plot method
4. To make students understand the concept of state space analysis
5. Demonstrate the design of state space
6. To study the digital control system Z-Transform and sampling, mapping between S-Plane & Z-Plane, stability analysis, transient & steady state analysis.

Course Outcomes:

1. The students will be able to design a compensation techniques like Lag, Lead and Lead-Lag Controllers in frequency domain, design of PID controller
2. Derive and Design a Lead, Lag, and Lead-Lag Compensation using Root Locus
3. Derive and Design a Lead, Lag, and Lead-Lag Compensation using Bode Plot
4. Analyse the state space representation of digital control system, derive state space equation, and its Transfer function
5. Design a state space using controllability, Observability, Pole Placement techniques for controller, Pole placement technique by Transformation method, Direct Substitution Method and by Ackermann’s formula
6. The students will be able to understand the digital control system of Z-Transform and sampling, mapping between S-Plane & Z-Plane, stability analysis, transient & steady state analysis.
SECTION I

**Unit –I Basics of Control Systems [6 Hrs]**
Classical Control Design Techniques Compensation techniques – Lag, Lead, Lead-Lag Controllers design in frequency Domain, Design of PID control system.

**Unit –II Control System Design by Root Locus [9Hrs]**
Review of Root Locus, Cascade Lead compensation, cascade Lag compensation, cascade Lead-Lag compensation, Series and parallel compensation, Effect of addition of poles and zeros, Design of Lead compensation based on Root Locus approach, Design of Lag compensation based on Root Locus approach, Design of Lead-Lag compensation based on Root Locus approach, Root Locus of system with dead time.

**Unit –III Control System Design by Bode Plot [9Hrs]**

SECTION II

**Unit –IV State Space Analysis [6 Hrs]**
State space representation of digital control system, Solving state space equation, Pulse transfer function.

**Unit –V State Space Design [9Hrs]**
Review of State Space, Controllability, Observability (Kalman's test & Gilbert's test), Pole placement technique for controller design, State Feedback Law, Pole placement technique by Transformation method, Direct Substitution Method and by Ackermann’s formula.

**Unit –VI Digital Control System [9Hrs]**
General Instructions:

Term Work- Minimum 8 to 10 MATLAB based experiments based on above syllabus should be performed.

Textbooks:


Reference Books:

SHIVAJI UNIVERSITY, KOLHAPUR

THIRD YEAR B.TECH (ELECTRICAL) SEMESTER - V

SIGNALS AND SYSTEMS

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ISE: InSemesterEvaluation  MSE: MidSemesterEvaluation  ESE: End Semester Evaluation

Objectives:

1. This course intends to provide basic knowledge of theoretical structure, formal representation, computational methods, notation, and vocabulary of linear models.
2. It is aimed to impart skills to perform signal analysis with reference to spectrum analysis of deterministic signals

Course Outcomes: After completion of this course students will be able to:

1. Define CT and DT signals mathematically and Classify systems based on their properties
2. Explain concept of LTI system and Evaluate convolution.
3. Make use of Laplace transform to analyze CT signals and systems.
4. Make use of Z transforms to analyze DT signals and systems.
5. Determine Fourier transforms for CT & DT.
6. Explain sampling theorem in time domain and frequency domain.

SECTION I

Unit 1: Introduction to signals & systems (6 Hrs)

Continuous & discrete signal: size of signal, signal operations, classification of signals, standard test signals, singularity functions. Continuous & discrete systems: Classification of systems, system models of Electrical systems
Unit 2: Description and analysis of system (7 Hrs)
Continuous & discrete systems: zero state response, zero input response, convolution sum and convolution integral, graphical representation of convolution, block diagram representation of differential and difference equation, FIR and IIR systems

Unit 3: System Analysis using Laplace transform (6 Hrs)
Laplace transform: A brief introduction to Laplace transform its properties and inverse Laplace transform, transfer function analysis, solution of LTI differential equation.

SECTION II

Unit 4: System analysis using Z-transform (6 Hrs)
A brief introduction to Z-transform, its properties & inverse – Z transform, connection between Laplace transform and Z–transform, transfer function analysis, solution of LTI difference equation, and stability in Z-domain.

Unit 5: Fourier analysis of continuous & discrete signals (8 Hrs)
Periodic representation by trigonometric Fourier series, Fourier spectrum, Dirichlet’s condition, exponential Fourier series, exponential Fourier spectra, Parseval’s theorem, Fourier transform and its properties, Relation between Fourier and Laplace Transform, Fourier spectrum. DTFT, Properties and symmetrical properties of DTFT, Convergence of DTFT: Gibb’s Phenomenon.

Unit 6: Sampling (4 Hrs)
Representation of continuous time signals by its samples, The sampling theorem, Reconstruction of signals from its sample s using interpolation, The effect of under sampling, aliasing, Discrete time processing of continuous time signals, Sampling in the frequency domain.

General Instructions:
1. Minimum number of tutorials should be 8 covering all topics.
Text Books:

1. Linear systems and signals, B. P. Lathi, Oxford University Press, 2nd edition, 2005
2. Signals and systems, Simon Haykin, Wiley Publications

Reference Books:

5. Signals and Systems by Dr.D.D.Shaha and Dr.A.C.Bhagali, MPH.
Objectives:

Students are expected to solve Electrical Engineering problems using any available software tools such as MATLAB/Simulink, C, C++, PSIM, ETAP, PSCAD, MIPOWER, Power World Simulator, SKM Power Tools, VISIO, AUTOCAD, PSPICE, LABVIEW etc. Sample tasks are enlisted below.

Minimum 12 tasks should be performed as a part of term work.

1. Programming of at least 3 numerical methods for solving nonlinear equations.
2. Simulation of Electrical Machines such as transformers, DC machines and AC machines and evaluation of their performance parameters.
3. Simulation of electrical R-L-C networks, resonant circuits, filter circuits and plotting their input-output waveforms.
4. Simulation of power system networks and its performance analysis (load flow analysis, short circuit analysis, transient analysis, stability analysis, relay coordination etc.)
5. Simulation of DC-DC, DC-AC, AC-DC and AC-AC converter circuits, plotting their input output waveforms and performing their analysis.
7. Simulation of hybrid power system (Wind, Solar, Solar Series/Parallel).
8. Design of typical control panel for industrial application.
General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.

Recommended Books:

4. L. Ashok Kumar, A. Kalaiarasi, Y. Uma, “Power Electronics with MATLAB” Cambridge University Press 2017
Objectives:

1. To expose students to Different domestic appliances and luminaries.
2. To familiarize procedure of troubleshooting and maintenance of electrical appliances

Course Outcomes:

After completion of this course students will be able to:

1) Apply Knowledge to maintain the different electrical appliances
2) Construct And repair domestic appliances
3) Design and troubleshooting of UPS and Inverters
4) Illustrate basic concepts of illumination.
5) Designing of lighting for domestic purpose
6) Designing of lighting for special purpose

SECTION I

Unit 1: Fundamentals of Domestic appliances (6 Hrs)

Principle of heating appliances, motoring appliances, construction, dismantling, reassembling, testing and repairing of: electrical iron, electric kettle, electric emersion heater, electric geysers, electric toasters, electric fans, battery operated torch, coffee percolator and electrical mixer.

Unit 2: Domestic appliances (6 Hrs)

construction, dismantling, reassembling, testing and repairing of: heat convector(blower), room cooler, electric washing machine, hair dryer, electric vacuum cleaner, emergency light, domestic refrigerator, water cooler, air conditioner (window type)
Unit 3: Study of UPS and inverter (6 Hrs)
Introduction to UPS, Construction and operating principle of different UPS systems: Standby, line interactive standby ferro, standby online hybrid, double conversion online, delta conversion online, elements of UPS: Relay, transformer, battery, fuse/fuse holder, switches, sockets, panel indicator, meter
Introduction to inverter, working principle of inverter, Construction and operating principle of different inverters, classification of inverters, sine wave inverter and square wave inverter, testing and troubleshooting of inverters

SECTION II

Unit 4: Fundamentals of illumination (6 Hrs)
Basics of illumination, Laws of illumination, polar curves and its applications for designing the lamp, concept of photometry, measurement of illumination, lighting calculation methods: watt per meter square method lumens method point to point method

Unit 5: Types of Lamps (6 Hrs)
Incandescent lamp, fluorescent lamp, sodium vapour lamp, mercury vapour lamp metal halide lamp, neon lamps, LED, CFL, LASER Selection criteria for lamps.

Unit 6: Lighting for special applications (6 Hrs)
Factory lighting, street lighting, flood lighting, Railway lighting, lighting for advertisement/hording lighting, agriculture and horticulture lighting, health care centers, hospitals, decorating purpose stage lighting, aquarium and shipyards lighting and special purpose lamps used in photography video films

General Instructions:
- The number of students per batch should be as per the university pattern for practical batches.
- Minimum number of assignments should be 6 covering all topics

Recommended Books:
- Study of Electrical Appliances and devices, K. B. Bhatia, Khanna Publishers
- Lighting engineering; applied calculation, Simons R.H. Bean Robort, Architectural Press

Reference books:
- Handbook of Industrial Lighting, Butterworths, Lyon Stanley
SHIVAJI UNIVERSITY, KOLHAPUR

THIRD YEAR B. TECH (ELECTRICAL) SEMESTER - V

DOMESTIC /INDUSTRIAL ELECTRICAL INSTALLATION, ESTIMATION AND COSTING
(Open Elective – I)

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ISE: InSemesterEvaluation  MSE: MidSemesterEvaluation  ESE: End Semester Evaluation

Objectives:
7. This course is intended to provide basic knowledge of different material required for electrical installation
8. It intends to impart skills to select suitable electrical equipments for installation.
9. It develops ability of estimate and costing of electrical installation.

Course Outcomes: After completion of this course students will be able to:
7) Explain & Evaluate concept of domestic and industrial wiring
8) Define & Explain concepts of Estimating and concepts of contracting
9) Analyze & Design Estimating And Costing of Domestic And Industrial Wiring
10) Explain & Evaluate concept Estimating and Costing of Service Connection
11) Analyze & Design Estimation of Transmission line
12) Analyze & Design Estimation of Overhead and Underground Distribution System

SECTION I

Unit 1: Electrical Wiring
(6 Hrs)
Different types of wires, wiring system and wiring methods,Comparison of different types of wiring, Specifications of Different types of wiring materials, Accessories
Different types of wiring tools, Domestic and industrial panel wiring, different types of wiring circuits, I.E. rules for wiring, Electricity supply act-1948

Unit 2: Elements of Estimating and concepts of contracting
(6 Hrs)
Introduction to estimation & estimation tools, Electrical Schedule of rates, catalogues, Survey and source selection, recording estimates. Determination of required quantity of material, Labor conditions, Determination of cost material and labor, Contingencies, Overhead charges, Profit, Purchase system, Purchase enquiry and selection of appropriate purchase mode, Comparative statement, Purchase orders, Payment of bills, Terms, conditions

**Unit 3: Estimating And Costing of Domestic And Industrial Wiring** (8 Hrs)
Principles of circuit design in lighting and power circuits, Procedures for designing the circuits and deciding the number of circuits, Method of drawing single line diagram, Selection of type of wiring and rating of wires and cables, Load calculations and selection of size of conductor, Selection of rating of main switch, distribution board, protective switchgear ELCB and MCB and wiring accessories, Earthing of residential Installation, Sequence to be followed for preparing estimate, Preparation of detailed estimates and costing of residential installation, Important considerations regarding motor installation wiring, Determination of input power, input current to motors, rating of cables, rating of fuse, size of Conduit, size of distribution Board, main switch and starter. Preparation of detailed estimates and costing industrial installation, I.E. rules observed for abovewiring.

**SECTION II**

**Unit 4: Estimating and Costing of Service Connection (Domestic and Industrial): (7Hrs)**
Concept of service connection, Types of service connection and their features, Method of installation of service connection(1-phase and 3-phase), Lay out/ wiring diagram of service connection list of materials and accessories along with specifications required for given installation work, Estimation of service connection for domestic and industrial (1-phase and 3-phase) I.E. rules pertaining to abovewiring.

**Unit 5: Estimation of Transmission line:(5Hrs)**
Main components of overhead lines, Line supports, Factors governing height of pole, Conductor materials, Determination of size of conductor for overhead Transmission line, Cross arms, Pole brackets and clamps, Guys and Stays, Conductors configuration spacing and clearances, Span lengths, Overhead line insulators, Insulator materials Lightning Arrestors, Points to be considered at the time of erection of overhead lines, Erection of supports, Setting of stays, Earthing of lines, Guarding of overhead lines, Clearances of conductor from ground, Spacing between supports conductors,important specifications and sketches List of materials and accessories required for the given project estimate for material required I.E. rules pertaining to aboveproject
**Unit 6: Estimation of Overhead and Underground Distribution System (4Hrs)**

Survey work for estimation of overhead and underground distribution system. Planning and layout of project. List of materials and accessories required for the given project. Procedure for preparing estimate for 440 V, 3-phase, 4 wire or 3 wire overhead and underground distribution system. Necessary drawing/sketches of overhead and underground system. I.E. rules pertaining to above project.

**General Instructions:**
- 3. The number of students per batch should be as per the university pattern for practical batches.
- 4. Minimum number of assignments should be 6 covering all topics.

**Term Work:**
- Minimum 6 number of assignments should be covering all topics
- 1. Draw different types of wiring circuits
- 2. Prepare a tender for installation of distribution transformer and give procedure for inviting and scrutinizing tender
- 3. Prepare detailed estimates and costing of residential installation & draw layout of it
- 4. Draw wiring diagram of domestic and industrial service connection (1-phase and 3-phase)
- 5. Sketches List of materials and accessories required for installation of Transmission line
- 6. Prepare estimation of 440V, 3-phase, 4 wire or 3 wire overhead and underground distribution system & draw layout of it

**Recommended Books:**

**Reference Books:**
Objectives:

1. Imparting Basic knowledge of Digital Signal Processing
2. To develop skills of filter design.
3. It is intended to learn basics of Digital Signal Processors
4. Overview of communication systems

Course Outcomes: After completion of this course students will be able to:

1. Explain & Evaluate concept of convolution, DFT & FFT
3. Analyze & Construct DSP filter.
4. Illustrate & Distinguish DSP processors
5. Define & Explain various modulation techniques

SECTION I

Unit 1: Discrete Fourier Transform (10 Hrs)


Unit 2: FIR Filter Design & Realization (8 Hrs)

phase and Linear phase), Cascade and Parallel realization

**Unit 3: IIR Filter Design & Realization (8 Hrs)**

Introduction to IIR Filters, IIR Filter Designing using Impulse Invariant method and Bilinear Transformation method, Butterworth Filter approximation, Frequency Transformation. IIR realization- Direct form I and II, Cascade and parallel realization

**SECTION II**

**Unit 4: DSP Processors (6 Hrs)**

Introduction, Architecture of DSP Processor, TMS320C67XX, Specifications, Comparison between general purpose and DSP Processors.

**Unit 5: Amplitude Modulation (8 Hrs)**

Base-band and carrier communication, amplitude modulation -DSB, AM, AM, SSB, VSB, carrier acquisition, super heterodyne AM receiver.

**Unit 6: Angle Modulation (8 Hrs)**

Concept of instantaneous frequency, band-width of angle modulated waves, generation of FM waves, demodulation of FM, Interference in angle modulated systems, FM receiver.

**General Instructions:**
Minimum number of assignments should be 8 covering all topics.

**Recommended Books:**

2. Digital Signal Processing Salivahanam, AVallavaraj, C. Guanapriya, TMH

**Reference Books:**

1. Digital Signal Processing, Tarun Kumar Rawat (Oxford)
2. Digital Signal Processing SanjeetMitra, MGH
3. Digital Signal Processing- Dr. A. C. Bhagali, MPH
5. Digital Signal Processing P. Ramesh Babu, Scitech publication
SHIVAJI UNIVERSITY, KOLHAPUR

THIRD YEAR B.TECH (ELECTRICAL) SEMESTER -VI

ELECTRICAL MACHINE DESIGN

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ISE: InSemesterEvaluation  
MSE: MidSemesterEvaluation  
ESE: End Semester Evaluation

Objectives:

1. This course intends to provide basic knowledge of design process of simple Electrical machines.
2. It is aimed to impart skills to perform and apply basics of Electrical Engineering for design of Electrical machines
3. It is aimed to impart knowledge of software applications for electrical machine design.

Course Outcomes: After completion of this course students will be able to:

1) Recognize thefundamentals and essential standards to design electrical machine
2) Design of entire transformer in detail
3) Design of armature, field winding and Commutator of DC machines
4) Design of stator core, stator winding and rotor bars of three phase induction motor
5) Design of different parts of synchronous machine
6) Design of transformer, induction motor, DC machines and synchronous machines using Computer application.

SECTION -I

Unit 1: Fundamentals of electrical Machine Design (08 Hrs)

General consideration in the design, limitations in the design, output coefficient and their standard values for various machines, effect of size & ventilation on specific electric and magnetic loading. Different Indian Standard Specifications (ISS).

i) Magnetic circuits – Formulae for air and iron parts, calculations for magnetic circuits of electric
machines, estimation of no load current, determination of leakage fluxes and reactance calculations, design of electromagnets.

ii) **Mechanical Design** – design of shafts, choice and types of bearings, determination of mechanical strength of rotors, design consideration of cooling fans and frames.

**Unit 2: Design of Transformer**

Classification of transformer (Core type, Shell type transformer), Comparison of core and Shell Type transformer, Single phase & 3 Phase transformer connections, Core Cross Section, Cooling of transformer, transformer Insulation using Oil & other materials. Output equation of transformer, Relation between Core Area & Weight of iron & copper, Design for minimum cost, Design for minimum loss or maximum efficiency, variation of Output & losses in transformer with linear Dimensions, Design of Core (rectangular core, Square & stepped Cores), Variation of Core Diameter, Selection of core areas & type of core, Choice of Flux Density, design of winding, Windows Space Factor, Windows Dimensions, Overall Dimensions, Simplified Steps for transformer Design. Resistance of Winding, Mechanical Forces, No load currents, No load current of 1ph transformer, No load current of 3phase transformer, Design of Tank with Tubes, Core Design, Winding Design, Window Area

**Unit 3: Design of DC Machines**


**SECTION -II**

**Unit 4: Design of Three Phase Induction Motor**

Main Dimension, stator Winding,(Turns Per Phase, Stator Conductors), Shapes of Stator Slots, No of Stator Slots, Area of stator Slots, Length Of Mean Turn, Stator Teeth, Stator Core, Rotor Design, length of air gap, Relation For Calculations of Length of air gap, No of Rotor Slots,(Rules For Selecting Rotor Slots, Reduction of Harmonic torques), Design of rotor bars & Slots, (Rotor Bar Currents, Area of Rotor Bar, shapes& Size Of Rotor Slots, Rotor Slot Insulations), Design of End Rings.
**Unit 5: Design of Synchronous Machine**  
(8 Hrs)

Construction of water wheel and turbo alternators. Different parts and materials used for Synchronous machine, choice of electric and magnetic loadings, Output equation. Determination of diameter and length, effect of short circuit ratio on machine performance.

**Unit 6: Computer Applications in electrical machine design**  
(8Hrs)

Benefits of computer in machine design, methods of approach, optimization and computer aided design of three phase transformer, three phase induction motor, DC Motor and synchronous machine

**Term work:**

1. The term work shall consist of six drawing sheets and four sheets should be drawn using suitable software

**Recommended Books:**


**Reference Books:**

2. Computer Aided Design for Electrical Machines, Vishnu Murthy, B.S. Publications
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) SEMESTER - VI

POWER SYSTEM STABILITY AND CONTROL

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**ISE**: InSemesterEvaluation
**MSE**: MidSemesterEvaluation
**ESE**: End Semester Evaluation

**Objectives**:  
1. Perform fundamental computation and modeling of power system control and stability.  
2. Develop skills to model control devices that can be incorporated in power system simulations.  
3. Analyze dynamic behavior of power control systems subject to various disturbances from the aggregated behavior of the many dynamic devices.

**Course Outcomes**:  
After completion of this course students will be able to:  
2. To develop ability to analyze and use various methods to improve stability of power systems.  
3. Evaluate Methods of Improving Stability  
4. To illustrate the automatic frequency and voltage control strategies for single and two area case.  
5. To understand formulation of unit commitment and economic load dispatch tasks and solve it using optimization techniques  
SECTION I

Unit 1: Introduction to Power System Stability & Control (6 Hrs)

Unit 2: Power system Stability (10 Hrs)

Unit 3: Methods of Improving Stability (10 Hrs)
Transient Stability Enhancements:- High Speed Fault clearing, Reduction of transmission system reactance, regulated shunt compensation, dynamic Braking, Reactor Switching, Controlled system Separation & Load Shedding – High Speed Excitation & Control, Discontinuous Excitation Control, Small Signal Stability Enhancement-Power system Stabilizers, Supplementary Control of SVC.

SECTION II

Unit 4: Power System Control (10 Hrs)
Load frequency control (Single and two area case) modeling of generator, governor, prime mover, Load frequency control and economic dispatch, automatic generation control, steady state analysis and dynamics response of an isolated power systems, automatic voltage control, reactive power control.

Unit 5: Optimal Power System Operation (8 Hrs)
Load duration curve, load factor, diversity factor, plant capacity factor, plant utilization factor, Load Forecasting, Optimal Unit commitment, Economic load Dispatch [with/without Transmission line Losses & Generator Limits], NUMERICALS EXPECTED.

Unit 6: Power System Security (4 Hrs)
General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

List of Experiments

Minimum 10 experiments/simulations based on above curriculum should be performed.

Recommended Books:

3. Power System Operation and Control, Dr. K Uma Rao, Wiley India Publication

Reference Books:

Objectives:
1. To expose students to the operation, application and control of power conversion systems employing electric drive to cater to industrial needs.
2. To familiarize the operation principles, and design of starting, braking, and speed control converters arrangements for electric motors and their applications.
3. To provide strong foundation to assess performance of different industrial drives considering issues such as, energy efficiency, power quality, economic justification, environmental issues, and practical viabilities.

Course Outcomes:
After completion of this course students will be able to:
1. Understand the concept, classification, Parts and advantages of electrical drives with types of loads and conditions of dynamic and stability considerations.
3. Outline of Chopper operation, configuration and control techniques to control the DC Motor.
5. Appraise the rotor resistance control method of Induction motor drive in Rotor side control.
6. Appraise the speed and frequency control method of synchronous motor.
SECTION I

Unit 1: Introduction to Electrical drives: (4Hrs)
Concept of Electrical drive, Classification of Electrical drives, Parts of Electrical drive, Advantages of Electrical Drives, Types of loads and their characteristics, Motor load interaction, Dynamic conditions in Electrical drives, Stability considerations in Electrical drives

Unit 2: Control of DC motor (6Hrs)

a) Single Converters
Introduction, review of Classification of dc motors and their speed control, Electric braking of dc motors, Block Diagram of Electrical Drive, Single phase Controlled Converter for Separately Excited dc motor Drives, DC series Motor Drives, Introduction to 4 quadrant operation of dc motor, Single phase Dual Converter for Four Quadrant Operation

b) Three-Phase Converters

c) Chopper
Introduction, Principle of chopper Operation, Classification of Chopper Circuits (single quadrant and four quadrant operation of chopper), Performance of chopper Fed Separately Excited dc Motors, introduction to closed loop system

Unit 3: Induction Motor Drives: Stator side control: (8Hrs)

a) Stator voltage control:
Introduction, review of types of 3 phase Induction motors, Torque-speed characteristic of 3 phase Induction motor, Stator Voltage Control using different 3 phase AC voltage controllers, Introduction to closed loop control using stator voltage control

b) Stator Frequency control:
Introduction, Variable Frequency Characteristics, Block Diagram of Variable Frequency Speed Control, V/f control, Voltage Source Inverter (VSI) fed induction motor drive, Braking and multi quadrant operation of VSI fed induction motor drive, Variable Frequency Control From a current Source inverter (CSI), comparison of VSI and CSI drives, Introduction of Closed loop speed Control for VSI fed
Induction Motor Drives, Basic operation of Pulse Width Modulated Inverter Fed Induction motor Drive

SECTION II

*Unit 4: Induction Motor Drives:* (6Hrs)

**Rotor side control:**
Introduction, Conventional Rotor Resistance Control, Rotor Resistance Control using power converters, Slip Power Recovery Schemes (Static Kramer drive, Static Scherbius drive), Introduction to Vector control of Induction motor

*Unit 5: Synchronous Motor Drives and Brushless DC Motor Drives:* (6Hrs)

*Unit 6: Special Drives :* (6Hrs)

**General Instructions:**
1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

**List of Experiments**
Minimum eight experiments and two simulations based on above curriculum should be performed

**Recommended Books:**
1. Power Semiconductor Drives, S. Sivanagaraju, M. B. Reddy, A. M. Prasad, PHI, Delhi
3. Electric Drives, N. K. De, P. K. Sen

**Reference Books:**
1. Electrical Machines & Drives, A First course, Ned Mohan, Wiley Publications
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) SEMESTER –VI

ELECTRICAL INSTALLATIONS TESTING AND MAINTENANCE

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ISE: In Semester Evaluation  
MSE: Mid Semester Evaluation  
ESE: End Semester Evaluation

Objectives:

1. Identification of tools and equipment’s used for installation and maintenance of electrical equipment.
2. To understand practical aspects of condition monitoring and maintenance of various electrical equipment.
3. To make students aware of electrical safety and IERules
4. To increase interest towards electrical installation

Course Outcomes:

After completion of this course students will be able to:

1. Read and interprets electrical installation drawings
2. Understand and apply IERules
3. To learn testing methods of various electrical equipment
4. Describe corrective and preventive maintenance of electrical equipment’s.
SECTION I

Unit 1: Electrical Tools, Accessories, Electrical installations and IE rules: (06 Hrs.)

Tools, Accessories and Instruments required for Installation, Maintenance and Repair Work, Safety Codes
Causes and Prevention of Accidents, Artificial Respiration, Workmen’s Safety Devices, General requirements of
electrical installation, electrical engineering symbols, schematic, understanding of wiring diagram and its single
line representation, IE rules related to electrical installation. Earthing / Grounding, Necessity types of Earthing.

Unit 2: Maintenance Strategies, Dielectric Theory, Insulating Materials, Failure Modes, and
Maintenance Impact on Arc-Flash Hazards: (04 Hrs.)

Introduction, Why Maintain and Test, Overview of Electrical Maintenance and Testing Strategies, Planning an
EPM Program, Overview of Testing and Test Methods, Insulating Materials for Electrical Power Equipment,
Maintenance of Protective Devices and their Impact on Arc-Flash Hazard Analysis

Unit 3: Domestic Installation: (04 Hrs.)

Introduction, Testing of Electrical Installation of a Building, Testing of Insulation Resistance to Earth, Testing
of Insulation and Resistance between Conductors Continuity or Open Circuit Test, Short Circuit Test, Testing
of Earthing Continuity, Location of Faults, IE Rules for Domestic Installation.

SECTION - II

Unit 4: Maintenance of Cables: (04 Hrs.)

Cable Failures and Their Analysis, Field Testing of Medium-Voltage Cables, Latest Trends in Cable Condition
Monitoring and Aging Assessment, Cable Fault Locating Methods

Unit 5: Condition Monitoring and Testing of Electrical Equipment: (04 Hrs.)

Failure modes of transformer, Condition monitoring of oil as per the IS/IEC standards, Filtration/reconditioning
of insulating oil, Condition monitoring of transformer bushings, On load tap changer, dissolved gas analysis,
degree of polymerization. Induction motor fault diagnostic methods – Vibration Signature Analysis, Motor
Current Signature Analysis.

Unit 6: Industrial Installation: (05 Hrs.)

Industrial load, Design considerations of electrical installation in small industry/factory/workshop, selection of
size for wires, cables required for the machines and its controlling unit, length and size of cable required for the
every industrial load, ratings of wiring accessories, main switch, bus bar MCB, ELCB etc. for industrial load,
methods of earthing for industrial installation, list of material for industrial installation
General Instructions:

1. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be 8 covering all topics.

List of Experiments

1. Drawing of Electrical symbols
2. Single line diagram of Domestic wiring (of one House)
3. Electrical load calculation of single house /apartment.
4. Operation of MCB and ELCB
5. Study of different methods of Earthing.
6. Study of electrical installation in small industry/factory/workshop
7. Preparation of Tender /Quotation
8. Preparation of Comparative statement
9. One visit to understand Electrical wiring and Installation.

Recommended Books:

Reference Books:
1. Testing, Commissioning, Operation and
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) SEMESTER -VI

ELECTRICAL ENERGY AUDIT AND CONSERVATION
(Open Elective -II)

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ISE: InSemesterEvaluation  MSE: MidSemesterEvaluation  ESE: End Semester Evaluation

Objectives:

1. Provides basic understanding of energy audit and conservation
2. Essential theoretical and practical knowledge about the concept of energy conservation.
3. Economic aspects of energy conservation project and energy audit
4. Different approaches of energy conservation in industries

Course Outcomes: After completion of this course students will be able to:
1) Prepare energy flow diagrams and energy audit report.
2) Carryout energy audit for Mechanical Systems.
3) Relevant tariff for reducing losses in facilities.
4) Interpret energy conservation policies in India.
5) Identify and evaluate the energy conservation opportunities in different electric system.
6) Identify and assess energy conservation opportunities in thermal system.

SECTION I

Unit I: Energy Audit system aspect  (6 Hrs)
General philosophy, current practices, need of energy audit and its types, methodology of energy audit and approach, Energy audit (definition as per energy conservation act), specific energy consumption, Instruments for Audit and Monitoring Energy and Energy Savings, Types and Accuracy, energy flow diagram (Sankey), simple payback period, energy audit procedure (walk through audit and detailed audit), energy audit report format

Unit II: Energy Audit in mechanical  (7 Hrs)

**Unit III: Tariff**  
(5Hrs)

Types of tariff structure: LT and HT, special tariff, time-off-day tariff, Peak-of-day tariff, power factor tariff, maximum demand tariff, load factor tariff and availability based tariff (ABT), application of tariff system to reduce energy bill.

**SECTION II**

**Unit IV: Energy Conservation basic**  
(5 Hrs)

Energy scenario: Primary and secondary energy, energy demand and supply, national scenario, energy conservation and energy audit: concept and difference, energy conservation Act 2001: relevant clauses of energy conservation, BEE and its role, MEDA and its role, star labeling: Need and its benefits

**Unit V: Energy conservation in Electrical Machine**  
(6 Hrs)


**Unit VI: Energy Conservation in Mechanical System**  
(7Hrs)

Potential energy, conservation forces, distinction between conservative and non-conservative forces, potential energy functions, spring potential energy, conservation of mechanical energy: gravitation, spring, conservative force and potential energy function, conservative force for a Hypothetical Potential Energy Function, energy diagram, gravitational potential energy, scape speed

General Instructions:

1. Minimum number of assignments should be 6 covering all topics.
2. Submit one Energy audit report.

Recommended Books:

3. Principle of power Systems by V K Mehta S chand Publication
4. Energy Management: W.R.Murphy, G.Mckay, Butterworths Scientific

Reference Books:
1. Energy Audit and Management, Volume-I, IECC Press
9. Energy Conservation guide book Patrick/Patrick/Fardo (Prentice Hall)

List of Experiment:
1. Computing efficiency of DC motor/Induction Motor/Transformer
2. Identify star labeled electrical apparatus and compare the data for various star rating.
3. Calculating the efficiency of boiler / blowers / compressors etc.
4. Study of APFC panel or Estimating the requirement of capacitance for power factor improvement.
5. Study of various energy efficient equipment like LED lighting devices, Energy Efficient motors, Electronics ballast etc.
6. Soft starting of an induction motor
7. Study of Variable frequency drive based IM speed control for energy conservation.
8. Industry visit with an aim of
   (i) Studying various energy Audit systems prevailing in a particular industry/Organization
   (ii) Identifying the various energy conservation methods useful in a particular industry
9. Studying the various energy conservation methods useful in power generation, transmission and distribution
10. Study of various measuring instruments used for energy audit : Lux meter, Power analyzer, flue gas analyzer
11. Prepare a technical report on energy conservation act 2003
SHIVAJI UNIVERSITY, KOLHAPUR
THIRD YEAR B.TECH (ELECTRICAL) SEMESTER – VI

PLC & SCADA
(Open Elective-II)

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ISE: InSemesterEvaluation MSE: MidSemesterEvaluation ESE: End Semester Evaluation

Objectives:
4. To expose students to PLC, Input/Outputs and I/O Processings.
5. To familiarize the Ladder and Functional Programming, IL, SFC, and ST Programming methods, Jump and call, Timers, Counters and Shift Registers
6. To expose students Introduction to SCADA, system components architecture and Applications.

Course Outcomes: After completion of this course students will be able to:
7. Describe architecture and hardware connections of PLC
8. Basics of I/O Processing, Ladder and Functional Block Programming, IL, SFC and ST Programming, Internal Relays
9. Outline of Jump and Call, Timers, Counters, and Shift Registers
10. To describe introduction, evaluation, communication SCADA.
11. To describe system components, HMI and applications of SCADA.
SECTION I

Unit 1: Introduction to PLC: (7Hrs)
Programmable logic controller hardware and internal architecture, PLC systems basic configuration and development, Input/output Devices, Examples of Applications, I/O Processing
Input/output units, Signal Conditioning, Remote Connections, Networks, Processing inputs, I/O Address

Unit 2: Ladder and Functional Block Programming (7Hrs)
Ladder Diagrams, Logic Functions Latching, Multiple Outputs, Entering Programs, Function Blocks, Program examples

IL, SFC and ST Programming Methods: Instruction Lists, Sequential Function Charts

Unit 3: Jump & Call, Timers, Counters, Shift Registers (5Hrs)
Jump, Subroutines, Types of Timers, On-Delay Timers, Off-Delay Timers, Pulse Timers, Retentive Timers, Programming Examples, Forms of Counter, Programming, Up- and Down-Counting, Timers with Counters, Sequencer, Shift registers, Ladder Programs

SECTION II

Unit 4: Introduction to SCADA (7Hrs)
Introduction, Data Acquisition system(DAS)-single, double, sensors, signal conditioning, sample and hold circuit, ADC-integrating, successive approximation, Evaluation of SCADA, communication of SCADA, selection criteria of DAS.

Unit 5: SCADA system components (5Hrs)
Introduction, Remote Terminal Unit(RTU)-Evaluation, Architecture, Design standards, selection criteria, Intelligent Electronic devices(IED), PLC, Data concentrators and merging unit, Master control centers, Global positioning systems (GPS)-Relevance to SCADA, Human Machine Interface(HMI)

Unit 6: SCADA Architecture (5Hrs)
Introduction, Communication Architecture, communication philosophies, systems reliability and availability, Applications-Oil and Gas Industry, Automobile Industry, Water pumping stations.
**Recommended Books:**
5. Programming Logic Controller, Fifth Edition by W. Bolton, Published by Elsevier
6. Programming Logic Controller by Vijay R. Jadhav, Khanna Book Publishing-New Delhi
7. Programmable Logic Controllers, by Frank D. Petruzella, Mcgraw Hill Publications
8. Industrial Automation with SCADA by K.S. Manoj, Notion press publications.

**Reference Books:**
9. Programmable Logic Controllers: Programming Methods And Applications, 1e, Hackworth, Pearson Education
SHIVAJI UNIVERSITY, KOLHAPUR

REVISED SYLLABUS OF
B. E. CIVIL ENGINEERING
SEMESTER VII & VIII

To be introduced from the academic year 2016-17 (i.e. from June 2016)
## SYLLABUS STRUCTURE

### B. E. CIVIL ENGINEERING SEMESTER-VII

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*Assessment of Report on field training to be done by Project Guide along with Project Term Work Assessment Committee.*

### B. E. CIVIL ENGINEERING SEMESTER-VIII

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*Elective II from structure group  
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B. E. PART-I (SEMESTER-VII)
DESIGN OF CONCRETE STRUCTURES-I

Teaching Scheme
Lectures: 4 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objective:
1. To understand the concept of RCC structural design
2. To conceive the elementary design of different structural elements.

Course Outcome: After successful completion of course student will be able to
1. Convey the concepts of structural design procedure
2. Design the individual members and hence building.

SECTION- I

Unit : 1 (08)
Introduction- Stress strain behavior of concrete and steel, Behavior of RCC, Permissible stresses in steel and concrete, Different design philosophies, various limits states, Characteristic strength and Characteristic load, Load factor, Partial safety factors.

Unit : 2 (08)

Unit : 3 (08)
a) Limit state of collapse (shear and bond): Shear failure, Types of Shear reinforcement, Design of Shear reinforcement, Bond-types, Factors affecting bond resistance, Check for development length.
b) Limit state of serviceability: Significance of deflection, IS recommendations, Cracking-classification and Types of Cracks, Causes, Mechanism, and IS recommendations.

SECTION- II

Unit : 4 (08)
a) Design of slabs: Cantilever Slab, Simply supported One way slab, Two way slab with different support conditions as per IS:456-2000
b) Design of Simply Supported single flight and Dog legged staircase.
Unit : 5

Analysis and Design of axially and eccentrically (uni-axial) loaded circular and rectangular columns, Interaction diagram, Circular column with helical reinforcement.

Unit : 6

Design of isolated rectangular column footing with constant depth subjected to axial load and moment, Design of combined rectangular footing

Term work: At least two assignments on each unit

Reference books:
1. IS 456-2000, Relevant Special publications of BIS
2. Limit state theory and Design –Karve and Shah , Structures publications, Pune
4. Fundamentals of Reinforced Concrete –Sinha and Roy, S. Chand and company Ltd. Ram Nagar, New Delhi
6. Reinforced Concrete Design- B.C. Punmia Laxmi publications New Delhi
7. Reinforced Concrete Design-M. L. Gambhir-Mc millan India Ltd. New Delhi
B. E. CIVIL ENGINEERING PART I SEMESTER VII

EARTHQUAKE ENGINEERING

Teaching Scheme
Lectures: 3 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks
Term Work: 50 Marks

Course objectives:
1. To understand behavior of earth during earthquake.
2. To understand the concepts of mathematical modeling.
3. To understand dynamic behavior of structure.
4. To understand earthquake resistant philosophy of structure.
5. To understand modern techniques of earthquake resistant method.

Course Outcomes:
Students will be able to
1. prepare mathematical modeling of structure.
2. design earthquake resistant structure.
3. know the concept of modern techniques.

SECTION-I

Unit : 1 (05)
Elements of seismology – terminology, structure of earth, causes of an earthquake, plate tectonic theory, continental drift theory, elastic rebound theory, seismic waves, magnitude and intensity, methods of measurement, energy released, seismograph, strong motion earthquakes, accelogram, prominent earthquakes of India

Unit : 2 (08)
Fundamentals of theory of vibration, free and forced vibrations (harmonic loading) of single degree of freedom systems. Undamped and viscously damped vibrations, equations of motion and solution, General dynamic loading Duhamel Integral, earthquake response of SDOF system

Unit : 3 (07)
Response spectrum theory: Earthquake response spectrum, tripartite spectrum, construction of design response spectrum, effect of foundation soil and structural damping on design spectrum, evaluation of lateral loads due to earthquake on multistory buildings as per IS 1893–2002 Part I
B. E. CIVIL ENGINEERING PART I SEMESTER VII

SECTION- II

Unit : 4
Part A : (04)
Conceptual Design: Planning aspects, Load path, Stiffness and strength distribution, different structural system, liquefaction and settlement.

Part B : (06)
Earthquake Resistance Design Principles: Design philosophy, Behavior of RC building, ductility and ductile detailing of beam and columns using IS 13920.

Unit : 5 (04)

Unit : 6 (06)
Introduction to Earthquake resistant modern techniques – Base Isolation- Elastomeric, Sliding, Combined.
Seismic Dampers - Friction Dampers, TMD, Visco elastic dampers.

Term work:
At least one assignment on each unit

Reference books :
3. Earthquake Engineering - Manish Shrikhande and Pankaj Agarwal, Prentice Hall of India Pvt Ltd, New Delhi
4. Structural Dynamics - Mario Paz CBS Publication
5. Earthquake Resistant Structures –D.J. Dowrick John Wiley Publication
10. Manual of Earthquake Resistant Non engineering Construction, University of Roorkee
13. Elements Seismology – Rochter
SECTION - I

Unit : 1

a) General introduction to Quantity surveying – purpose of estimates. Types of Estimates, Various items to be included in estimates. Principles in selecting units of measurement for items, various units and modes of measurement for different trades, administrative approval and technical sanction to estimates. I.S. 1200, Introduction to D.S.R.
b) Specification- purpose and basic principle of general and detailed specification (writing the detailed specification for various constructions should be covered in term work)

Unit : 2

b) Analysis of rates, factors affecting the cost of materials, labor. Task work, schedule as basis of labor costs. Plants and equipment –hour costs based on total costs and outputs. Transports, Overhead charges, rates for various items of construction of civil engineering works. Standard schedule of rate, price escalation

Unit : 3

a) Detailed estimate of buildings, R.C.C works, culverts, earthwork for canals. Roads including hill roads and other civil engineering works.
b) Approximate estimates, purpose, various methods used for buildings and other civil engineering works such as bridge, water supply, drainage, road project, school buildings, industrial sheds.
c) Preparation of schedule for steel as reinforcement.
B. E. CIVIL ENGINEERING PART I SEMESTER VII

SECTION- II

Unit : 4

(07)
b) Essentials of legally valid contract, Contract between Engineer & Employers, Contract between Employer & Contractor, Appointment & authority of Engineer for execution of civil construction works, Category of contractor.
c) Introduction to non conventional contract such as B.O.T, B.O.O.T, B.O.L.T.
d) Introduction to Indian Arbitration and conciliation Act 1996.

Unit : 5

(06)
a) Principles of valuation, definition of value, price and cost. Attributes of value, Different types of values. Essential characteristics of market value.
b) Valuer and his duties, purpose of valuation and its function. Factors affecting the valuation of properties-tangible and intangible properties, Landed properties- free hold and leasehold properties, different types of lease.
c) Valuation from yield and from life, gross yield and net yield, outgoing, capitalized value, Year’s purchases-Single rate and dual rate, reversion value of land, annuity-perpetual, deferred. Sinking fund.

Unit : 6

(05)

Valuation Methods
a) Rental method of valuation. Form of rent, different types of rent, standard rent.
b) Value of land, belting method of valuation, Valuation based on land and building.
c) Development method of valuation for building estate.
d) Valuation on profit base.
e) Comparison method.
Term Work:
1. Detailed estimate of G + 1 Framed Structure.
2. Preparing detailed estimate for any one of the following:
   a) A stretch of a road about 1 Km. long including earthwork.
   b) A reach of canal about 1 Km. long.
   c) A factory shed of steel frame.
3. Valuation reports for building of residential purpose or commercial purpose
4. Detailed specification for minimum ten civil engineering items.
   (One each from Roads, Irrigation works, Water Supply & Sanitation & seven from buildings)
5. Rate Analysis of ten civil engineering items.
6. Schedule of reinforcement for the following
   a) Beams
   b) Slab,
   c) Staircase
   d) Column & Column footing
8. At least one assignment based on software application.

Reference books:
1. Quantity Surveying – P. L. Bhasin. S. Chand&Co-Ramnagar, Delhi-110055
7 Estimating, Costing and Specification in civil engineering – hakrobery M.21b,Bhabananda Road,Kolkata-700026
8 Valuation of real Properties – S. C. Rangwala Charotar Publishing House-opposite Amul dairy, court Road Anand. 388001.India
9 Standard specifications Volumes I & II (P. W. D. Maharashtra) Govt. of Maharastra
10 C.P.W.D. specifications
11 C.P.W.D. schedules of rates.
PROJECT MANAGEMENT AND CONSTRUCTION EQUIPMENTS

Teaching Scheme:
Lecture: 3 hours per week
Practical: 2 hours per week

Examination scheme:
Theory paper: 100 marks
Term Work: 25 marks
Oral Exam: 25 marks

Course Outcomes:
On completion of this course, students will be able to-
1. Understand the importance of Project Management tools.
2. Plan and Schedule the Project by using CPM, PERT and MSP.
3. Understand the working of various construction equipments.
4. Know the importance of Safety and Risk Management in Construction.

SECTION I

UNIT 1:

2. Project Planning - Bar Chart, Mile Stone Chart, CPM
4. Network Compression, Resource Allocation- (Concept only), Network Updating

UNIT 2:

1. PERT - Concept of Probability, Normal and Beta Distribution, Time Estimates, Slack, Probability of Project Completion
2. Precedence Network: Concept only.
3. Introduction to Management Software- MSP.

UNIT 3:

SECTION II

UNIT 4: (08)

UNIT 5: (06)
Drag line, Clamshell, Trenchers, Compactors, Tippers, Cranes.

UNIT 6: (06)

Term work
1. Two assignments on each unit of Section I and one assignment on each unit of Section II.
2. Planning and Scheduling of a Small Project by using MSP.

References:
1. Project Planning and Control with PERT and CPM – Dr. B. C. Punmia and K. K. Khandelwal.
2. PERT and CPM: Principles and Applications – L. S. Srinath
4. Construction Project Management – Kumar Neeraj Jha
6. Construction planning equipment and methods—R.L. Peurifoy
8. RAMP – Risk Analysis and Management of Projects by Institution of Civil Engineers and the Faculty of Institute of Actuaries, Thomas Telford Publication, London.
PROJECT WORK- (PHASE –I)

Teaching Scheme
Practical: 2 Hrs/Week
(for batch of 9 Students)

Examination Scheme
Term Work: 50 Marks

The project work will be a design project, experimental project, field surveying or computer oriented on any of the topics of civil engineering interest. It will allot as a group project consisting of a minimum THREE and maximum FIVE number of students, depending upon the depth of project depth work. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem.

The term work assessment of the project will be done at the end of the semester by a committee consisting of three faculty members from the department along with Project Guide. The students will present their project work before the committee. The complete project report is not expected at the end this semester. However a Ten pages typed report based on the work done will have to be submitted by the students to the assessing committee. The project guides will award the marks to the individual students depending on the group average awarded by the committee.

One Project Guide shall be allotted Maximum TWO groups for guidance.

For work load calculation minimum load is 1 Hr./week, for one groups of FOUR to FIVE students. (As per AICTE Guide Lines).
The students are required to undergo training in any area related to Civil Engineering as mentioned in the syllabus for 30 working days beyond the academic schedule between the completion of T.E. (Civil) Part-II and B.E.(Civil) Part-I term end.

Students shall submit the report of the field training taken and necessary certificate from the organization where such training is undertaken.

**Assessment will be done at the end of VII Semester by project guide along with Project Term Work Assessment Committee.**
## B. E. CIVIL ENGINEERING PART I SEMESTER VII

### ELECTIVE –I

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<td>Open Channel Hydraulics</td>
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<td>Advanced Engineering Geology</td>
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<td>Ground Improvement Techniques</td>
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B. E. CIVIL ENGINEERING PART I SEMESTER VII

ELECTIVE - I

ADVANCED STRUCTURAL ANALYSIS

Teaching Scheme
Lecture : 3 hrs/Week
Practical : 2 hrs/Week

Examination Scheme
Theory Paper: 100 Marks
Term Work : 25 marks

SECTION- I

Unit : 1  (05)
Influence Line Diagrams : Muller Breslau Principle, I.L.D. for
Propped Cantilever, Fixed beam, Continuous beam

Unit : 2  (10)
Beams Curved in Plan : Determinate and Indeterminate beams curved in
plan. Fixed Arches : Analysis of fixed arches by Elastic Center Method

Unit : 3  (05)
Approximate Method for Analysis : Analysis of Portal Frames subjected to
lateral loads – Portal Method, Cantilever Method.

SECTION- II

Unit : 4  (06)
Beams on Elastic Foundations : Analysis of infinite and semi-
infinite beams

Unit : 5  (09)
Analysis of Space Trusses by Tension Coefficient Method
Analysis of Secondary Stresses in Plane Frames

Unit : 6  (05)
Unsymmetrical Bending and Shear Center
Term Work:

1 Term Work shall consists of minimum eight assignments based on above syllabus with at least Two problems from each unit

Reference books:

1 Analysis of Structures Vol.II- Vazirani and Ratwani, Khanna Publishers, Delhi
2 Advanced Theory of Structures & Matrix Methods- Vazirani and Ratwani
4 Design of Steel Structures Vol.II– Ramchandra Standard Book House, Delhi
Design of Steel Structures- B.C.Punmia, A.K.jain, Laxmi Publication(p) Ltd. Delhi
ELECTIVE - I

EXPERIMENTAL STRESS ANALYSIS

Teaching Scheme  
Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

Examination Scheme  
Theory Paper: 100 Marks  
Term Work : 25 marks

SECTION- I

Unit : 1  (08)
Introduction to experimental stress analysis, advantages of ESA technique, Fundamental concept of strain measurement.

Development of ERSG, types, construction and material, Gauge sensitivity and gauge factor, transverse sensitivity, correction for transverse strain effect, Grid, Backing material, Adhesive, Mounting method, checking gauge installation, Performance characteristics of foil strain gauge, linearity, hysteresis, zero shift, environmental effect, moisture proofing.

Unit : 2  (07)
Wheatstone bridge circuit, sensitivity, types, balancing of bridges, constant current circuit, Transducer application, diaphragm pressure transducer, displacement transducer, axial force transducer, bending force transducer, torque transducer.

Unit : 3  (05)
Introduction, determination of principal strains, principal stresses, maximum shear stress and principal angles, three and four element rectangular rosette, delta rosette, tee rosette.

SECTION- II

Unit : 4  (06)
Introduction, general principles, advantages and disadvantages, state of stress and laws of failure, detection of cracks, types of brittle coating, test procedure, calibration technique.

Unit : 5  (07)
Basic optics related to photo elasticity, ordinary light, monochromatic light, polarized light, natural and artificial,
Birefringence, Stress optic law in two dimensions at normal incidence, Material fringe value in terms of stress function

Unit : 6

Plane polariscope, isoclinics, isochromatics, Circular polariscope, different arrangements, isochromatics, Fractional fringe measurement, Tardy's method, Babinet Soleil method, Selection and properties of model materials, Calibration methods, circular disc, tensile specimen, Separation methods, oblique incidence method, shear difference method

Term Work:
Minimum ten of the following experiments to be performed

1. Study of electrical resistance strain gauge
2. Study of commercial strain indicator
3. Calibration of electrical resistance strain gauge. Determination of gauge factor $S_g$
4. Determination of unknown weight. Transducer application of strain gauge
5. Calculation of gauge factor and strain for single and two arm bridges.
6. Calculation of gauge factor and strain for four arms lateral and linear sensitive bridges.
7. Measurement by using commercial strain indicator and transducers.
8. Study of isoclinics and isochromatics and use of white light
10. Determination of fringe order by Tardy’s method.
11. Separation of stresses by oblique incidence method.

Text books:
1. Experimental stress analysis by Dailly and Riley, McGraw Hill.

Reference books:
1. Experimental stress analysis by Holister Dove and Adams.
2. Photoelasticity Vol. I by Frecht
3. Applied stress analysis by Direlli
4. The strain gauge primer by Perry Listner
ELECTIVE – I

ADVANCED FOUNDATION ENGINEERING

Teaching Scheme
Lecture : 3 hrs/Week  
Practical : 2 hrs/Week

Examination Scheme
Theory Paper: 100 Marks  
Term Work : 25 marks

SECTION- I

Unit 1:  (06)
Shallow foundations- Types, Depth of foundation, calculation of bearing capacity by various approaches (Terzaghi, IS code method), Proportioning of footing (isolated, combined rectangular and combined trapezoidal), Eccentrically loaded footing, Calculation of foundation settlement (immediate and consolidation settlement).

Unit 2:  (07)
Raft foundations: Types of rafts, Bearing capacity and settlements of raft, Design considerations and I.S. Code method of analysis

Unit 3:  (07)
Deep foundation: Classification of piles, Calculations of load capacity of single pile by static and dynamic formulae, Group action of piles, Negative skin friction and its estimation, Under reamed piles, Settlement of piles, Cyclic pile load test

SECTION- II

Unit 4:  (06)
Design of machine foundations: Static and dynamic design criteria-permissible amplitude of vibrations for different types of machines. Foundations for reciprocating machines- design criteria- calculation of induced forces and moments- multi cylinder engines

Unit 5:  (06)
Sheet Pile walls and Cofferdams: Types and uses of sheet piles, design of cantilever sheet pile walls in granular and cohesive soils, anchored bulkhead, free earth support and fixed earth support method, coffer dams, types, uses of cofferdams
Unit 6:  

Foundations in difficult soils and soil stabilization: Foundation in expansive soil, soft and compressible soils, problems associated with foundation installation- ground water lowering and drainage, shoring and underpinning, different methods, damage and vibrations due to constructional operations

Soil stabilization: Mechanical stabilization, cement stabilization, lime stabilization, bituminous stabilization, chemical stabilization, stabilization by grouting

Term Work:

1. At least one assignment on each unit.

Reference books:

ELECTIVE I
ADVANCED TRAFFIC ENGINEERING

Teaching Scheme
Lecture : 3 hrs/Week
Practical : 2 hrs/Week

Examination Scheme
Theory Paper: 100 Marks
Term Work : 25 marks

Course learning objectives:
1. Provide an insight on traffic and its components, factors affecting road traffic.
2. Provide an insight on traffic movements and speed studies.
3. Provides clear understanding on conducting various types of traffic surveys, data collection, analysis, inference and presentation.
4. To identify the role of various modes of Mass Transportation like Bus and Rail and its Planning and Management.
5. Learn the objectives, benefits in ITS and functional areas in ITS.

Course learning outcomes:
After the completion of the course students should be
1. Able to acquire and apply knowledge of traffic, its components, factors affecting road traffic.
2. Able to analysis traffic speed study data and its presentation.
3. Able to apply the knowledge of sampling data in conducting various surveys and analysis.
4. Able to understand various modes of mass transit system.
5. Able to appreciate the advantages of ITS and suggest the appropriate technologies for field conditions

SECTION- I
Unit: 1 (05)
Introduction: Infrastructure & its role in developing society; Transport sector in India – policy framework; Development plans – Airports, Highways – National highway development program (NHDP); JNNURM, Asian highways network (AH).

Unit: 2 (07)
Traffic characteristics: Traffic characteristics – Road user characteristics, General human characteristics, Physical characteristics. Vision eye – movement peripheral vision, Visual attention, Visual sensitivity to light and
colour, glare vision and recovery perception of space. Hearing, Stability sensation, Time factor in response, Theory of PIEV modifying factors, conditional responses; Vehicular Characteristics – types, dimensions, resistance, power requirement for different resistance, change in direction – minimum turning radius, off tracking, slip angle.

**Unit: 3**

(a) **Traffic Engineering & Speed Analysis:** Introduction, Speed studies, journey time and delay studies, Sampling in traffic studies & application, Traffic surveys-types of volume count Planning, Problems on PCU, moving observer method and spot speed.

(b) **Traffic operation and management.**
Traffic systems management and Travel demand management - Congestion management-Cost effective management measures, Traffic control aids, Street furniture, Road Arboriculture–Traffic Regulation, Traffic Sign and Road Markings.

**SECTION II**

**Unit: 4**

**Trip generation and distribution:** Factors governing trip generation and attraction –Application of Regression Analysis- Methods of trip distribution; Growth and Synthetic Models Calibration and Application of gravity model.-Category analysis.

**Unit: 5**

(a) **Introduction to intelligent transportation systems (ITS) –** Definition, Objectives, Historical Background, Benefits of ITS -ITS Data collection techniques –Detectors,Automatic vehicle location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), Video data collection.

(b) **ITS functional areas –** Advanced traffic management systems (ATMS), Advanced traveller information Systems (ATIS), Commercial vehicle operations (CVO), Advanced vehicle control systems (AVCS), Advanced Public transportation systems (APTS), Advanced rural transportation systems (ARTS).
Unit: 6

Public transport system


Term Work:

Assignment on each unit

On field practices.

1) Volume study
2) Spot speed study
3) Parking study
4) Marking study

Text books:

Reference books:
14. www.nhai.org
**ELECTIVE – I**

**ADVANCED ENGINEERING GEOLOGY**

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<tbody>
<tr>
<td>Lecture: 3 hrs/Week</td>
<td>Theory Paper: 100 Marks</td>
</tr>
<tr>
<td>Practical: 2 hrs/Week</td>
<td>Term Work: 25 marks</td>
</tr>
</tbody>
</table>

**Course Outcomes:**
After successful completion of this course, student will be able to:

1) Understand the stratigraphic sequence of India.
2) Understand and apply the knowledge of tectonic activities in Deccan traps.
3) Acquire and apply knowledge of the preliminary geological investigations for civil engineering projects.
4) Study the behavior of subsurface water and acquire knowledge of natural resources and environmental impact of civil engineering structures.
5) Develop skills to apply geophysical methods for geological investigation of civil engineering sites.

**SECTION - I**

**Unit 1:** (05)

**STRATIGRAPHY AND INDIAN GEOLOGY:** Scope, Geological Time scale, Physiographic divisions of India, General study of important geological formations of India viz; Vindhyan, Gondwana system and Deccan traps and its Civil engineering significance.

**Unit 2:** (06)

**SEISMIC ACTIVITY OF DECCAN TRAP REGION:** Continental Drift and Plate Tectonics, Seismic zones of world, Seismic activity of Deccan trap region, Theories on origin of the seismic activity, Reservoir induced seismicity. Nature and characteristics of seismic activity. Tectonic nature of seismic activity of Deccan trap region.

**Unit 3:** (09)

**SUBSURFACE EXPLORATION:** Various steps in the geological studies of project site, Engineering consideration of structural features. Exploratory drilling—observations, preservation and limitations, core logging, Graphical representation, Bore hole problems.

**SUBSURFACE WATER:** Groundwater—aquifer parameters, water bearing
capacity of common rocks, springs, cone of depression and its significance in civil Engineering, Natural and artificial recharge of aquifers, Saline water intrusions - control and prevention. Interpretation of groundwater quality based on Piper trilinear, Gibbs, Wilcox and USSL diagrams.

**SECTION- II**

**Unit 4:**

ENGINEERING GEOLOGY OF DECCAN TRAPS: Types of basalts and their engineering characteristics, Compact and amygdaloidal basalt as construction material, Tail channel erosion problem in Deccan Trap region, Suitability of basalts from tunneling point of view. Problems due to columnar basalt, dykes and fractures, red bole, tachylitic basalt and Volcanic breccia. Laterites-Origin, occurrence and engineering aspects. Occurrence of groundwater in Deccan Trap region, Geological conditions suitable and unsuitable for construction of percolation tanks. Nature of alluvium and sand of Deccan Trap region, Scarcity of sand in Deccan Trap area.

**Unit 5:**

GEOPHYSICS: Geophysical methods--- Basic principles of seismic, magnetic gravitational and electrical resistivity methods. Application of electrical resistivity method using Wenner configuration in Civil Engineering aspects such as--i) Finding out the thickness of over burden and depth of hard rock, ii) Locating the spot for ground water.

**Unit 6:**

RESOURCE ENGINEERING: Renewable and non renewable resources, Coal and Petroleum-- genesis, occurrence and reserves in India, Geothermal energy.

ENVIRONMENTAL GEOLOGY: Environmental implications of dam, road and canal construction.

**Term Work:**
The term work shall consist of the laboratory work based upon following experiments. [Any 8]

1. Study of geological map of Maharashtra state and India..
2. Study of Civil Engineering aspects of important rock types.
3. Microscopic study of rocks and minerals.
4. Three point problems.
5. Core logging of exploring drill hole.
6. Study and constructions of sections based upon drill holes data.
7. Problems on width of outcrop.
8. Structural geological maps with faults and inclined dykes.
9. Use of electrical resistivity method for determining depth of bedrock or groundwater.
10. Various case studies of engineering geological investigations.

- Educational study tour to the places important from civil engineering point of view.

**Reference books:**

1. Geology of India and Burma – M. S. Krishnan, Higginbothams Pvt Ltd;
7. Engineering Geology for Civil Engineers- By Dr. D. V. Reddy.
8. Introduction to Rock Mechanics by Verma B. P., Khanna Publisher Delhi.
ELECTIVE - I

OPEN CHANNEL HYDRAULICS

Teaching Scheme

<table>
<thead>
<tr>
<th></th>
<th>Hours/Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
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<tr>
<td>Practical</td>
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Examination Scheme

<table>
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<th>Marks</th>
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<tbody>
<tr>
<td>Theory Paper</td>
<td>100</td>
</tr>
<tr>
<td>Term Work</td>
<td>25</td>
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</table>

SECTION - I

Unit : 1

Basic Fluid Flow Concepts: Classification of open channels and O.C.F., Basic equations (Continuity, Energy, Momentum), Energy and Momentum coefficients, Specific energy and Critical depth, Establishment of Uniform flow in open channels, Uniform flow formulae, Section factor and conveyance factor, First and Second hydraulic exponent, Uniform flow computations

Unit : 2

Non-Uniform Flow in Open Channel: Types of Non-Uniform flow, Governing equation for GVF, Characteristics and classification of surface curves, Computation of GVF in prismatic channels, Hydraulic jump in rectangular channels (Types and characteristics), Jump on sloping floor, Jump in non-rectangular channels, Use of jump as Energy Dissipater, Spatially-Varid Flow, Side weir, Bottom racks

Unit : 3

Flow in Non-linear alignment and Nonprismatic Channels: Nature of Flow, Spiral Flow, Energy Loss, Superelevation, Cross Waves, Design Considerations for Subcritical and Supercritical flow

Transitions and contractions in open channel flow, Subcritical & Supercritical flow through sudden transitions and constrictions, Standing wave flume, Flow between bridge piers, Flow through culvert, Flow through Trash Racks.

Unit : 5

(a) Dispersion in Open Channels: Diffusion and dispersion, Some classical solutions of the diffusion equation, Discharge measurement using tracer techniques

(b) Hydraulics of Mobile Bed Channels: Initiation of motion of sediment, Bed forms, Sediment Load, design of Erodible Channels, Regime Theory for Alluvial Channels

Unit : 6

Hydraulic Models: Fixed bed river models (Distorted and Undistorted), Moveable bed Models, Model materials and construction, Physical model calibration and verification, Special-Purpose models

Term Work:

At least one assignment based on each unit.

Reference books:

B. E. CIVIL ENGINEERING PART I SEMESTER VII

ELECTIVE – I

REMOTE SENSING AND G.I.S IN CIVIL ENGINEERING

Teaching Scheme
Lecture : 3 hrs/Week
Practical : 2 hrs/Week

Examination Scheme
Theory Paper: 100 Marks
Term Work : 25 marks

Course Objectives:
1. To study the evolution of Remote Sensing and G.I.S
2. To get a basic and advanced level insight into the approach of latest remote sensing techniques.
3. To understand the subject of Geographical information system as an extension of application software in civil engineering

Course Outcomes:
On successful completion of this course students will be able to,
1. Adopt the principles of physics of Electromagnetic radiation as applied to remote sensing.
2. Learns the interrelationship of civil, environmental and geological studies.
3. Formulate and apply remote sensing and GIS concepts to engineering problems.

SECTION- I

Unit : 1
Introduction: Definition, History, Types of satellites based upon uses, Programs of different countries, India’s position, etc. Scope - Various fields of applications, Users in India, Data requirements of users. Topo sheets, Evolution of G.I.S. Technology.

Unit : 2
Space System: Technique of aerial photography, Photographic flight mission, Factors influencing flight mission, Numbering of aerial photographs. Remote Sensing Technique of satellite imaging - Important units of satellite and functioning of satellite, height, and coverage. Stages in remote sensing,
Electromagnetic radiation, and electromagnetic spectrum, Interaction of electromagnetic radiation with atmosphere and earth surface. Sensors, Types of Resolutions used in remote sensing. Introduction to the application of computer in analysis of satellite pictures, Digital Image processing.

**Unit : 3**  
(06)

Geomorphology: Geomorphology and its scope in photo interpretation as well as in engineering, Drainage analysis, Drainage patterns, Drainage density and Drainage frequency. Landforms associated with igneous, secondary and metamorphic rocks, Landforms developed due to structural features like dip strike, fractures, faults, folds etc.

**SECTION- II**

**Unit : 4**  
(08)

G.I.S-Fundamentals of GIS, Definition, Components, Types of data inputs in GIS, spatial data, thematic characteristics, rasters and vectors, databases and database management.

**Unit : 5**  
(06)

Application of RS and G.I.S in Civil Engineering: In the study and selection of site or hydraulic structures, Application in urban planning. Use in Landslide, Application in transportation engineering.

**Unit : 6**  
(08)

Application of RS and G.I.S in water Resources Studies: Surface water delineation, study of floods, surface keys for subsurface water. Delineation of these keys on aerial photographs, Steps in water investigations of the area.

Application of RS and G.I.S in Environmental Studies: Land use study, Terrain analysis, and soil mapping with the help of remote sensing techniques, Applications in delineating forest areas.

**Term Work:**
The term work shall consist of the laboratory work based upon following syllabus-

1. Study of topo sheets.
2. Preliminary study of aerial photographs – scale, ground coordinates, and mosaic.
3. Determination of elevations of different points with the help of mirror stereoscope and parallax bar.
4. Study of drainage density, drainage pattern, watershed from Soil and water Maps.
5. Ground truth data collection using Total station and G.P.S.
   a. Georeferencing of toposheets.
   b. Vectorosation (digitization) of raster Images.
   c. Converting Google map kml files into shape files.

The oral examination based upon above syllabus of the term work.

Reference books :

4) G.I.S- Anji Reddy , publishers- MGH
10) Introduction to geomatics –QGIS user guide – Mr.C.V. Nishinkanth, Mrs.Annu Nishinkanth, Dr S S Vasudevan, Dr P Ramkumar, Publishers-
ELECTIVE – I

SOLID WASTE MANAGEMENT

Teaching Scheme
Lecture: 3 hrs/Week
Practical: 2 hrs/Week

Examination Scheme
Theory Paper: 100Marks
Term Work: 25 marks

Course Outcomes:
At the end of successful completion of course, the students will be able to:
1. State the importance of solid waste management.
2. Describe different types and sources of solid waste.
3. Illustrate different solid waste collection methods & process.
4. Identify the various process of solid waste.
5. Understand the disposal of solid waste by sanitary land filling, composting, and incineration methods.

SECTION- I

Unit: 1
Solid waste management: Introduction, rule & regulation, present status, objectives, effects, sources, types, refuse analysis, composition and quantity of refuse.
Introduction to Biomedical waste & Hazardous waste management

Unit: 2
Functional outline of solid waste management, Generation rate, Factors affecting generation rate, different methods of collection, collection systems, storage, transfer and transportation of refuse.

Unit: 3
Solid waste processing techniques, reduction, segregation, recovery of bye-products, recycling & reuse of solid waste.

SECTION- II

Unit: 4
Sanitary landfilling - Introduction, components of landfilling, methods of landfilling, site selection, construction techniques, maintenance and
precautions, landfill gas and leachate and its control measures, Closure & end-use.

**Unit: 5**

Composting-Theory, types of composting, factors governing composting, mechanical composting plant, recovery of Bio – gas energy.

**Unit: 6**

Incineration -Theory and types of incinerators, site selection criteria, factors affecting incineration, pyrolysis and its by-products, Energy recovery, Air pollution and its control.

**Term Work:**
1. Assignment on each unit.
2. Visit to solid waste processing plant & its report.

**References:**
1. Solid Waste Management – Dr. A. D. Bhide
2. Solid Waste Management – Gorge Tchobanoglous
3. Solid Waste Management Hand Book – Pavoni
4. Composting – Gottas
5. Handbook on Solid Waste Disposal – Techabonglaus
**ELECTIVE - I**

**OPTIMIZATION TECHNIQUES**

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
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<td>Lecture : 3 hrs/Week</td>
<td>Theory Paper: 100 Marks</td>
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<tr>
<td>Practical : 2 hrs/Week</td>
<td>Term Work : 25 marks</td>
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**SECTION- I**

**Unit : 1** (10)

**Unit : 2** (04)
Transportation problems: Assignment problems

**Unit : 3** (06)
Decision theory, decision tree, Game theory.

**SECTION- II**

**Unit : 4** (10)
Inventory models – deterministic models probabilistic model. Queuing theory, simulation applications

**Unit : 5** (04)
Introduction to non linear programming

**Unit : 6** (06)
Dynamic programming and integer programming, Forecasting techniques.

**Term Work:**
At least one assignment based on each unit.

**Reference books :**
2. Operation Research - H. A. Taha, Mac-Millan
3. Graph Theory – NarsinghRao, Prentice Hall
5. Project Management – Lick D., Gower Publication England
ELECTIVE - I

GROUND IMPROVEMENT TECHNIQUES

Teaching Scheme
Lecture: 3 hrs/Week
Practical: 2 hrs/Week

Examination Scheme
Theory Paper: 100Marks
Term Work : 25 marks

Course objectives:
1. Convey the importance of ground improvement to the students
2. Make the students familiar to the different ground improvement techniques
3. Make the students understand the theoretical background for different ground improvement techniques such as stone column, soil nailing
4. To elaborate the design methods for some ground improvement techniques
5. Make the students aware of the applications of ground improvement techniques

Course outcomes:

At the end of course, following will be the outcomes:

1. Students would have understood the importance of the ground improvement
2. Students would be familiar with different ground improvement techniques
3. Students would have conceptual clarity regarding the different ground improvement techniques
4. Students would be in position to design stone column and reinforced retaining wall
5. Students would be aware of application areas for different ground improvement techniques

Unit 1 (07)
Definition of ground improvement, objectives, classification of ground improvement techniques, suitability of different techniques, preloading: need, preloading without vertical drain, preloading with vertical drain, dynamic consolidation

Unit 2 (06)
Stone column, Design of stone column: unit cell concept, area replacement ratio, spacing and diameter, depth, stress ratio, Load bearing capacity of individual stone column, settlement of stone column, Failure mechanism

**Unit 3**

Ground anchors, components, load transfer mechanism, rock anchors, anchors in granular soil, anchors in cohesive soil, Rock bolt, types, action of rock bolt, Soil nailing, analysis of nailed soil

**SECTION II**

**Unit 4**

Soil stabilization: cement, lime, fly ash, factors affecting. Grouting: classification, types of grouts, equipments, grouting design and layout, applications, case histories

**Unit 5**

Earth reinforcement, mechanism and concept, stress strain relationship of reinforced soil, design theories, stability analysis of retaining wall: tie back analysis, coherent gravity analysis, application areas of earth reinforcement

**Unit 6**

Geosynthetics – Types, functions, Application of geosynthetics: reinforcement, separator, filter, drainage, Selection of geosynthetics; damage and durability of geosynthetics.

**Term Work:**

At least one assignment based on each unit.

**References:**

1. Ground improvement techniques by Dr. P Purushothma Raj
2. Ground improvement by Klaus Kirsch
3. An introduction to ground improvement engineering by Satyendra Mittal
4. Ground improvement techniques by NiharRanjanPatra
5. Reinforced soil and its engineering applications by Swami Saran
6. Earth reinforcement and soil structures by Colin JFP Jones
7. An introduction to soil reinforcement and geosynthetics by G. L. SivakumarBabu
8. Geotechnical engineering by Shashi K Gulhati and ManojDatta
B. E. PART-II (SEMESTER-VIII)
DESIGN OF CONCRETE STRUCTURES-II

Teaching Scheme
Lectures: 4 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
3. To study the concept of torsion, Design for torsion, Design of continuous beams, design of water tanks
4. To study concept of prestressed concrete, losses in prestress, analysis & design of prestressed concrete sections.

Course Outcomes:
After successful completion of course student will be able to design -
3. Sections subjected to torsion
4. Continuous beams/slabs
5. Water tanks resting on ground
6. Prestressed concrete sections

SECTION- I

Unit : 1 (07)
Limit State of Collapse – Torsion Behavior of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and torsion, combined shear and torsion.

Unit : 2 (08)
Limit state Design of two span continuous beams and three span continuous beams using IS coefficient, concept of moment redistribution

Unit : 3 (09)
Design of water tank - Introduction to working stress method for water tank design, Design criteria, permissible stresses, design of water tank resting on ground using IS code method – (i) circular water tanks with flexible and rigid joint between wall and floor, (ii) rectangular water tanks.
B. E. CIVIL ENGINEERING PART II SEMESTER VIII

SECTION- II

Unit : 4 (08)

Unit : 5 (06)
Losses of prestress in Pre & Post tensioned members. Flexural strength of prestress concrete section

Unit : 6 (10)
Design of prestress concrete - rectangular and Symmetrical I sections for following criteria:
(i) Design of section for flexure (ii) Design of section for the limit state of collapse in flexure.

Term Work:
At least one assignment on each unit.

Reference books :
1 IS: 456-2000
2 IS:1343, IS 3370
3 Limit State Theory & design -Karve& Shah Structures Pub. Pune
4 Reinforced Concrete Design (Limit State) - A.K. Jain
5 Fundamentals of Reinforced Concrete - - Sinha & Roy
6 Limit State Design of Reinforced Concrete - P.C. Varghese,
Prentice Hall of India, New Delhi
7 Reinforced Cement Concrete -B.C. Punmia
8 Handbook of Reinforced Concrete SP-34
9 Prestressed Concrete - T.Y. Lin John Willey &sons Newyark
10 Prestressed Concrete - Sinha & Roy S.Chand & Co. NewDelhi
11 Prestressed Concrete – N Krishna Raju, Tata McGraw-Hill Publication Company Ltd., New Delhi
WATER RESOURCES ENGINEERING-II

Teaching Scheme
Lectures: 3 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks
Term Work: 25 Marks
Oral Exam: 25 Marks

SECTION I

Unit-1  (08)

Introduction to dams:
Types of dams, selection of site for dams, selection of type of dam, Storage Calculations using mass curves, Area elevation curve & Elevation capacity curve, Control levels, silting of reservoirs, control of Losses in reservoirs.

Earthen dam: Types of earthen dams, Components and their functions, methods of construction of earthen dam, Design criterion, plotting of phreatic line, Modes of failure, seepage control measures-Drainage & filters, stability of slopes for sudden drawdown & steady seepage.

Unit-2  (07)

Gravity Dams: Forces acting on dam, Design Criterion-theoretical and practicle profile, high and low dam, fixing section of dam, stability analysis, and methods of construction, galleries and joints in dams. Arch dams-Introduction & types only. Introduction to instrumentation in dams.

Unit-3  (05)

Spillway: Necessity and function components of spillway, different types, factors affecting choice of type of spillway. Elementary hydraulic design, types of energy dissipation arrangements, gates for spillway.
Outlets in Dams: Outlets through concrete and earth dams, different types.

SECTION II

Unit-4  (06)

Diversion Head Works: component parts & their functions, types of weir and barrages, Causes of failure and remedies, Introduction to Theory of seepage-Bligh’s creep theory, critical exit gradient, Khosla’s theory,
**Unit-5**

**Canals:** Types, alignment, typical sections of canals, balancing depth Kennedy’s and Lacey’s silt theories, canal lining-purpose, types, selection and economics.

**C.D.Works:** Necessity, Types.

**Canal Regulatory Works:** head regulator, cross regulator, canal fall, canal escape, standing wave flume.

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**Unit-6**

**River Engineering:** Classification and types of river, meandering phenomenon, 

**River training works:** Classification-Marginal bunds, Guide banks and Groynes.

River navigation. Interlinking of rivers, National perspective plan.

**Elements of hydro-power:** Hydro-power & importance, typical layout & functions of components parts-Intakes, conveyance system, surge tanks, Power house, Tail race, Types of hydro-power plants.

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**Term work:**

Ten assignments of the following

1. Determination of height of dam: demand/supply reservoir calculation and control levels and free board
2. Earthen dam: Determination of section (drawing of one plate), one slip circle calculations, Types of failure
3. Gravity dam: Forces acting, Modes of failure,
4. Gravity dam: Elementary and practicle profile with stability calculations (drawing of one plate) types of arch dam.
5. Spillway: Geometrical section, energy dissipation arrangement and gates, Outlet through earth dam and gravity dam.
6. Typical section diversion headwork, Blighs & khoslas theory.
7. Typical sections of canal, kenedy & lacey’s theory
8. Types of CD work and canal regulatory works
9. Different types of river training work, Interlinking of rivers
10. Atypical layout & components parts of Hydropower plant and its functioning
11. Report based on field visit to dam & CD work.
Recommended books:
7. Leliavsky, ‘Design of hydraulic structures,’
9. P.N.Modi. ‘Irrigation and water power engineering’
10. Satyanarayan Murty, ‘Water resources Engg’, New age international private Ltd.
TRANSPORTATION ENGINEERING-II

Teaching Scheme
Lectures: 3 Hrs/Week

Course learning objectives:
1. Provides a basic knowledge on Urbanisation and its trend.
2. Deals with different types of plan, its implementation, regional development and management for sustainable urban growth.
3. To expose the various aspects of planning and designing of rail transportation system.
4. Identify the input parameters required for design of a bridge structures.

Course learning outcomes:
1. Able to understand importance of town planning and its past trends.
2. Able to understand with a different types of urban strategies and management for sustainable urban growth.
3. Decide the selection of a bridge structures; list the factors affecting, design of a various parameters of bridge structures.
4. Able to understand railway engineering design parameters and its importance.

SECTION- I

Unit: 1 (05)
a) Necessity and scope and principles of Town Planning, Present status of town planning in India.
b) Contribution of town planners in modern era such as Sir Patrick Geddes. Sir Ebenezer Howard. Clarence stein, Sir Patrick Abercrombie, Le Corbusier.

Unit: 2 (08)

Growth pattern of towns-Natural and Planned ,Elements of town, Types of zoning and importance, Urban roads- traffic problem in cities, various road networks(Grid iron pattern, shoe string development ,etc),Surveys of data collection, physical, social, economic, civic etc. Analysis of data, Town aesthetics, landscape architecture (Suitability of trees. Treatment of traffic islands, open spaces, walks ways, public sit-out, and continuous park system. Green ways),Rehabilitation of slum and urban renewal
Unit: 3

a) Development control rules with respective to town planning.
b) Different town planning works with reference to M.R.T.P. Act. (Brief idea about various provisions)
c) Land acquisition act – necessity and procedure of acquisition.
d) Village planning- Necessity and principles.
e) Multilevel planning, Decentralization concepts, Rural developments- Growth centre approach, Area Development approach, Integrated rural development approach.

SECTION- II

(A) Railway Engineering

Unit: 4

a) Introduction, Permanent Way : Components, coning of wheels
b) Geometric design: Alignment, gradient, horizontal curves, superelevation, design problems on above.
c) Points & Crossing: Terms used, standard points and crossings, design of simple turnout various types of track junctions.
d) Stations and yards: purpose, location, site selection, types and general layouts of terminus, Junction.

Unit: 5

a) Signaling and interlocking—Introduction, Construction and maintenance of railway track: methods, material required per KM of track, tools and plant used for plate laying, maintenance of Track, Modern trends in railways, Safety in railways

(B) Bridge Engineering

Unit: 6

a) Classification of bridges, selection of site, Bridge Hydrology: determination of design discharge, linear water way, economical span, location of piers and abutments, afflux, scour depth, design problems on above topics.
b) Standard specification for bridges: - IRC loads, Railway bridge loading, forces acting on super structure. Design considerations, aesthetics of bridge design.
c) Types of bridge foundations, Bridge piers, Abutments, Wing walls, Bearings, Construction and maintenance of bridges - Introduction; Recent trends in bridges.

**Reference books:**

2. Town and country Planning - N.K. Gandhi
3. Town Planning - S.C. Rangawala, Charotar Publications, Pune
4. MRTP Act 1966
5. Land Acquisition Act - 1894
6. Urban Pattern by Gallion, Eisner
11. Bridge Construction Practice – Raina
13. Railway Engineering – K. F. Antia
STRUCTURAL DESIGN AND DRAWING-II

Teaching Scheme
Practical: 4 Hrs/Week

Examination Scheme
Term Work: 50 Marks
Oral Exam: 25 Marks

Course Objectives:
1. To apply holistic approach of planning, analysis, segmentation & design of RCC building & other Civil Engineering Structures
2. To get an exposure to the method of analysis & design using software.

Course Outcomes:
After successful completion of course student will be able to
1. Translate the ideas into workable plans
2. Classify the components
3. Design the units & hence the structure as a whole
4. Draft the details for execution
5. To read and understand the supplied drawing for execution on site.

Term work shall consist of detailed design & drawing of the following R.C. structures by Limit State Method.
1. Residential two storied building. (Minimum 120 sq mt.) Drawings prepared shall indicate ductility details as per the provision in IS: 13920.
2. Any ONE from the following:
   a) Retaining wall (cantilever or counter fort type)
   b) Design of footing (Raft foundation /pile foundation)
3. Analysis and design of RCC framed structure using software.

Note:
At least one site visit to be conducted to show the onsite detailing.
The project work started in the seventh semester will continue in this semester. The students will complete the project work in this semester and present it before the assessing committee.

The term work assessment committee as constituted in the seventh semester will assess the various projects for the relative grading and group average. The guides will award the marks for the individual students depending on the group average. Each group will submit the copies of the completed project report signed by the guide to the department. The head of the department will certify the copies and return them to the students. One copy will be kept in the departmental library.

For work load calculation minimum load is 2 Hr./week, for one group of to FIVE students. (As per AICTE Guide Lines)
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<tr>
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<th>Name of Subject</th>
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<tbody>
<tr>
<td>1.</td>
<td>Advanced Design of Concrete Structures</td>
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<td>2.</td>
<td>Design of Industrial Structures</td>
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<td>3.</td>
<td>Structural Design of Foundation and Retaining Structures</td>
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<td>4.</td>
<td>Advanced Pre-stressed Concrete Design</td>
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<td>5.</td>
<td>Design of Bridges</td>
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<td>6.</td>
<td>Dynamics of Structures</td>
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<td>7.</td>
<td>Finite Element Method</td>
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### ELECTIVE-II

**ADVANCED CONCRETE DESIGN**

<table>
<thead>
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<th>Teaching Scheme</th>
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<tbody>
<tr>
<td>Lectures: 3 Hrs/Week</td>
<td>Theory Paper: 100 Marks</td>
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</table>

1. All designs should be based on IS codes

#### SECTION- I

**Unit : 1**

Large span concrete roofs – Classification- Behaviour of Flat slabs-Direct design and equivalent frame method- Codal provisions

**Unit : 2**

Analysis of deep beams- Design as per IS 456-2000

**Unit : 3**

Analysis of stresses in concrete chimneys- uncracked and cracked sections- Codal provisions- Design of chimney

#### SECTION- II

**Unit : 4**

Overhead water tanks- rectangular and circular with flat bottom-spherical and conical tank roofs- staging- Design based on IS 3370

**Unit : 5**

Analysis and Design of cantilever and counter fort retaining walls with horizontal and inclined surcharge

**Unit : 6**

Yield line analysis of slabs- virtual work and equilibrium method of analysis- simply supported rectangular slabs with corners held down-uniform and concentrated loads- design of simply supported rectangular and circular slabs
Term Work:

1. At Least TWO Assignments on each unit.

Reference books:

2. Design and Construction of Concrete Shell Roofs-G.S.Ramaswamy
3. Reinforced Concrete – Ashok K Jain, Nem Chand Bros. Roorkee
5. Reinforced Concrete Chimneys- Taylor C Pere,
6. Yield Line Analysis of Slabs- Jones L L, Thomas and Hudson
7. Design of deep girders, Concrete Association of India
8. Reinforced Concrete, Mallick & Gupta- Oxford & IBH
9. IS 456-2000
10. IS2210-1998- Criteria for design of reinforced concrete shell structures and folded plates
11. IS 4998-1998- Criteria for design of reinforced concrete chimneys
12. IS 3370- 1991- Part 1-4- Code of Practice for concrete structures for the storage of liquids
ELECTIVE-II

DESIGN OF INDUSTRIAL STRUCTURES

Teaching Scheme Examination Scheme
Lectures: 3 Hrs/Week Theory Paper: 100 Marks

Objectives:
The course deals with some of the special aspects with respect to Civil Engineering Structures in industries. At the end of this course the student shall be able to design some of industrial structures.

SECTION- I

Unit : 1 (07)
Analysis and design of single storey shed, knee braced truss column structure, various arrangements for gantry columns.

Unit : 2 (07)
Types of column configuration in case of knee-braced trussed bent with gantry loads. Design of stepped columns and bases under various load combinations.

Unit : 3 (06)
Industrial shed using single storey portal frame with and without gantry. Design of haunches.

SECTION- II

Unit : 4 (07)
Space deck structures. Domes in the form of space trusses, trussed purlins.

Unit : 5 (07)
Machine foundations, industrial flooring, protection and maintenance of industrial structures.

Unit : 6 (06)
Open web frames for industrial shed.
Term Work:
Design and drawing of any two different types of industrial structures on the basis of topics listed above with use of commercial software for analysis.

Reference books:

4. Advanced Design in Structural Steel: John E. Lothers
B. E. CIVIL ENGINEERING PART II SEMESTER VIII

ELECTIVE-II

STRUCTURAL DESIGN OF FOUNDATION AND RETAINING STRUCTURES

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks

SECTION- I

Unit : 1 (07)
Combined footings: Introduction, necessity and types of combined footings, design of slab type and slab-beam type of combined footing

Unit : 2 (05)
Pile foundations: Types, design and placement. Design of pile caps for 3, 4 and 6 piles group.

Unit : 3 (08)
Raft foundation: Introduction, necessity and types of raft or mat foundation. Analysis and Design of raft foundation

SECTION- II

Unit : 4 (08)
Well foundations: Elements, forces acting on well, lateral stability analysis, problems in sinking of wells and remedial measures

Unit : 5 (07)
Retaining Structures: Introduction, Functions and types of retaining walls. Analysis and design of RCC cantilever type of retaining wall for various types of backfill conditions

Unit : 6 (05)
Break Waters: Design and methods of construction
Term Work:
1. At least eight assignments
2. At least site visit on foundation site

Reference books:
2. B.J. Kasmalkar, “Foundation Engineering”, Pune Vidyarthi Griha Prakashan
ELECTIVE – II

ADVANCE PRESTRESSED CONCRETE DESIGN

Teaching Scheme
Lecture : 3 hrs/Week

Examination Scheme
Theory Paper: 100 Marks

SECTION- I

Unit : 1  (08)
a) Analysis and design of beams - Rectangular, Flanged and I sections, for
Limit State of flexure, ultimate flexural strength, recommendations of I.S.
codes.
b) Analysis and design of end blocks in post tensional members -primary and
secondary distribution zones, Bursting and spalling tensions.

Unit : 2  (08)
Shear strength of prestressed concrete beams - mode of failure in beams,
recommendations of I.S. code, ultimate shear strength of concrete, Design of
shear reinforcement, Bond in prestressed concrete.

Unit : 3  (04)
Analysis and design of continuous (upto two spans) and fixed beams. Elastic
analysis, secondary moments, concordant cable, linear transformations.

SECTION- II

Unit : 4  (04)
Analysis and design of prestressed concrete structures such as concrete pipes
and Sleepers.

Unit : 5  (08)
Analysis and design of portal frames, single storey and limited to two bays
(fixed and hinged).

Unit : 6  (08)
Design of pre-stressed concrete bridges (simply supported) for I.R.C. loadings
or equivalent uniformly distributed loads.
Reference books:
1. IS 1343: Code of Practice for Prestressed Concrete by Bureau of Indian Standards.
5. Dayaratnam P., Prestressed Concrete Structures.
ELECTIVE-II

DESIGN OF BRIDGES

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks

SECTION- I

Unit : 1
Introduction & Brief History of bridges, Classification, Importance of bridges, Components of bridges, Investigation for Bridges.

Unit : 2
Standard specification for Road Bridges. I.R.C. bridge code, width of carriage way, clearances, loads to be considered i.e. D.L., L.L., Impact load, wind load, Earthquake load, Longitudinal force, Centrifugal force, buoyancy, Earth pressure, water current force, thermal force etc.

Unit : 3

SECTION- II

Unit : 4
Construction Techniques – Construction of sub structure footing, piles, cassions, construction of reinforced earth retaining wall and reinforced earth abutments, super structure – erection method for bridge deck construction by cantilever method, Repair, Strengthening, and Rehabilitation of Existing Bridges

Unit : 5
Design of sub structure – Abutments, Piers, Approach slab.
Unit : 6  

Different types of bridge Bearing and expansion joints – forces on bearings – Types of bearings, design of unreinforced elastomeric bearings, expansion joints.

Reference Books:
ELECTIVE - II

DYNAMICS OF STRUCTURES

Teaching Scheme
Lecture: 3 hrs/Week

Examination Scheme
Theory Paper: 100 Marks

SECTION- I

Unit : 1  
(07)


Unit : 2  
(06)

SDOF system subjected to periodic & impulsive loading, Fourier series loading, Rectangular pulse, Introduction to Frequency – Domain Analysis

Unit : 3  
(07)

SDOF systems subjected to general dynamic loading, Duhamel’s integral, Application to simple loading cases, numerical evaluation of response integral, Piece wise exact method.

SECTION- II

Unit : 4  
(07)

MDOF systems, selection of DOFs, formulation of equations of motion, Structure matrices, Static condensation, Free Vibration Eigen Value problem, Frequencies and Mode Shapes, Determination of natural frequencies and mode shapes by Stodola-Vianello method, Orthogonality conditions

Unit : 5  
(06)

Discrete systems, Fundamental mode analysis, Rayleigh method, Response of MDOF systems to dynamic loading, Mode superposition method, Coupled and Uncoupled equations of motion, Model Contribution
Distributed- parameter Systems, Partial differential equations of motion, Free and forced Vibration, Application to beams in flexure.

**Reference books:**
2. Structural Dynamics - Mario Paz CBS Publication
Earthquake Resistant Design of R. C. C. Structures – S. K. Gosh
ELECTIVE-II

FINITE ELEMENT METHOD

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks

Objectives:
FEM is a powerful tool for the numerical solution of a wide range of Engineering Problems. With advance in computer technology and CAD systems, complex problems can be modeled with relative ease. The section I of this course consists of understanding of basic concepts of FEM, Development of [k] for 1-D, 2-D and 3-D elements, relevant structural applications. The section-II consists of Isoparametric formulation of FEM, axisymmetrical elements.

SECTION- I

Unit : 1 (08)
Elementary Theory of Elasticity: Stress-Strain relations; Strain- Displacement relations; Plane stress and plane strain problems; Compatibility condition; Differential equations of equilibrium; Equations for two and three dimensional problems.

Unit : 2 (06)
Analysis of Skeletal structures: Formulation of element stiffness matrices for plane truss, beam and plane portal frame by direct method; Co-ordinate System; Transformation matrix; Discretization of Continuum; Numbering of nodes; Minimization of band width; Force displacement relationship; Solution for displacement unknowns; Application of method to plane truss, continuous beam and plane portal frames.

Unit : 3 (06)
Basic Concept and Procedure of FEM. Principle of minimum potential energy; Variational method; Continuum problems; Two dimensional elements; Use of displacement functions; Pascal’s triangle; Triangular and rectangular elements; Formulation of element stiffness matrix.
SECTION- II

Unit : 4  (06)

Convergence requirement; Selection of order of polynomial; Conforming and non-conforming elements; Effect of element aspect ratio, Finite representation of infinite bodies

Unit : 5  (08)

Shape function in Cartesian and natural coordinate system; Classification-Isoparametric, Sub-parametric, Super-parametric elements. Lagrange’s interpolation formulae; Concept of isoparametric element; Relation between Cartesian and natural Coordinate systems; Jacobian matrix; One and two dimensional isoparametric element.

Unit : 6  (06)

Introduction to three dimensional problem; Various three dimensional elements; Axisymmetric problems; Formulation of stiffness matrix of three dimensional and axi-symmetric elements.

Term Work:
Set of exercises based on above syllabus

Reference books :
1. Introduction to Finite Element Method – Chandrakant C. Desai and J.F.Abel
5. Introduction to Finite Element in Engineering – T R Chandrupatla and A D Belegundu University Press, India.
7. Finite Element Analysis-S.S. Bhavikatti, New Age International Publisher, New Delhi.
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<th>Sr. No.</th>
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<td>Hydrology and Watershed Management</td>
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<td>3.</td>
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ELECTIVE-III

PAVEMENT ANALYSIS, DESIGN AND EVALUATION

Teaching Scheme  Examination Scheme
Lectures: 3 Hrs/Week  Theory Paper: 100 Marks

SECTION- I

Unit : 1 (07)

Stresses and Deflections in Flexible Pavements: Types and component parts of pavements, Factors affecting design and performance of pavements. Comparison of highway and airfield pavements. Stresses and deflections in homogeneous masses. Burmister's two layer theory, three layer and multi layer theories; wheel load stresses, various factors in traffic wheel loads; ESWL of multiple wheels. Repeated loads and EWL factors; sustained loads.

Unit : 2 (07)

Flexible Pavement Design Methods for Highways: Empirical, semi-empirical and theoretical approaches, development, principle, design steps, advantages and application of the different pavement design methods McLeod Method, CBR Method, including IRC: 37-2012.

Unit : 3 (06)

Stresses in Rigid Pavements: Types of stresses and causes, factors influencing the stresses; general considerations in rigid pavement analysis, Westergaard’s Analysis, EWL; wheel load stresses, warping stresses, frictional stresses, combined stresses.

SECTION- II

Unit : 4 (06)

Unit : 5  (07)

Pavement Maintenance Management: Pavement failures: Failures in flexible pavement and rigid pavement; Methods of Maintenance of different types of pavements; Special problems in high rainfall areas and wet/water logging condition, maintenance of drainage system, Components of Pavement Management System, Examples of HDM/RTIM packages.

Unit : 6  (07)

Pavement Evaluation: Visual rating, Pavement Serviceability Index, Roughness, Skid resistance and Deflection measurements, Use of modern equipment for pavement surface condition measurements-Analysis of data, interpretation and application, Functional evaluation, Structural evaluation of flexible pavements by rebound deflection method, analysis of data, interpretation and applications, FWD, and Benkelman Beam Deflection Technique (IRC:81-1997), Choice and Design of overlay type and pavement materials over existing flexible and rigid pavements with different degrees of distress. Rehabilitation and Recycling of bituminous pavement.

Term Work:
1 At least one assignment based on each unit.

Text books :

Reference books :
B. E. CIVIL ENGINEERING PART II SEMESTER VIII

ELECTIVE - III

HYDROLOGY AND WATERSHED MANAGEMENT

Teaching Scheme
Lecture : 3 hrs/Week

Examination Scheme
Theory Paper: 100 Marks

SECTION- I

Unit : 1 (06)
Runoff and River Gauging
Estimation of Runoff by Curve Number Method, Rational Method and using Empirical formulas, Stage -Discharge Measurement, Runoff Simulation Models (HEC)

Unit : 2 (07)
Design Flood
Definition and causes of Floods, Design Flood and its Importance, Estimation of Design Flood in Gauged and Ungauged Catchments, Flood Frequency Analysis, Rainfall Intensity-Duration and Frequency Relationships

Unit : 3 (07)
Flood Routing
Inflow-Outflow Relationship, Hydrologic Channel Routing, Hydrologic Reservoir Routing, Flood Routing Machines, Flood Forecasting, Flood Control Measures

SECTION- II

Unit : 4 (07)
Soil Erosion and Conservation

Unit : 5 (07)
Water Harvesting
Measures through Appropriate Technology viz. Contour Methods, Check Dams, Ponds, Rooftop Rainwater Harvesting etc. Integrated Water Resources management, Conjunctive Use, Groundwater Recharge, Application of Remote Sensing and GIS

Unit : 6 (06)

River Basin Management
Types of Rivers and their characteristics, Indian rivers and their classification, Behavior of Rivers, River Regime theory, Meandering, Control and Training of Rivers

Term Work:

1. At least 2 assignments based on each unit
2. Field visit to river-gauging site
3. Preparing Watershed Management Report

Reference books:
1. Hydrology and Soil Conservation Engineering: By, Ghashyam Das (Prentice-Hall India)
5. Watershed management: By, J.V.S. Murthy. (New Age International Publishers)
6. River Morphology: By, R.J. Garde. (New Age International Publishers)
7. Water Resources Engineering: By Ralph A. Wurbs and Wesley P. James (Prentice-Hall India)
ELECTIVE - III
WATER POWER ENGINEERING

Teaching Scheme
Lecture : 3 hrs/Week

Examination Scheme
Theory Paper: 100 Marks

SECTION- I

Unit : 1 (06)
Introduction: Sources of energy, types of power station, types of hydro power schemes, Estimation of hydro power available, gross head, net head, storage and pondage, hydrographs, mass curves, flow duration curves. Nature of demand: Load curve, load duration curves, load factor, plant capacity factor, plant use factor, firm power, secondary power.

Unit : 2 (07)
Intake: types, hydraulics of intake, trash rack, transition from gate to conduit, intake gates.
Surge Tank: Functions and behaviour of the surge tanks, location, types of surge tanks, basic design criteria of simple surge tank, forebay

Unit : 3 (07)
Water Conveyance Systems: Power canals – Hydraulic Design
Pen-stock: types, hydraulic design and economic diameter pipe, supports, anchor blocks,
Tunnels: classification, location and hydraulic design, tunnel linings.

SECTION- II

Unit : 4 (07)
Power station: General arrangements of power station, power house, substructure and super structure, main dimensions underground power station – necessity, types, development and economics. Advantages and disadvantages.
**Unit : 5**  
(06)  
Turbines: Classification of turbines, characteristics of different types, choice of type of turbine, turbine setting and cavitation, Tail Race, draft tubes, function and types, Hydraulic Design

**Unit : 6**  
(07)  

**a)** Pumped storage plants: purpose and general layout of pumped storage schemes, types, economics of pumped storage plants.

**b)** Tidal power stations: Classification, general description of different types, depression power plants.

**Reference books :**

3. Hydro – Electric Hand Book – Creager and Justin
4. Hydro Power Structures – Varshney
7. Water Power Engineering – M. M. Deshmukh, DhanpatRai and Sons
ELECTIVE-III

SITE INVESTIGATION METHODS AND PRACTICES

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks

Course Outcomes:
At the end of successful completion of course, the students will be able to--
6. State the importance of site investigation in Civil Engineering process
7. Describe different site investigation methods
8. Illustrate different subsurface exploration by non-destructive test
9. Identify the various Soil Exploration methods for soil sampling
10. Examine the various field and lab test on soil
11. Interpret how to write the technical report for site investigation

SECTION- I

Unit: 1 (07)
Introduction to Site investigation:
Introduction, the Importance of Site Investigation, Purposes of a Site Investigation, Objectives, 
Need for Site investigation, Advantages of Site Investigation, Phases in site investigation process, Approach to site investigation.

Unit: 2 (07)
Methodology of site investigation:
Preliminary site investigation: Preliminary desk study, Topographical maps, Geological records, 
Mining records, Air-photography and remote sensing, Photogrammetry, Air-photo interpretation, 
Site walk-over survey, Reconnaissance of site works.

Unit: 3 (06)
Site Investigation using Non-Destructive Tests:
Introduction, Electrical Methods, Magnetic Methods, Gravity Methods, Acoustic Emission Methods, Seismic Methods

SECTION- II

Unit: 4 (06)
Site investigation using in situ testing:
Introduction, Penetration testing - Standard penetration test & Cone penetration test, Strength and compressibility testing - Field vane shear test, Pressure meter test, Plate loading test.

**Unit: 5**

**Sampling:**
Introduction, Sample sizes, Soil Disturbance, Soil disturbance during drilling, Soil disturbance during sampling, Disturbance after sampling, Undisturbed sampling techniques, Sand Sampling, Preparation of disturbed samples for testing, Preparation of undisturbed samples for testing.

**Unit: 6**

**Laboratory testing for site investigation:**
Introduction, Purpose of soil testing, Purpose & Significance of following test – Soil classification tests, Particle size distribution tests (Sieve analysis, Hydrometer analysis), Plasticity tests (Liquid limit, Cone penetrometer test, Plastic limit), Compaction tests (Proctor compaction test), Particle density (Specific gravity) determination, Tests for Geotechnical parameters - Strength tests (CBR test, Lab vane test, Direct shear test, Triaxial test), Seepage and permeability tests

**Technical Report writing** - Standard format for a site investigation report

**References:**
1. Site investigation by Clayton, Mathews and Simons
ELECTIVE-III

AIR POLLUTION AND CONTROL

Teaching Scheme
Lectures: 3 Hrs/Week

Examination Scheme
Theory Paper: 100 Marks

Course objectives-
Upon completion of this course you should be able to:
1. Describe current air pollution issues;
2. Know the main air pollutants and its effect on human health and environment;
3. Understand the regulations and policies to manage air pollution;
4. Have knowledge of technologies used to control and remove air pollutants

Out comes-
Student will be able to
1. Scope of air pollution
2. Design air pollution control devices
3. Know the air pollution monitoring and regulatory control.

SECTION-I

Unit: 1
(08)
The structure of the atmosphere, Definition and Scope of Air Pollution, Sources of air pollution: Natural and artificial, Chemistry and Classification of pollutant, quantity and composition of particulate & gaseous pollutant, Unit of measurements.

Unit-2
(04)
Effect of different air pollutants on living and non-living things. Various air pollution Episodes.

Unit- 3
(08)
The meteorology and air pollution : Different Meteorological factors & their effect, lapse rate and stability of atmosphere, inversion phenomenon, various meteorological factors like precipitation & scavenging,
humidity, temperature, wind patterns, direction, velocity and fluctuations, models of diffusion and dispersion plume behavior, stack height design.

**SECTION-II**

**Unit: 4**

Introduction to application of software for air quality. Air pollution monitoring and regulatory control, Ambient Air quality standards, emission limits, ambient air & stack sampling, equipment for ambient air and stack sampling, methods of sampling, pollution monitoring of existing sources and new installations.

**Unit: 5**

Control of pollutant emission at source, alternative fuels, process change, removal methods for particulate, principles of particulate removals, various types of particulate control equipment, setting chamber, cyclone separators and scrubbers, fabric filters, electrostatic precipitators.

**Unit: 6**

a) Principles of removal of gaseous pollutants, design of incineration, absorption adsorption system. Vehicular pollution, composition, quantity & control.

b) Status of air pollution in India, air pollution control act and strategy for effective control of air pollution.

**Reference books:**

1. Air Pollution- Wark and Warner
2. Air Pollution- Martin Crawford
3. Air Pollution and Industry – R.D.Ross
5. Environmental engineering- By Peavy & Powe.
6. Air Pollution- Stern
INDUSTRIAL WASTE TREATMENT

Teaching Scheme
Lecture : 3 hrs/Week

Examination Scheme
Theory Paper: 100 Marks

SECTION- I

Unit : 1 (08)
Use of water in industry, sources of wastewater, quality and quantity variations in waste discharge, water budgeting, characterization and monitoring of wastewater flow, stream standards and effluent standards. Miscellaneous methods of dissolved solids removal, sludge disposal methods

Unit : 2 (07)
Waste volume and strength reduction, in-plant measure, good housekeeping, process change, leakage prevention, segregation and recycling Neutralization, equalization and proportioning of waste

Unit : 3 (05)
Water Quality monitoring of Streams, Self purification of streams, B.O.D. reaction rate, D.O. sag curve and D.O. deficit calculations

SECTION- II

Unit : 4 (06)
Different types of waste treatment & their selections, Development of treatment flow diagram based on characteristics of waste
Acclimatization of bacteria to toxic wastes, process sensitivity operation and maintenance requirements

Unit : 5 (09)
Manufacturing processes in major industries, water requirements, wastewater sources, composition of wastes, Viz. sugar, distillery, dairy, pulps, paper mill, fertilizer, tannery, chemical, steel industry, power plants, textile Treatment flow sheets, alternative methods of treatment, factors affecting efficiency of treatment plant
Unit : 6

Water pollution control act, organizational set up of central and state boards for water pollution control, classification of river on water use, minimal national standards, socio-economic aspects of water pollution control

Reference books :
2. Industrial Waste Treatment Nelson Meneroo
3. Industrial Waste Treatment Rao&Datta
ELECTIVE - III

ADVANCED CONSTRUCTION TECHNIQUES

Teaching Scheme
Lecture: 3 hrs/Week

Examination Scheme
Theory Paper: 100 Marks

SECTION- I

Unit : 1 (07)

COMPOSITE CONSTRUCTION: - composite v/s non composite action; composite steel-concrete construction.

FORMWORK: - Material for formwork, special types of formwork, design of formwork

Unit : 2 (07)

NEW MATERIAL of construction such as geosynthetics, Epoxy resins, Adhesives, MDF, FRC, FRP, Polymer-based composites.

Unit : 3 (06)

LAND RECLAMATION:- Technical progress, Drainage for land reclamations, structural improvement.

SECTION- II

Unit : 4 (06)

CONSTRUCTION of power-generation structures, Atomic Power stations, Thermal Power stations, wind-mills.

Unit : 5 (06)

a) Rehabilitation of bridges: Necessity and methods of strengthening, preservation of bridges.

b) Retaining structures like diaphragm walls, advanced methods of their construction.
Unit: 6

a) **Construction of concrete pavement** by techniques like vacuum processing, revibrated concrete, Roller–compact concrete.

b) **Use of techniques** like slip form paving in pavement construction; using Wet-MIX macadam in Road. Advanced Techniques, vacuum dewatering in concrete slab construction, Reinforced earth construction, foundation strengthening

**Reference books:**

1. Handbook of Composite construction Engg--- G.M. Sabanis
2. Formwork design and construction---- Wynn
3. Water power Engineering—Dandekarsharma
4. Bridge Engineering--- Raina
5. Bridge engineering Punnuswamy
6. Concrete Technology--- M.S. Shetty S.Chand publication
Shivaji University, Kolhapur

Syllabus Structure

B E Civil Engineering Semester VII and Semester VIII

Subject Equivalences

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SHIVAJI UNIVERSITY, KOLHAPUR

“A”

Accredited by NAAC

Revised Syllabus and Structure of

(B.E. Computer Science & Engineering

Sem – VII & VIII )

To be introduced from the academic year 2016-17

(i.e. from June 2016) Onwards

(Subject to the modifications will be made from time to time)
## SEMESTER VII

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**Elective – I**

A. Soft Computing  
B. Mobile Applications  
C. Adhoc Wireless Networks  

**Elective – II**

A. Internet of Things  
B. Software Testing and Quality Assurance  
C. Introduction to Mainframes
Note:

1. The term work as prescribed in the syllabus is to be periodically and jointly assessed by a team of teachers from the concerned department.
2. In case of tutorials, students of different batches be assigned problems of different types and be guided for the solution of the problem during tutorial session. Problems thus solved be translated into computer programs wherever applicable and executed by respective batches during practical session.
3. The assignments of tutorials and practical’s need to be submitted in the form of soft copy and / or written journal.
4. The Term Work (TW) Assessment be done based on the performance of the student in the Class Tests, Timely submission of Tutorials/Assignments, Practical Performance during the entire semester etc.
5. Project work should be continually evaluated based on:
   a. The contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
   b. Two mid-term evaluations should be done, which includes presentations and demos of the work done.
6. In addition to the above list of electives, any other elective based on the current developments and need may be offered with prior sanction from the University Authorities.
7. The elective should be offered by the department, if the minimum number of students opting for a particular elective must be 15 students and it should be taught by the concerned teacher.
B.E. (COMPUTER SCIENCE & ENGINEERING) Sem – VII
CS7C01. ADVANCED COMPUTER ARCHITECTURE

Lecture : 4 hrs / week
Tutorials : 1 hr/ week

Theory : 100 Marks
Term work : 25 Marks

Pre-requisite: Digital systems and microprocessors, computer organization and architectures.

Objectives:
1. To understand different computer architectures
2. To learn concepts of pipeline architectures and different performance measures
3. To understand memory organizations
4. To understand latest technologies in parallel processing
5. To understand loosely coupled architectures

Section - I

Unit 1. Introduction

Unit 2. Principles of Pipelining and Vector Processing:
Pipelining, linear pipelining, classification of Pipeline Processors, Interleaved memory organizations, performance evaluation factors. Vector processing concepts, characteristics, pipelined vector processors, Cray type vector processor - design e.g. Array processors, Systolic arrays.

Unit 3. Different parallel processing architectures:
Introduction to Associative memory processors, Multithreaded architecture –principles of multithreading, Latency hiding techniques, Scalable coherent multiprocessor model with distributed shared memory.

Section - II

Unit 4. Distributed Memory Architecture :
Loosely coupled and tightly coupled architectures. Cluster computing as an application of loosely coupled architecture. Examples – CM*

Unit 5. Data-Level Parallelism in Vector, SIMD and GPU Architectures
Introduction, Vector Architecture, SIMD Instruction Set Extensions for Multimedia, Graphics Processing Units Detecting and Enhancing Loop-Level Parallelism, Crosscutting Issues Mobile versus Server GPUs and Tesla versus Core i7.

Unit 6. Program and Network Properties:
Conditions of parallelism Data and Resource Dependences, Data dependency analysis - Bernstein’s condition, Hardware and Software Parallelism, Grain Sizes and Latency, Grain Packing and Scheduling.

Text Books:
1. Advanced computer architecture – Kai Hwang (MGH). (for Unit 1, 3 & 6)
2. Computer Architecture & Parallel Processing – Kai Hwang & Briggs (MGH) (for Unit 2 & 4)

Reference Books:
1. Advanced computer Architecture – Dezso Sima, Terence Fountain & Peter Kacsuk (Pearson Education)

Term Work: It should consist of minimum 8-10 assignments with emphasis on solving exercise problems

CS7L02. DISTRIBUTED SYSTEMS

Lecture : 3 hrs / week Theory : 100 Marks
Practical : 2 hrs/ week Term work : 25 Marks

Objectives:
1. To present the principles underlying the function of distributed systems and their extension to grid and cloud computing and virtualization techniques
2. To expose students to current technology used to build architectures to enhance distributed computing infrastructures with various computing principles and paradigms, including grid and cloud computing
3. Expose students to past and current research issues in the field of distributed systems and new challenges in cloud computing
4. Enhance students understanding of key issues related to multi-level interoperability across a distributed infrastructure and across multiple heterogeneous and distributed resources in a dynamically changing computing environment

Section I

UNIT 1: Introduction

UNIT 2: Communication and Synchronization : (8)
Remote Procedure Call, Message Oriented Transient Communication, Physical Clock Synchronization, Logical Clock, Mutual exclusion, Election Algorithms

UNIT 3: Distributed File Systems and Fault Tolerance (8)
Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Introduction to fault tolerance, Process Resilience, Distributed Commit, Recovery.

Section II

UNIT 4: Introduction to Cloud (4)
Getting to know the Cloud, Cloud and other similar configurations, Components of Cloud Computing, Cloud Types and Models: Private Cloud, Community Cloud, Public Cloud, Hybrid Clouds.

UNIT 5: Virtualization (5)
Introduction and benefits, Implementation Levels of Virtualization, Virtualization at the OS Level, Virtualization Structure, Virtualization Mechanism, Open Source Virtualization Technology, Xen Virtualization Architecture, Binary Translation with Full Virtualization, Paravirtualization, Virtualization of CPU, Memory and I/O Devices.

UNIT 6: Cloud Computing Services and Data Security in Cloud (6)
Infrastructure as a Service, Platform as a Service, Software as a Service, Database as a Service, Specialized Cloud Services, Challenges with Cloud Data, Challenges with Data Security, Data Confidentiality and Encryption, Data availability, Data Integrity, Cloud Storage Gateways.

Text Books:

Reference Books:

List of experiments:
1. Study / Configuring P2P clients
2. RPC
3. Configuring the Client/Server for NTP
4. Simulation of Mutual Exclusion Algorithms
5. Simulation of Election algorithms
6. Client/Server Configuration of NFS
7. Auto mounting in NFS
8. Simulation of Distributed Commit
9. Simulation of recovery techniques
10. Installing a private cloud
11. Installing OS on a Virtual Machine Monitor
12. Offline migration of virtual OS
13. Live migration of virtual OS
14. Developing application on Google AppEngine

(Minimum 4 experiments from Section-I and 4 from Section-II should be framed based on the above list)

**CS7L03. ADVANCED DATABASE SYSTEMS**

<table>
<thead>
<tr>
<th>Lecture</th>
<th>3 hrs / week</th>
<th>Theory</th>
<th>100 Marks</th>
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</thead>
<tbody>
<tr>
<td>Practical</td>
<td>2 hrs / week</td>
<td>Term work</td>
<td>25 Marks</td>
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<td>OE</td>
<td>50 Marks</td>
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**Objectives:**

1. To learn Basics of design of databases.
2. To acquire knowledge on parallel and distributed databases and its applications.
3. To study the usage and applications of Object Oriented database.
4. To Understand and perform common database administration tasks, such as database monitoring, performance tuning, data transfer, and security.
5. To understand the usage of advanced data models.

**Section - I**

**Unit I: Parallel and Distributed Databases** (7)


**Unit II: Object And Object Relational Databases** (7)


**Unit III : Advanced SQL** (7)

PL SQL- A Basic introduction, Functions and Procedure, Packages, Synonyms, Database Links, Embedded SQL and Dynamic SQL. Database Design: systems development life cycle, database life cycle, DBMS Software Selection, top-down versus bottom-up design, centralized versus decentralized design.
Section - II

Unit IV: Database Security and Authorization (5)

Discretionary Access Control, Mandatory Access Control, Audit Trails in Databases, Statistical Databases

Unit V: Databases on the Web and Semi-structured data (5)

Overview of XML, structure of XML data, document schema, querying XML data, storage of XML data, XML applications, the semi-structure data model, implementation issues, indexes for text data.

Unit VI: Business Intelligence and Data Warehouses (5)

The Need for Data Analysis, Business Intelligence, Business Intelligence Architecture, Decision Support Data, Online Analytical Processing, Star Schemas, Implementing a Warehouse, Data Mining, SQL Extension for OLAP.

Text Books:

1. Database System Concepts – Silberschatz, Korth, Sudarshan – 5th Edi (MGH International edition). (Unit No.1, Unit No.5, Unit No.2)
2. Fundamentals of Database Systems - Elmasri and Navathe [4e], Pearson Education (Unit No.2)
3. Database Systems, Design, Implementation and Management - Coronel-Morris- Rob (Unit No.3, 4, 6)

References:


Term Work:

It should consist of minimum 8-10 assignments, based on the syllabus and below mentioned experiment list.

1. To develop and write SQL queries for a distributed database of Bookstore at four sites S1, S2, S3 and S4. The Bookstores are divided into four sites by their ZIP codes.
2. Deadlock Detection Algorithm For Distributed Database Using Wait For Graph.
3. Implement Partitioning on the tables.
4. Implement semi join in distributed DBMS.
5. Implement bloom join in Distributed DBMS.
6. Implement two phase commit in distributed DBMS.
7. Develop an application using multi-valued Attributes, complex types, procedure, function and Inheritance in ORDBMS.

8. Demonstration of Active Database.

9. Implementation of Synonyms and Sequence.

10. Implementation of XML commands.


12. Implement K-Means Data Mining Clustering Algorithm.

13. Implement a priori algorithm.


15. Implementation of cube operator in OLAP queries in data warehousing and decision support system.

16. Implement view modification and materialization in data warehousing and decision support systems.

CS7E04. ELECTIVE – I A) Soft Computing

<table>
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<th>Lecture</th>
<th>3 hrs / week</th>
<th>Theory</th>
<th>100 Marks</th>
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<tbody>
<tr>
<td>Tutorials</td>
<td>1 hr/week</td>
<td>Term work</td>
<td>25 Marks</td>
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Course Objectives:

1. To earn fuzzy set theory and properties of Fuzzy sets.
2. To learn Neuro-Fuzzy modeling concepts
3. To learn Neural networks and training algorithms
4. To apply derivative based and derivative free optimization
5. To demonstrate applications of computational intelligence

Section - I


Unit 2. Artificial Neural Networks: Fundamental Concept, Evolution of Neural Networks, Basic Models of Artificial Neural Network, Terminologies of ANNs, McCulloch-Pitts Neuron, Linear Reparability, Hebb Network. (7)

Section - II


Unit 6. Applications of Soft Computing: GA Based Internet Search Technique; Soft Computing Based Hybrid Fuzzy Controllers. (4)

Text Books:
2) Elements of Artificial Neural Networks - K Mehrotra, C.K. Mohan, and S. Ranka Published by MIT Press, 1997)

Reference Books:


Term Work: It should consist of minimum 10-12 assignments including problem solving assignments based on Neural Networks and Fuzzy Logic.

CS7E04. ELECTIVE – I B) Mobile Applications

Lecture : 3 hrs / week
Tutorials : 1 hr/ week

Theory : 100 Marks
Term work : 25 Marks

Course Objectives:
1. To develop problem solving abilities using Mobile Applications
2. To study different Mobile OS
3. To study procedure to develop applications using Mobile OS.

Section - I

Page 10 of 32
**Unit 1: Introduction**

Mobile Development Importance, Survey of mobile based application development, Mobile myths, Third party frameworks, Mobile Web Presence and Applications, Creating consumable web services for mobile, JSON, Debugging Web Services, Mobile Web Sites, Starting with Android mobile Applications.

**Unit 2: Mobile Web**

Introduction, WAP1, WAP2, Fragmentation Display, Input Methods, Browsers and Web Platforms, Tools for Mobile Web Development.

**Unit 3: Application Architectures and Designs**

Mobile Strategy, Navigation, Design and User Experience, WML, XHTML Mobile Profile and Basics, Mobile HTML5, CSS for Mobile, WCSS extensions, CSS3, CSS for mobile browsers, HTML5 Compatibility levels, Basics of Mobile HTML5: Document Head, Document Body, HTML5 Mobile Boilerplate, the Content, HTML5 Forms: Design, Elements, Attributes, validation.

**Section - II**

**Unit 4 : Devices, Images, Multi-Media**


**Unit 5: Advanced Tools, Techniques**


**Unit 6: Advanced Applications**

Geolocation and Maps APP, Offline Apps, Storage, and Networks, Distribution and Social Web 2.0

**Text Books:**


**Reference Books:**


**Term Work:** It should consist of minimum 10-12 assignments based on latest Web Technologies and Mobile operating systems.
CS7E04. ELECTIVE – I C) Adhoc Wireless Networks

<table>
<thead>
<tr>
<th>Lecture</th>
<th>3 hrs / week</th>
<th>Theory</th>
<th>100 Marks</th>
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</thead>
<tbody>
<tr>
<td>Tutorials</td>
<td>1 hr/ week</td>
<td>Term work</td>
<td>25 Marks</td>
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Course Objectives:-

To expose students to:

1. Adhoc wireless networks, their unique applications and design issues.
2. How Adhoc N/w works at MAC layer, forwarding mechanism and link recovery strategies.
3. Different routing mechanisms in Adhoc N/w, finding path from source node to destination node, recovery of routes.
4. Forming multicast sessions in Adhoc N/w, efficiently using resources available in networks.
5. Modification in traditional TCP protocol to make it best suitable for Adhoc Wireless Network.
6. Security issues in Adhoc N/w and strategies to overcome these issues.
7. Strategies for providing QoS in Adhoc N/w and dealing with power management issues to effectively use energy in Adhoc N/w.

Section - I

Unit 1. Introduction to Ad-hoc wireless networks: (3)

Unit 2. MAC Protocols for Ad-hoc wireless networks: (6)
Introduction, Issues in designing MAC protocol, Design goals of MAC protocol, Classification of MAC protocols, Contention based protocols :- MACAW, Busy Tone Multiple Access, MACA-By Invitation, Media Access with Reduced Handshake.

Unit 3. Routing protocols for Ad-hoc wireless networks (8)
Introduction, Issues in designing a routing protocol for ad hoc wireless networks, Classification of routing protocols, Table driven protocols :- DSDV, WRP, CGSR; On-Demand Hybrid routing protocols:- DSR, AODV, LAR, ABR, SSA , ZRP, ZHLS.

Section - II

Unit 4. Multicast Routing in Ad hoc wireless networks (8)
Introduction, Issues in designing a multicast routing protocol, Operation of multicast routing protocols, An architecture reference model for multicast routing protocols, Classification of multicast routing protocols, Tree-based Multicast Routing Protocols:- BEMR, MZRP, ABAM, PLBM, MAODV ; Mesh-based multicast routing protocols:- NSMP, CAMP.

Unit 5. Transport layer and security protocols for ad hoc wireless networks (6)
Introduction, Design issues and goals, Classification of transport layer solutions, TCP over ad hoc wireless networks:- TCP-F,Ad Hoc TCP, Split TCP; Security in ad hoc wireless networks:- ,

Unit 6. Energy Management and Quality of service

Introduction, Need, Classification of energy management schemes, System Power Management schemes- Processor Power Management Scheme, Device Power Management Scheme. Issues and challenges, Classification of QoS solutions, QoS framework – INSIGNIA, INORA, SWAN.

Text Books:


Reference Books:

1. Ad Hoc Wireless Networks – A communication Theoretic perspective by O.K.Tonguz & G.Ferrari, Wiley India.
3. Ad Hoc Networking by Charles E. Perkins (Pearson Education)
5. Mobile AD HOC Networking, Student Edition; by Stefano Basagni, Marco Conti, Silvia Giordano, Ivan Stojmenovic
6. The Handbook Of Ad Hoc Wireless Networks By Mohammad Ilyas Florida Atlantic University Boca Raton, Florida. (for Network Simulation Tool)

Term Work:

It should consist of minimum 8-10 assignments based on the above topics and some assignments should be on NS-2/3 to simulate MAC, Routing and Multicast routing protocols.

CS7L05. WEB TECHNOLOGIES - I

<table>
<thead>
<tr>
<th>Lecture</th>
<th>3 hrs / week</th>
<th>Term work</th>
<th>50 Marks</th>
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<tbody>
<tr>
<td>Practical</td>
<td>4 hrs/ week</td>
<td>POE</td>
<td>50 Marks</td>
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Course Objectives:

1. To introduce students to emerging web technologies
2. To teach front end web designing tools and to develop web applications
3. To know XML concepts and its applications
4. To motivate students to develop web applications using Servlets and JSP

Section - I

Unit 1: Front End Web Designing (7)

**HTML Design Patterns:** HTML Structure, XHTML, DOCTYPE, Header Elements, Conditional Style Sheet, Structural Block Elements, Terminal Block Elements, Multipurpose Block Elements, Inline Elements, Class and ID Attributes, HTML Whitespaces

**CSS Selector and Inheritance:** Type, Class and ID Selector, Position and Group Selectors, Attribute Selectors, Pseudo-element Selectors, Pseudo-class Selectors, Subclass Selector, Inheritance, Visual Inheritance

**Box Model:** Display, Box Model, Inline Box, Inline-Block Box, Block Box, Table Box, Absolute Box, Float Box, Box Extends: Width, Height, Sized, Shrink, wrapped, Stretched, Box Margin, Border, Padding, Background, Overflow, Visibility, Page Break Positioning Models, Closest Positioned Ancestor, Stacking Context, Atomic, Static, Absolute, Fixed Relative, Float and Clear, Relative Float

Unit 2: Introduction to XML (6)


**DTD and Namespaces:** Validation, Element Declarations, Attribute Declaration, General Entity Declarations, ExternalParsed General Entities, External Unparsed Entities and Notations, Parameter Entities, Conditional Inclusion, Two DTD Example, Locating Standard DTD, The need for namespaces, Namespace Syntax, How Parsers Handle Namespaces, Namespaces and DTDs

Unit 3: Working with XML (7)


**XPath:** The Tree Structure of an XML Document, Location Paths, Compound Location Paths, Predicates, Unabbreviated Location Paths, General Xpath Expressions, Xpath Functions

**Processing Models:** Common XML Processing Models, Common XML Processing Issues, Generating XML Documents Document Object Model (DOM), DOM Foundations, Structure of DOM Core, Node and Other Generic Interfaces, Specific Node-Type Interfaces, The DOM Implementation Interface, DOM Level 3 Interfaces, Parsing a Document with DOM, A Simple DOM Application Simple API for XML (SAX), The ContentHandler Interface, Features and Properties, Filters

Section - II
Unit 4: Basics of Servlets

Introduction to Servlet: History of Web Application, Support for Servlets, The power of Servlets, HTTP Basics, The Servlet API, Page Generation, Server-Side Includes, Servlet Chaining and Filters, Java Server Pages

The servlet Lifecycle: The Servlet Alternative, Servlet Reloading, Init and Destroy, Single-Thread Model, Background Processing, Last Modified Time


Unit 5: Advanced Topics in Servlet

Session Tracking: User Authorization, Hidden Form Fields, URL Rewriting, Persistent Cookies, The session Tracking API

Database Connectivity: Relational Database, The JDBC API, Reusing Database Objects, Transaction, Advanced JDBC Techniques

Unit 6: Java Server Pages (JSP)


Text Books:
1. Pro HTML5 and CSS3 Design Patterns by Michael Bowers, Dionysios Synodinos and Victor Sumner, Apress edition

Reference Books:

Term Work:
Term work marks is based on regular practical performance and final internal practical oral examination as well.

Sample Experiment List:
It should consist of 15-20 experiments based on the following topics.
1. Create html pages for website like login, registration and about us pages.
2. Design created pages using CSS
3. Create different types of valid XML documents
4. Search information from XML document using SAX parser
6. Creating XML document using DOM
7. Write XSLT styles-sheet to convert XML document to HTML
8. XML Validation using XSchema
9. Remote Procedure call using XML
10. Installation, Configuration of Tomcat Server and Deployment of Servlet based application
11. Write a servlet to store form data to database – use Type 4 JDBC driver
12. Write a servlet to search data from database
13. Session Management using Servlet
14. Write a JSP application to display database contents
15. Write a servlet to search data from database. Write a JSP application to input book information and store in the database. Application must provide facility to search book based on title of book, and author
16. Write a JSP application to input student information like first name, last name, department, date of birth, class, marks obtained in five subjects and store this information into database. Also generate report showing aggregate marks of all the students.
17. Write a JSP application to demonstrate Session Management using JSP (Application Controlled Authentication)

CS7L06. PROJECT - I

**Practical** : 4 hrs/ week

**Term work** : 75 Marks

**OE** : 75 Marks

The project work is to be carried out in two semesters of B.E. The project should be undertaken preferably by group of 4-5 students who will jointly work and implement the project in the two semesters.

In Semester VII, The group will select a project with the approval of the Guide (teaching staff) and submit the name of the project with a synopsis of the proposed work of not more than 02 to 08 pages before second week of August in the academic year. The group is expected to complete detailed system design, analysis, data flow design, procurement of hardware and/or software, implementation of a few modules of the proposed work at the end of semester –VII as a part of the term work submission in the form of a joint report. The term work assessment will be done jointly by teachers appointed by Head of the Department.
The oral examination will be conducted by an internal and external examiner as appointed by the University.

**Note:**
1. Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
2. Two mid-term evaluations should be done, which includes presentations and demos of the work done.
3. *Care should be taken to avoid copying and outsourcing of the project work.*
B.E. (COMPUTER SCIENCE & ENGINEERING) Sem – VIII
CSC801. DATA ANALYTICS

Lecture : 4 hrs / week  
Practical : 2 hrs/ week

Theory : 100 Marks  
Termwork : 25 Marks  
OE : 50 Marks

Objectives:
1. To understand Business Intelligence, decision support systems in Data warehouse
2. To study the Data analysis using data mining, data preparation and exploration
3. To forester the development of data mining capability in Hadoop and R and facilitate sharing of data mining codes/functions/algorithms among Hadoop and R users.

Section-I

Unit 1: Components of Decision-making process (8)
Business intelligence, Decision Support Systems, Data ware-housing.

Unit 2: Data analysis and exploration (8)
Mathematical models for decision making, data mining, data preparation, data exploration.

Unit 3: Introduction of Big data and Hadoop Echosystem (8)
Big data definition, Elements of Big data, Big data analytics, Big Data Stack, Virtualization and Big data, virtualization approaches, Hadoop Ecosystem, Hadoop Distributed file system(HDFS, MapReduce, Hadoop YARN, Hbase, Hive, Pig and Pig latin, Sqoop, ZooKeeper, Flume, Oozie.

Section-II

Unit 4: Data mining tasks (8)
Regression and association rules- structure of regression model, single linear regression, and multiple linear regression.

Classification - classification problems, Classification models, classification trees, Bayesian methods.

Unit 5: Association rules and clustering (8)

Unit 6: Exploring R (8)
Basic Features of R, Exploring RGui, Working with vectors, Handeling data in R workspace. Reading datasets and exporting data from R, Manipulating and processing data in R.

Text Books:
1. Business Intelligence - Data Mining and optimization for Decision Making- Carlo Vercellis-Wiley Publications. (For Units 1, 2, 4, 5)


3. Big Data (Black Book)- DT Editorial Services- Dreamtech Press (For Units 3, 6)

4. Data mining Introductory and Advanced topics- Margaret H. Dunham-Pearson (For Units 4, 5)

**Reference Books:**

1. Data Mining: Concepts and Techniques Second Edition- Jiawei Han and Micheline Kamber-Morgan KaufMan Publisher.


**List of Experiments:**

1. Installation of Hadoop and R.

2. Building Hadoop MapReduce application for counting frequency of word/phrase in simple text file.

3. Study of Hadoop YARN Administration command and User commands.


5. Study of Hadoop Hive DML commands like Insert, delete, update, data retrieval queries and Join-inner and outer.

6. Working with operators in Pig- FOREACH, ASSERT, FILTER, GROUP, ORDER BY, DISTINCT, JOIN, LIMIT, SAMPE, SPLIT, FLATIEN.

7. Study of R-declaring variables, expressions, functions and executing R script.

8. Working with R with data sets- create, read, write and R Tables- create, read, write.

9. Manipulating and processing data in R- merging datasets, sorting data, putting data into shape, managing data using matrices managing data using data frames.

**CS8C02. PROJECT MANAGEMENT**

**Lecture**: 3 hrs / week

**Theory**: 100 Marks

**Objectives:**

1. To provide students with a basic understanding of project management principles and practices.
2. To demonstrate competency in the creation and management of a project plan
3. To understanding impact of Scope, Time and Cost management.
4. To understanding the software quality metrics and quality assurance.
5. To develop strategies to calculate risk factors involved in IT projects.
Section - I

Unit 1. Introduction to Project Management: (5)
Project and Project Management (PM), Role of project Manager, System view of PM, Organization, Stakeholders, Project phases and lifecycle, Context of IT projects, process groups, mapping groups to Knowledge areas

Unit 2. Project Integration Management: (5)
Strategic planning and project selection, Developing a Project Management Plan, Directing and Managing Project Work, Monitoring and Controlling Project Work, Performing Integrated Change Control, Closing Projects or Phases

Unit 3. Project Scope, Time and Cost management: (9)
Planning Scope Management, Collecting Requirements, Defining Scope, Creating the Work Breakdown Structure, Validating Scope, Controlling Scope
Planning Schedule Management, Defining Activities, Sequencing and Estimating Activity, Resources & Duration, Developing & Controlling Schedule

Section - II

Unit 4. Quality Management: (6)
Importance, Planning Quality Management, Performing Quality Assurance, Controlling Quality, Tools and Techniques for Quality Control, Modern Quality Management, Improving IT Project Quality

Unit 5. Human Resource management: (6)
Importance, keys to managing people, human resource planning, acquiring, developing and managing project team, software assistance.

Unit 6. Risk management: (5)
Importance, risk management planning, sources of risk, risk identification, qualitative and quantitative risk analysis, risk response planning, risk monitoring and control.

Text Book:
1. Information Technology Project Management, 7E, Kathy Schwalbe, Cengage Learning (India Edition)

Reference Books:
CS8C03. REAL TIME OPERATING SYSTEM

Lecture : 4 hrs / week  
Tutorial : 1 hr/ week  
Theory : 100 Marks  
Termwork : 25 Marks

Objectives:
1. To understand basic real time operating system concepts.
2. To understand software engineering process for real time system design.
3. To learn programming languages for programming real time systems.
4. To understand different performance measures for real time O.S.
5. To understand different features of commercial real time operating systems.

Section - I

Unit 1. Basic Real Time Concepts & Hardware Considerations (3)
Terminology, Real Time System Design issues, Examples of Real-Time Systems

Unit 2. Hardware Considerations (5)
Basic Architecture, Hardware Interfacing, Central Processing Unit, Memory, Input / Output, Other special devices

Unit 3. Real-Time Operating System (10)
Real-Time Kernels, Theoretical Foundation of Real-Time Operating System, Scheduling ,Inter Task Communication and synchronization, System Services for Application Programs, Memory Management, Selecting Real Time Operating Systems ,Case study : POSIX .

Section - II

Unit 4. Software Requirements Engineering (8)
UNIT 4. Programming Language and the Software Production Process (8)
Coding of Real Time Software, Assembly Language, Procedural Language, Object-Oriented Language, Overview of programming languages for real time systems, Real time features of JAVA, C# languages, Special Real Time Languages, Compiler Optimization of code.

UNIT 5 Metrics & Cost Estimation (8)
Lines of Code, McCabe’s Metric, Halstead’s Metric, Function points, Feature Points, Metric for Object-Oriented Software, Fault Tolerance, Cost Estimation using COCOMO, Basic COCOMO, Detailed COCOMO, COCOMO II model.

Unit 6. Study of Commercial RTOS (6)
Architecture of RT Linux, Initialization Task Management in RT Linux, Scheduling, Memory Management, Task Synchronization.

Text Books:
1. Real-Time Systems Design and Analysis.. Tools for the Practitioner by Phillip A Laplante, Seppo J. Ovaska, Wiley - 4th Edition (For Units 1, 2, 3, 4, 5)

References:
1. Real Time Systems Theory and Practice, Rajib Mall, Pearson Education.

Term work:
It should consist of minimum 8 – 10 assignments based on the above topics, out of which few practical assignments should be on RTLinux / QNX / VxWorks / MQX / other RTOS.

CS8E04. ELECTIVE II – A) Internet of Things

Lecture: 3 hrs / week
Tutorial: 1 hr/ week
Theory: 100 Marks
Termwork: 25 Marks

Course Objectives:
1. To learn Internet of Things Technology
2. To know the basics of RFID, sensor and GPS technologies
3. To aware students about wireless technologies and IoT applications

Section - I

UNIT 1. Introduction (6)
What is the Internet of Things?: History of IoT, About objects/things in the IoT, Overview and motivations, Examples of applications, IoT definitions, IoT Frame work, General observations, ITU-T views, working definitions, Basic nodal capabilities.

UNIT 2. Fundamental IoT Mechanisms & Key Technologies: (6)
Identification of IoT objects and services, Structural aspects of the IoT, Environment characteristics, Traffic characteristics, scalability, Interoperability, Security and Privacy, Open architecture, Key IoT Technologies, Device Intelligence, Communication capabilities, Mobility support, Device Power, Sensor Technology, RFID technology, Satellite Technology.

UNIT 3. Radio Frequency Identification Technology: (6)
Introduction, Principles of RFID, Components of an RFID system, Reader, RFID tags, RFID middleware, Issue.
Wireless Sensor Networks: History and context, node, connecting nodes, networking nodes, securing communication.

Section - II
UNIT 4. Wireless Technologies For IoT: Layer 1/2 Connectivity: (6)
WPAN Technologies for IoT/M2M, Zigbee/IEEE 802.15.4, Radio Frequency for consumer Electronics (RF4CE), Bluetooth and its low-energy profile, IEEE 802.15.6 WBANS, IEEE 802.15 WPAN TG4j, MBANS, NFC, dedicated short range communication (DSRC) & related protocols. Comparison of WPAN technologies cellular & mobile network technologies for IoT/M2M.

UNIT 5. Governance of The Internet Of Things: (6)

UNIT 6. Internet Of Things Application Examples: (6)
Smart Metering, advanced metering infrastructure, e-Health/Body area network, City automation, automotive applications. Home automation, smart cards, Tracking, Over-The-Air passive surveillance/Ring of steel, Control application examples.

Text Books:
1. Hakima Chaouchi, The Internet of Things, Connecting Objects to the Web, Wiley Publications (for Units 1, 3, 5, 6)
2. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6 The Evolving World of M2M Communications”, Wiley Publications (for Units 2,4)

Reference Books:

CS8E04. ELECTIVE II – B) Software Testing Quality and Assurance

Lecture : 3 hrs / week
Tutorial : 1 hr/ week

Theory : 100 Marks
Termwork : 25 Marks

Course Objectives:
1) To provide knowledge about fundamentals of software testing and software quality
2) To understand the fundamentals of software verification
3) To understand and evaluate metrics and models used in software testing
4) To understand and compare testing web applications and desktop applications
5) To understand, compare and Choose from various software project assessment methods

Section - I

Unit 1. Introduction (4)

Unit 2. Software Verification (8)
Verification Methods, SRS document verification, SDD document verification, Source code reviews, User documentation verification, Software project audit

Creating test cases from SRS and Use cases: Use Case Diagram and Use Cases, Generation of test cases from use cases, Guidelines for generating validity checks, strategies for data validity, Database testing

Unit 3. Regression Testing (7)
What is regression testing?, Regression Test cases selection, Reducing the number of test cases, Risk analysis, Code coverage prioritization techniques

Object oriented testing: What is Object orientation?, What is object oriented testing?, Path testing, State based testing, Class testing

Section - II

Unit 4. Measurement - what is it and why do it? (6)
Measurement in everyday life, Measurement in software engineering, scope of software metrics

Metrics and Models in Software testing: Software Metrics, Categories of Metrics, Object oriented Metrics used in testing, what should we measure during testing, Software Quality attributes prediction models

Unit 5. Measuring Internal Product Attribute Size (5)
Aspects of software size, Length, Reuse, Functionality

Measuring External product Attributes: Modeling software quality, measuring aspects of software quality
Unit 6. Testing Web applications

What is web testing?, functional testing, UI testing, Usability testing, configurations and compatibility testing, security testing, performance testing, database testing, post deployment testing, web metrics.

Automated Test data generation: Automated Test Data generation, Approaches to test data generation, Test data generation tools

Text Books:
3) Software Quality Engineering, Jeff Tian, Wiley India Ltd.

Reference Books:
3) Software Quality, Mordechai Ben Menachem, Garry S. Marliss, BS Publications

Guidelines for tutorials:
It should consist of 8-10 assignments based on the following topics:

1. Software Testing Process, its need and limitations
2. Verification at different phases of SDLC for particular case study (SRS document verification, SDD document verification, Source code reviews, User documentation verification, Software project audit etc.)
3. Creating test cases from SRS and Use cases for particular case study
4. Generation of validity checks for particular case study
5. Regression testing with Test cases selection / Regression testing with reducing the number of test cases / Regression testing with code coverage prioritization techniques
6. Generation of test cases using Path testing/ State based testing/Class testing for particular case study
7. Measurement in Software Engineering
8. Software Metrics: Object oriented Metrics used in testing
9. Calculation of Software Quality attributes using different prediction models
10. Measurement of Internal / External Product Attributes
11. Generation of test cases in different key areas of Web application testing
12. Automated test data generation
CS8E04. ELECTIVE II – C) Introduction to Mainframes

Objectives:

1. Students will understand the fundamentals of Mainframes
2. Students will be able to know basics of JCL, COBOL & DB2
3. Students will simulate COBOL and JCL programs using SPFLite and Hercules and experience the Mainframes developer role

Section – I

Unit 1. Introduction to IBM Mainframe

Unit 2. Z/OS, MVS and VSAM:
z/Os and other Mainframe operating systems, What is z/OS, Overview of z/OS facilities, virtual Storage and other Mainframe Concepts, Workload management, MVS Concepts, Address Spaces, Addressing Mode and Residence Mode, Multiple Virtual Storage, Multiprogramming, MVS/370 Address Space Organizations, How data sets are stored?, Catalogs, Data Set Organization, VSAM Basics.

Unit 3. Introduction to JCL:
Introduction to Job Control language-Mainframe information representation and storage, sequential and partitioned datasets, Indexed files, structure of JCL, JOB statement, EXEC statement, JOB and EXEC statements, DD statement, JCL procedures and symbolic parameters, IBM utility programs.

Section – II

Unit 4. COBOL Programming I:
Introduction, History, coding format for COBOL programs, structure of COBOL program, character set, COBOL words, data names and identifiers, literals, figurative constants, continuation of lines, language description notation, IDENTIFICATION DIVISION, ENVIRONMENT DIVISION, DATA DIVISION-Level structure, data description entries, USAGE Clause, REDEFINES Clause, RENAMES Clause, SIGN Clause, FILE SECTION, WORKING-STORAGE SECTION, Editing, PROCEDURE DIVISION and basic verbs - Structure, MOVE, Arithmetic and Sequence Control Verbs, Input and Output Verbs, Conditional Verb

Unit 5. COBOL Programming II:
Table Handling - OCCURS Clause and Subscripting, Assigning values to table elements, Multidimensional Tables, PERFORM verb and Table Handling, Indexed Tables and Indexing, SET verb, SEARCH verb. Statements for Sequential Files- OPEN, CLOSE, WRITE, REWRITE. Miscellaneous verbs- SORT, MERGE, STRING, UNSTRING.

**Unit 6. Overview of DB2 :**
Introduction to DB2 , Major components of DB2- System Service component, Locking Service component, Database Service component, DB2 Application program preparation and Execution, DB2 Objects-Databases, Tablespaces, Stored tables, Indexes, Indexspaces, Storage groups, View, Bufferpool. DB2 SQL programming – Types of SQL statements, DCL, DDL, DML, Advanced SQL topics, UPDATE operations, Aggregate functions

**Text Books :**
1. IBM Mainframe Handbook – Alexis Leon. (For Unit 1, 2, 3, 6)

**Reference Books :**

**CS8L05. WEB TECHNOLOGIES-II**

<table>
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<th>Lecture</th>
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<tbody>
<tr>
<td>Practical</td>
<td>: 4 hr/ week</td>
</tr>
<tr>
<td>Termwork</td>
<td>: 50 Marks</td>
</tr>
<tr>
<td>POE</td>
<td>: 50 Marks</td>
</tr>
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</table>

**Course Objectives:**
1. To introduce emerging Web technologies concepts and tools.
2. To introduce client side and server side scripting languages and validation techniques.
3. To learn database access technologies and state management techniques.
4. To develop real life Web applications using ASP.NET and PHP

**Section - I**

**Unit 1:Introduction to ASP.NET 4.5**

**ONE ASP.NET:** Introducing One ASP.NET, Simplifying a Complex Ecosystem, How Do You Benefit?

**ASP.NET WEB FORMS STRUCTURE:** Application Location Options, The ASP.NET Page Structure Options, ASP.NET 4.5 Page Directives, ASP.NET Page Events, Dealing with Postbacks, Cross-Page Posting ,ASP.NET Application Folders, Compilation, Build Providers, Global.asax,

**Unit 2: Servlet Controls**
ASP.NET SERVER CONTROLS AND CLIENT-SIDE SCRIPTS: ASP.NET Server Controls, HTML Server Controls, Identifying ASP.NET Server Controls, Manipulating Pages and Server Controls with JavaScript.


VALIDATION SERVER CONTROLS: - Understanding Validation, Client-Side versus Server-Side Validation, ASP.NET Validation Server Controls, Turning Off Client Side Validation ,Using Images and Sounds for Error Notifications ,Working with Validation Groups

Unit 3: Data Binding and State Management (6)

DATA BINDING: Data Source Controls, Data Source Control Caching, Data-Bound Controls, Other Data-Bound Controls, Inline Data-Binding Syntax, Using Expressions and Expression Builders


Section - II

Unit 4: Client Side Development (6)

AJAX: Understanding the need of AJAX, ASP.NET AJAX and Visual Studio 2012, Binding ASP.NET AJAX Applications, ASP.NET AJAX’s Server Side Controls, Using Multiple Update Panel Control, Working with page history, Script Combining.

JQuery: Introduction to JQuery, Selecting Elements, Modifying Elements, Event Handling, Ajax, JQuery UI

Unit 5: Basics of PHP (6)

Introducing PHP: History, General Language Feature

PHP Basics: Embedding PHP code in Your Web Pages, Commenting Your Code, Outputting Data to the Browser, PHP supported Data Types, Identifiers, Variables, Constants, Expressions, String Interpolation, and Control Structures

Functions: Invoking a Function, Creating a Function, Function Libraries

Array: What is Array?, Creating an array, outputting an Array, Merging, slicing, splicing and Dissecting Arrays, Other useful Array Functions
Unit 6: Advanced Topics in PHP

Object-Oriented PHP: The benefits of OOP, Key OOP Concepts, Constructor and Destructors, Static Class Members, The instanceof Keyword, Helper Functions.

Advanced OOP Features: Object Cloning, Inheritance, Interfaces, Abstract classes, Introducing namespaces.

Strings and Regular Expressions: Regular Expressions, Other String-Specific Functions, Alternatives for Regular Expression Functions

Working with HTML Forms: PHP and Web Forms, Validating Form Data

Handling File Uploads: Uploading Files with PHP

Using PHP with MySQL: Installation Prerequisites, Using the MySqli Extension, Interacting with the Database, Executing Database Transactions

Session Handlers: What Is Session Handling, Configuration Directives, Working with Sessions, Practical Session-Handling Examples, Creating Custom Session Handlers

Text Books:
1. Professional ASP.NET 4.5 in C# and VB-Published by John Wiley & Sons, Inc. (WROX)

Reference Books:
1. ASP.NET 4.5- Black book – Kogent Dreamtech Publication

Open Source Resources

http://www.php.net

Sample Experiment List:
It should consist of 17-20 experiments based on the following topics.
1. Create registration form using different server controls
2. Accepting and validating user entered data in registration form using ASP.NET
3. Write a program to manage session in ASP.Net
4. Reading and writing HTML contents with JQuery
5. Write a sample application to demonstrate AJAX
6. Display database contents from SQL server or Oracle database using SQL Command class from ASP.NET
7. Display parameterized data using SqlDataReader and GridView in ASP.NET
8. Database access using DataSet in ASP.NET
9. Installing Apache and PHP on Linux, Configuring PHP at Build Time on Linux. Or Installation of XAMPP
10. Hello world Program-Embedded HTML with PHP
11. Program based on PHP variables, Expression, arrays, control structure
12. Experiment Based on OOP and Advance OOP PHP
13. Form validation using PHP using regular expressions
14. Upload various types of file from client side to server with validation
15. Write a program to send Mail using PHP
16. Insert user entered data in form to MySQL database using PHP
17. Update user’s data stored in MySQL database using PHP
18. Write a program to manage session in PHP having login facility in any web application

**CS8L06. PROJECT - II**

<table>
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<th>Practical</th>
<th>4 hrs / week</th>
<th>Termwork</th>
<th>75 Marks</th>
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</thead>
<tbody>
<tr>
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**Objective:**

The group will continue to work on the project selected during the semester VII and submit the completed project work to the department at the end of semester VIII as mentioned below-

1. The workable project.
2. The project report in the bound journal complete in all respect with the following: -
   i) Problem specifications.
   ii) System definition – requirement analysis.
   iii) System design – dataflow diagrams, database design
   iv) System implementation – algorithm, code documentation
   v) Test results and test report.
   vi) In case of object oriented approach – appropriate process be followed.
   vii) Open Source tools like Latex can be used for report preparation.

**Termwork:**

Term work will be jointly assessed by a panel of teachers appointed by Head of the Department

**External Exam:**

Oral examination will be conducted by internal and external examiners as appointed by the Shivaji University.

**Note:**
1. Project work should be continually evaluated based on the contributions of the group members, originality of the work, innovations brought in, research and developmental efforts, depth and applicability, etc.
2. Two mid-term evaluations should be done, which includes presentations and demos of the work done.
3. **Care should be taken to avoid copying and outsourcing of the project work**

**CS8L07. COMMUNITY SERVICES**

**Practical** : 2 hrs / week

**Termwork** : 25 Marks

**Objectives:**
1. To create an awareness among the common man of Western Maharashtra region and area coming under jurisdiction of the Shivaji University regarding the e-services provided by various public sector organization
2. To promote the use of technological services in day-to-day activities.
3. To understand the problems of the locality.
4. To make the student aware of the various engineering tools and techniques used in e-services.
5. Creating awareness of RTI (Right To Information) among general public for procuring public documents and it’s appropriate use.

**Details:**
The students project group is expected to do the following:

1. With the prior written permission from the Head of the Institute the project group should visit any Public Sector / Government/ Semi government organization like – Zilha Parishad, Collector Office, Municipal Corporation, Tahasildar Office, RTO, MSEB, Court, Railway station, Tourism Services, agricultural service sector, Banks where the facilities of e-governance and e-services available for public purposes.
2. The project group should understand the public related services and identify the required services for the common man.
3. Two/Three groups should plan awareness programs/camps to be carried out in the nearby villages / Taluka places / residential colonies / localities and visit the suitable areas along with the staff to create awareness among the common man about various e-services available in public domain.
4. They should prepare a presentation simulating the services that are being exposed to common man and give a demonstration during their visit to the concerned area.
5. Further group should take the feedback from the concerned locality on a pre-designed format that may be provided by the Head of the Institute.
6. Group should prepare a report detailing:
   a. The kind of services chosen.
   b. The office / organization visited mentioning the authorities meet.
   c. The facilities provided by the chosen service.
d. Preparations for the visit.

e. Presentation Techniques & Tools used

f. Analysis of the Feedback Form filled during visit

g. Observations and conclusions during the entire work

7. Submission of the above report duly signed by the concerned staff and Head of the department is to be done to the department at the end of semester.

**Equivalences of B. E. (CSE) for repeater / backlog students**

**BE (CSE) Sem.-VII**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>B.E.(CSE) – I Pre-Revised</th>
<th>Equivalent / Replacement Subject (Revised)</th>
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<tbody>
<tr>
<td>2.</td>
<td>Distributed Systems</td>
<td>Distributed Systems Sem VII</td>
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</table>
| 4.      | Elective – I  
A) Soft Computing  
B) Project Management  
C) Cyber Laws | Elective – I  
A) Soft Computing Sem VII  
B) Project Management Sem VIII  
C) Cyber Laws (Pre-revised Sem VII) |
| 5.      | Network Engineering | Network Engineering (Pre-revised Sem VII) |

**BE (CSE) Sem.-VIII**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>B.E.(CSE) – II pre-Revised</th>
<th>Equivalent / Replacement Subject (Revised)</th>
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<tr>
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<td>Grid Technology</td>
<td>Grid Technology (Pre-revised Sem VIII. Two more chances)</td>
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<td>2.</td>
<td>Storage Networks</td>
<td>Storage Networks (Sem VI)</td>
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<td>3.</td>
<td>Real-time Operating System</td>
<td>Real-time Operating System (Sem VII)</td>
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</table>
| 4.      | Elective – II  
A) Data Mining  
B) Business Intelligence System  
C) Adhoc Networks | Elective – II  
A) Data Mining (Pre-revised Sem VIII)  
B) Business Intelligence System (Pre-revised Sem VIII)  
C) Adhoc Wireless Networks (Sem VII) |
| 5.      | Web Technology | Web Technology (Pre-revised Sem VIII) |
SHIVAJI UNIVERSITY, KOLHAPUR

A Revised syllabus of
(B.E. Mechanical Engineering)

Structure (Semester III to VIII)

and

Syllabus of
Semester (III and IV)

To be introduced from Academic Year 2014-15

i.e. from June 2014 Onwards

(Subject to the modifications will be made from time to time)
<table>
<thead>
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<th>Examination Scheme</th>
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<td>Fluid Mechanics</td>
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<td>6</td>
<td>Machine Drawing</td>
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<td>7</td>
<td>Computer Graphics</td>
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* Practical's to be conducted alternate weeks. For Electrical Technology And computer Programming C++ Term work assessment consist of 25 marks for each Electrical Technology And computer Programming C++ separately. And combined marks out of 50 obtained by each student should be forwarded to Shivaji University, Kolhapur
## SHIVAJI UNIVERSITY, KOLHAPUR,

**Structure of S.E. (MECHANICAL ENGINEERING) Semester IV**  
WITH EFFECT FROM THE ACADEMIC YEAR JUNE/JULY 2014-2015

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<td>Fluid and Turbo Machinery</td>
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<td>Theory of Machines – I @</td>
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<td>5</td>
<td>Machine Tools and Processes</td>
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<td>6</td>
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@ Theory paper of 04 (four hour) Durations
Unless mentioned, theory paper examination duration 3 hours
**SHIVAJI UNIVERSITY, KOLHAPUR,**

**Structure of T.E. (MECHANICAL ENGINEERING) Semester V**

**WITH EFFECT FROM THE ACADEMIC YEAR JUNE/JULY 2015-2016**

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## SHIVAJI UNIVERSITY, KOLHAPUR,

**Structure of B.E. (MECHANICAL ENGINEERING) Semester VII**

**WITH EFFECT FROM THE ACADEMIC YEAR JUNE/JULY 2016-2017**

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<td>Finite Element Analysis</td>
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<tr>
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<tr>
<td>1</td>
<td>Experimental Mechanics</td>
<td>Total Quality Management</td>
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<tr>
<td>2</td>
<td>Human and Professional Ethics</td>
<td>Industrial Product Design</td>
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<td>3</td>
<td>Automobile Engineering</td>
<td>Advanced Forming Processes</td>
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<td>Computational Fluid Dynamics</td>
<td>Design of Thermal Systems</td>
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<td>Process Equipment Design</td>
<td>Smart Materials</td>
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<td>6</td>
<td>Advanced Foundry Processes</td>
<td>Design for Sustainability</td>
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<td>7</td>
<td>Introduction to Aircraft Systems</td>
<td>Flexible Manufacturing Systems</td>
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</table>


@ Industrial training of minimum two (2) weeks should be done after T.E. (II) in summer vacation and it’s assessment will be done in B.E. (I) based on report submitted. Work load of the assessment can be assigned to the project seminar guide.
SHIVAJI UNIVERSITY, KOLHAPUR,
Structure of B.E. (MECHANICAL ENGINEERING) Semester VIII
WITH EFFECT FROM THE ACADEMIC YEAR JUNE/JULY 2016-2017

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1. REFRIGERATION AND AIR CONDITIONING

Teaching Scheme:
Lectures: 3 Hrs. Per Week
Practical: 2 Hrs. Per Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks
Practical and Oral Exam: 25 Marks

Course Objectives:
The course aims to:
1. Study basic refrigeration cycles and Psychrometry.
2. Performance Evaluation of Refrigeration and Air Conditioning Systems
3. Enable the students to analyze and solve refrigeration related problems by applying principles of mathematics, science and engineering

Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Demonstrate an understanding of the need and importance of HVAC technology, the typical and some advanced and innovative schematic designs, and the goals of HVAC engineering and HVAC systems.
2. Demonstrate an understanding thermal comfort conditions with respect to temperature and humidity and human clothing and activities and its impact on human comfort, productivity, and health.
3. Demonstrate an understanding of psychrometrics and its application in HVAC engineering and design and will practice or observe psychrometric measurements.
4. Demonstrate an understanding of heat transfer in buildings with a given architectural design and its application to heating and cooling load estimation especially including thermal lag effects by conducting a detailed annual load analysis for a representative building and present the results of this analysis in a formal report possibly including recommendations for energy conservation.
5. Demonstrate an understanding of the engineering and operation of vapor compression and possibly heat-driven refrigeration systems and evaporative cooling systems and understand contemporary issues of ozone depletion and global warming potential with respect to refrigeration systems.

Unit 1
Application of Second Law of Thermodynamics

A Refrigerating Machine – The Second Law Interpretation, Energy Ratios (EER), BEE star rating COP, Power Consumption of a Refrigerating Machine, Refrigeration Cycle, vapour as a Refrigerant in Reversed Carnot Cycle Limitations of Carnot Cycle with Gas as a Refrigerant, Reversed Brayton or Joule or Bell Coleman Cycle, Introduction to aero-plane air conditioning cycles (Only Theory)
Unit 2
Vapour Compression System [08]
Removal of flash gas, Flash intercooling, Multistage, Multi evaporator and cascade system, Choice of Intermediate Pressure, System Practices for Multistage Systems (Simple analytical treatment) , Introduction to cryogenic Engineering and applications, Claude Cycle, Linde Cycle

Unit 3
Refrigerants and Refrigeration Equipment [09]
Classification, Desirable Properties like Thermodynamic, physical, and chemical.Comparison among commonly used refrigerants, Selection of Refrigerants, Effect on Ozone depletion and global warming, Alternative Refrigerants. Environmental Protection protocol and India’s commitment. ASHRAE nomenclature.
Insulation, types and different applications, properties of ideal insulations.
Compressor, Condenser, Evaporator, Expansion devices, Types, selection. Component balancing, safety devices and refrigeration controls.
Applications of Refrigeration, Ice plant, Cold storage, Dairy plant

Unit 4
Psychrometry and Human Comfort [09]
Moist air as a working substance, Psychrometric properties of air, Use of Psychrometric tables and charts, Processes, Combinations and Calculations, ADP, Coil Condition lime, Sensible heat factor, Bypass factor, Air washer and it’s applications.
Thermal exchange between human body and environment, factors affecting comfort, effective temperature comfort chart, ventilation requirements.

Unit 5
Heating and Cooling loading calculations [05]
Design of air conditioning systems, different Heat sources,- Adiabatic mixing of two air streams, sensible heat factor, RSHF, GSHF, ERSHF, Room apparatus dewpoint and coil apparatus dew point, Ventilation and infiltration, Inside andOutside Design condition.
Cooling Load estimation, Introduction to Unitary Products viz. Room/Split and Packaged Air Conditioners, Central air conditioning systems, Variable Refrigerant Flow systems, VAV control systems, Inverter Units.
Unit 6
Air Distribution System

Re-circulated air, Ventilation air, Duct work, Use of friction loss and rectangular equivalent of round duct chart, duct system, principle of duct sizing, and air distribution it's norms, diffusers, dampers, layout, duct systems for theaters, auditorium, hospitals, assembly shop etc.,

Energy Conservations and Green Buildings, Freeze drying, Pharmaceutical and hospital air conditioning, textile, car air conditioning (plant layout, system components and design conditioning)

Term Work:

1. Study of various conventional and Nonconventional methods of refrigeration.
2. Study and demonstration of refrigeration system. (water cooler, refrigerators, chiller, ice plant and cold storage).
4. Trial on Refrigeration Test Rig.
5. Trial on heat pump test rig.
6. Study and trial on vapour absorption system
7. Trial two stage cascade system.
8. Trial on ice plant test rig
9. Study and demonstration on air conditioning systems. (Unitary and central air conditioning / system)
10. Trial on window air conditioner or Air Conditioning Test Rig
11. Study or demonstration of dehydration, charging leak testing and testing of refrigeration system with trouble shooting.
12. Study and demonstration of controls and safety devices in refrigeration and air conditioning.
13. Visit to central air conditioning or cold storage or dairy plant to ice plant related with refrigeration and air conditioning.
14. Market survey of various refrigeration and air conditioning systems which include the equipments with related specifications, manufacturers, cost and comparison with respect to tonnage, coat and presentation of report in the laboratory.

(Three trials and market survey report is compulsory/ Total 10 are compulsory)

Reference Books:

**Text Book:**

SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester VII

2. MECHANICAL SYSTEM DESIGN

Teaching Scheme:
Lectures: 3 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme:
Theory Paper: 100 marks
Term Work: 25 marks
Oral Exam: 25 marks

Course Objectives:
The course aims to:

1. Study the concept of aesthetics, ergonomics and creativity considerations in product design.
2. Study design of various mechanical systems such as pressure vessel, brakes, clutches, machine tool gear box, I.C. Engine components etc.
3. Study the concepts of optimization of mechanical systems /elements.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Incorporate aesthetic, ergonomic and creativity considerations in industrial product design.
2. Design different systems such as Pressure vessel, Brakes, Clutches, Machine tool Gear box and I. C. Engine Components etc.
3. Optimize design of various components/systems in mechanical engineering
4. Use IS Codes, Design data books, Handbooks required for system design.

Unit 1
Aesthetic and Ergonomic Consideration in Design: [06]
Basic types of product forms, Designing for appearance, shape, Design features, Materials, Finishes, proportions, Symmetry, Contrast etc. Morgan’s colour code. Ergonomic considerations-Relation between man, machine and environmental factors. Design of displays and controls. Practical examples of products or equipments using ergonomics and aesthetic design principles. Creativity concept in designing.

Unit 2
Pressure Vessel Design: [07]
Thin and thick cylinders; Failure criteria of vessels; Lame’s equation; Clavarino’s and Birnie’s equation; Autofrettage and compound cylinders; Types of pressure vessels-Horizontal and vertical; Classification of pressure vessel as per IS2825, 1969, Introduction to design of pressure vessels as per IS Codes. Shell and end closures. Effect of opening and nozzles in shell and covers. Types of pressure vessel support.

Unit 3
Design of Braking and Clutch System. [07]
A) Brakes: Design consideration in brakes, Band, Internal expanding shoe, External contracting shoe. Thermal consideration and rating of brakes.
B) Clutches: Design requirement of friction clutches, Selection criteria. Torque transmitting capacity of single plate, Multidisc clutch, Cone clutch and Centrifugal clutch.

Unit 4

Design of Gear boxes for machine tool applications
Determination of variable speed range- Graphical representation of speeds- Structure diagram- Deviation diagram- Ray diagram- Selection of optimum ray diagram- Difference between number of teeth of successive gears in a change gear box- Analysis of twelve speed gear box- Compound ray diagram

Unit 5

Design of I. C. Engine Components
Introduction to selection of material for I. C. engine components, Design of cylinder and cylinder head, Design of cylinder liners, Design of piston and piston-pins, Piston rings, Design of connecting rod, Design of crank-shaft and crank-pin.

Unit 6

Optimum Design
Objectives of optimum design- Johnsons Method of Optimum Design (MOD), Adequate and optimum design. Primary, Subsidiary and Limit equations- Optimum design with normal specifications of simple machine elements like tension bar, transmission shaft, helical spring. Introduction to optimum design with Langrange Multiplier.

Term Work:
1) A detail design report and A2 size sheet containing working drawing of detail and assembly of the following
   a) Design of Machine Tool Gear Box.(Three Stage, Twelve speed gear Box)
   b) Pressure vessel design/ Brake design or Clutch design.
2) Assignment based on
   a) Aesthetic and Ergonomic design consideration – case study
   b) Problems on Optimum design.
   c) Minimum four Problems on Design of IC Engine components. such as connecting rod, crank shaft, piston with piston rings and pins, cylinder and cylinder head.

Text Books:

Reference Books
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester VII

3. FINITE ELEMENT ANALYSIS

Teaching Scheme:            Examination Scheme:
Lectures: 3 Hrs/ Week        Theory Paper: 100 Marks
Practical: 2 Hrs/ Week       Term work: 25 Marks

Course Objectives:
The course aims to:

1. Define the basic finite element formulation techniques.
2. Derive the finite element equations for 1d, 2d and 3d problems.
3. Formulate and solve basic problems in heat transfer, solid mechanics and fluid mechanics.
4. Develop the computer program based on finite element methods.
5. Use commercial software’s to solve basic engineering problems in heat transfer, solid mechanics and fluid mechanics.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Elaborate the fundamental concepts, equations of equilibrium, Stress-strain relations and the principle of potential energy and approximations of differentials equations.
2. Develop the key concepts of finite element formulations by considering the 1D problem just as Shape function, element stiffness and boundary conditions.
3. Apply the finite element formulations for two dimensional plane stress and plane strain problems using constant strain triangle.
4. Demonstrate the modelling aspects of axisymmetric solids subjected to axisymmetric loading.
5. Understand the Galerkin formulation for steady state heat transfer, torsion and potential flow.

Unit 1 Fundamental Concepts [07]
Introduction, Past, present and future of FEA, stresses and Equilibrium, boundary conditions, strain-displacement relations, stress-strain relations, Temperature effects, Potential energy and equilibrium; the Rayleigh-Ritz method, Galerkins method, Saint-Venant’s principle, Von-Mises stress, Gauss elimination method.

Unit 2 One Dimensional Problem [07]
Introduction, Finite element modeling (element division, numbering scheme), coordinates and shape functions, the potential energy approach (element stiffness matrix, force terms), Galerkin approach (element stiffness matrix, force terms), Assembly of the global stiffness matrix and load vector, properties of K, the finite element equations; treatment
of boundary conditions (types of boundary conditions, elimination approach, penalty approach (Theoretical concept only), multipoint constraints, Quadratic shape functions.

Unit 3 Two-Dimensional Problems using Constant Strain Triangles [06]

Introduction, finite element modelling, Constant Strain Triangle (CST), Iso-parametric representation, potential-energy approach, element stiffness, force terms, Galerkin approach, stress calculations, Problem modelling and boundary conditions

Unit 4 Axisymmetric solids subjected to axisymmetric loading and Analysis of Trusses [08]

Introduction, Axisymmetric formulation, Finite element modelling, Triangular element, potential energy approach, body force term, rotating flywheel, pressure vessel, Galerkin approach, stress calculations.

Trusses:- Plane trusses, Local and Global coordinate systems, formulas for calculating L and M, element stiffness matrix, Stress Calculations, Assembly of global stiffness matrix.

Unit 5 Scalar Field Problems [05]

Introduction, steady state heat transfer, One dimensional heat conduction, One dimensional heat transfer in thin fins, Two dimensional steady state heat conduction, two dimensional fins.

Unit 6 Computer Implementation of the Finite Element Method: [07]

Pre-processing: Model definition – nodal coordinates element connectivity, material and element type and property definitions, type of analysis (static/modal), loading and boundary conditions. Meshing techniques- free and mapped meshing, Quality checks – aspect ratio, warp angle, skew, distortion, stretch, included angle, taper

Processing: Element level calculations, Equation assembly, Equation solver (sparse solvers, factorization, numerical/computational issues)

Post Processing: Strain and stress recovery (integration and nodal points), interpretation of results (results validation and data interpretation) and design modification

Term Work:

1. One assignment on past, present and future of FEA.
2. One assignment on Meshing – types of elements, choice of element, type of meshing – automatic, mapped, meshing in critical areas.
3. Finite Element Analysis of Stepped bar (Two or Three Steps only) using
   a) Finite Element Approach (Theory )
   b) Finite Element Software (ANYSYS / ABACUS / NISA / NASTRAN etc)
   c) Computer Program using C or C++
   Compare the results by above three methods in tabular form.
4. Use of any ONE Standard software packages like ANSYS, NISA, NASTRAN, HYPERWORKS
   for solving following types of problems with snap shots of software (Any FIVE)
   - Static Analysis of Truss
   - Static Analysis of Beam
   - Static Analysis of Plate with a circular hole
   - Static Analysis of Wall Bracket
   - Buckling Analysis of Column
   - Analysis of 1D or 2D Fin

Text Books:


Reference Books:


Website References:

1. University of Alberta Tutorials from Website.
2. NPTEL Videos Lectures Series.
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester VII
4. EXPERIMENTAL MECHANICS (ELECTIVE I)

Teaching Scheme:        Examination Scheme:
Lectures: 3 Hrs/Week       Theory Paper: 100 Marks
Practical: 2 Hrs/Week       Term Work: 25 Marks

Course Objectives:

The course aims to :

1. Introduce the concept of elementary elasticity and experimental stress analysis
2. Prepare mechanical engineering students for advanced graduate studies in various experimental stress analysis techniques like photo elasticity, strain gauge
3. Supply qualified personnel to meet the requirement of specialist in experimental stress analysis

Course Outcomes:

Upon successful completion of this course, the student will be able to:
1. Analyze photoelastic technique to stress analysis
2. Explain the concept of strain gages and its applications
3. Elaborate the concept of coating methods.
4. Apply the knowledge of Moiré fringe method of stress analysis.

Unit 1  Principles of Experimental Approach- [03]
Introduction to Experimental Mechanics, advantages scope of Experimental Mechanics in design, various experimental methods of stress analysis and their relative merits and demerits

Unit 2  Two Dimensional Photoelasticity- [11]

- optics related to photoelasticity, temporary and permanent double refraction, principle of photoelasticity, method of photoelastic stress analysis
- stress optics law, material fringe value in terms of stress and strain, significance of material fringe value
- polariscope, its scope in photoelasticity, various configurations of polariscope
- effect of stressed model in plane and circular polariscope, isoclinics, isochrometics, their significance in photoelastic stress analysis, fringe order, use of white light in photoelasticity
- fractional fringe measurement methods- color matching techniques, compensation methods like babinet soleil compensation method and Tardy’s method (Derivation)
**Unit 3 Analysis of Photoelastic Data –**

Determination of direction of principal stress at a given point, determination of exact fringe order N and difference of principal stresses at a given point, shear difference method, oblique incidence method and electrical analogy method.

Photoelastic Materials - Criteria for selection, common photoelastic materials and their properties, Photoelastic sheet casting and model making, calibration of photoelastic material, calibration methods using circular disc

**Unit 4 Strain Measurement Using Strain Gauges–**

Concept, meaning of strain gauge, desirable properties of strain gauges, types of strain gauges, comparison of various strain gauges Strain measurement using electrical resistance strain gauge –Introduction, principle, types, construction, materials used in construction, sensitivity, gauge factor, cross sensitivity, semiconductor strain gauge, comparison with electrical resistance strain gauge, advantages and limitations Selection and mounting of strain gauge, criteria for selection, mounting of gauge and checking its installation

**Unit 5 Strain Gauge Circuitry –**

Wheatstone bridge circuit, its role in measurement of resistance change, condition for bridge balance, different configurations of Wheatstone bridge, output voltage of Wheatstone bridge, relationship between output voltage and strain, commercial strain indicators, potentiometer circuit. Introduction to strain gauge rosettes, two, three and four element rosettes, different configurations of rosettes and their comparison, determination of magnitudes and direction of principal stresses when principal stress directions are specified and not specified. Transducer applications of strain gauge

**Unit 6 Coating Method and Moire Fringe–**

Brittle coating, Introduction, interpretation of crack pattern data, crack detection techniques, selection of brittle coating, advantages, Birefringent coating:- Limitations and applications, Introduction to Birefringent coating, use of reflection polariscope, merits and demerits

Introduction to Moiré fringe method of stress analysis – Mechanism of fringe formation, approaches to moiré fringe analysis, advantages, limitations and applications
Term Work:

Any Eight out of the following list

1. Bonding of strain gauge and checking its installation.
2. Determination of gauge factor for one arm sensitive and two arm sensitive configuration.
3. Determination of gauge factor for four arm sensitive and four arm sensitive two linear and two lateral configuration.
4. Transducer applications of strain gauge- determination of unknown weight using load cell.
5. Transducer applications of strain gauge – determination of unknown torque using torque transducer.
7. Determination of fractional fringe order using Tardy’s method.
10. Study of Moiré Fringe Technique.
11. Study of Brittle Coating Method.

Text Books:


Reference Books:

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Theory Paper: 100 Marks
Term work: 25 Marks

Course Objectives:

The objective of the course is an exploration of human values which go into making a good human being, a good human society and a good life. The context is the work life and the personal life of modern Indian professionals. The movement to identify and promote the values shared by societies around the world is relatively new. It is only in recent years as globalization extended its reach to even remote corners of the earth that the need to refocus and build upon what we as a human society have in common, has become apparent. Increased contact between peoples and nations enhances awareness of our kinship and the shared code of ethics and conduct that underlies all civilization. It is the Human values that we must now promote to create a common vision and means for moving forward toward a more peaceful and sustainable world.

The course also aims to have students appreciate the vastness of the Universe and the wonder of its parts, and the philosophical significance of this for improving the quality of human life through value clarification.

Course Outcomes:

Upon successful completion of this course, the student will be able to:
1. Understand the role of cognitive and moral values in world views, by discussing and writing about the ethical implications of modern scientific and technological results
2. Recognize the difference between matters of fact and matters of value, while understanding the important ways in which facts influence value assessments and how value judgments shape our vision of "the facts"
3. Understand ethical methodologies and competency in ethical deliberation on rationally applying these methodologies to contemporary ethical questions related to scientific progress and technological power
4. Understand why ethics plays an important role in science and technology

Unit 1 Human Values

Unit 2 Engineering Ethics
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of
Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

Unit 3 Engineering as Social Experimentation [06]
Engineering as experimentation - engineers as responsible experimenters - Research Ethics - codes of ethics - a balanced outlook on law - the challenger case study

Unit 4 Safety [05]
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - The Government Regulator’s Approach to Risk - the three mile island, Chernobyl and Bhopal case studies. Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime -.

Unit 5 Responsibilities and Rights [05]
Engineers responsibility, Professional rights - Employee rights - Intellectual Property Rights (IPR) - Discrimination

Unit 6 Global Issues [10]
Multinational corporations - Business Ethics - Environmental ethics - Role in Technological Development - computer ethics - weapons development - engineers as managers-consulting engineers - engineers as expert witnesses and advisors - Honesty-moral leadership-sample codes of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

Term Work:
The term work should be carried out with the methodology of Lectress, group discussions (based on case studies), movies, field visits, essays and student self investigation sessions.
1. TEN modules based on the topics mentioned above and Including –
   • Group Discussions based on Case Studies with Report/Essays.
   • Undergoing the Art of Living’s YES / Happiness Programme on the Awareness of Human Values conducted by Vyakti Vikas Kendra, Bangalore in assistance with INTERNATIONAL ASSOCIATION OF HUMAN VALUES, (IAHV).
   • Visits (with report writing) to Public Institutes like Municipal Corporation, ZP, Co-op organizations, social clubs like charitable trusts, Waste Water/Air Pollution Control Plant, Slum Areas etc.
   • Conduction of Health and Hygiene Awareness Camp for Society.
   • Study of economic status of the society – Survey data collection, analysis and any suggestions.
   • Study of impacts of technology on society.

Text Books:
1. “Professional Ethics and Human Values”, M.P. Raghavan, Scitech Publications (India) Pvt Ltd.

Reference Books:
5. “Business Ethics – An Indian Perspective”, Prof. (Col) P S Bajaj and Dr. Raj Agrawal, Biztantra, New Delhi, (2004).

Relevant CDs, Movies, Documentaries and Websites
  www.artofliving.org, www.ijhvpe.com,
- Al Gore, An Inconvenient Truth, Paramount Classics USA.
- Charlie Chaplin, Modern Times, United Artists, USA.
- IIT Delhi, Modern Technology–The Untold Story.
Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Theory Paper: 100 Marks
Term work: 25 Marks

Course Objectives:
The course aims to:

1. Describe importance and basic knowledge of automobile engineering.
2. Classify various automobile layouts and bodies.
3. Demonstrate automobile systems, wheels and tyres and automobile electrical and electronic systems for understanding construction and working principle.
4. Enable students to analyze and solve problems on automobile system by focus and critical thinking.
5. Demonstrate use of modern trends, techniques and skill to fulfill industrial needs by arranging industrial visit.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Explain components of automobile.
2. Distinguish various types of automobile lay outs as per drive given to wheels.
3. Identify types of automobile bodies and materials used for the same.
4. Demonstrate various automobile systems like clutch, gearbox final drive, brake, steering suspension wheels and Tyres, and its construction and working.
5. Demonstrate various electrical and electronic systems like lighting, starting charging electronic controlled management system and its construction and working principle, sensors used in automobile
6. Solve the problems related with various resistances for the automobile, engine power calculation.
7. Explain modern trends, techniques used in industries.

Unit 1 Introduction [06]
Automobile history and development, Classification, vehicle layouts- engine location and drive arrangement, safety regulations, specifications of vehicles, Type of vehicle bodies, body parts and its advanced materials, Chassis types, constructional details, Types of Frames, sub frames, frameless vehicles, details of chassis material, Vehicle life development cycle overview.

Unit 2 Transmission System [06]
Clutch – Function and requirements, Classification, Construction and working of Single-plate, Multi-plate, Diaphragm spring and centrifugal clutches, Fluid flywheel.

**Unit 3 Steering and Suspension Systems [08]**

Live and dead axles, live axle arrangement.

Steering systems, function, principle of steering, Ackerman and Davis, steering geometry, center point steering, cornering force, slip angle, scrub radius, steering characteristic, steering gearbox, power steering, collapsible steering.

Suspension system- Functions, Sprung and unsprung mass, Types of suspension linkages, types of spring - leaf, coil, air springs, telescopic shock absorber, hydro gas suspension, rubber suspension, interconnected suspension, self-leveling suspension (active suspension) Advances in suspension system, Air suspension

**Unit 4 Brakes, Wheels and Tyres [07]**

Brakes: Need, principle, types, Mechanical, hydraulic and pneumatic brakes disc and drum types, air brakes, servo and power braking, ABS, their relative merits, details of components, brake adjustments, defects and causes.

Wheels and Tyres: Wheel construction, alloy wheel, Types, tyre construction, tread design, specification, factors affecting tyre performance, tyre wear and its causes, wheel balancing.

**Unit 5 Electrical and Electronic Systems [07]**

Automotive batteries - lead acid batteries, Advances in batteries ,battery charging system, alternators, principle and operation of cutout and regulators, starter motor, Bendix drive, solenoid drive, magneto coil and solid stage ignition systems, lighting and electrical accessories, automobile air conditioning, panel board instruments. Electronic Controlled Management (ECM) Systems, Automobile wiring. Sensors used in automobile.

**Unit 6 Performance of Automobiles [06]**

Resistance to vehicle motion, Air, Rolling and Gradient resistance, Acceleration, Gradability and draw bar pull, Traction and Tractive effort, Distribution of weight, Power required for vehicle propulsion, Selection of gear ratio, Rear axle ratio. (Numerical)

**Term Work:**

Minimum eight experiments from Group A and all experiments from Group B are to be performed.
Group A.
1. Study and demonstration of four wheeler chassis layout and vehicle body parts and its materials.
2. Study and Demonstration of working of single plate automobile clutch and clutch plate lining materials.
3. Study and demonstration of synchromesh gearbox. (necessity, interlocking mechanism, gear shifting mechanism (Troubleshooting)
4. Study and demonstration of final drive and differential. (Types of final drive gear, Troubleshooting)
5. Study and demonstration of front wheel steering geometry and steering mechanism. (Troubleshooting)
6. Study and demonstration of suspension system of a four-wheeler. (Any one suspension system from conventional or independent, troubleshooting)
7. Study and demonstration of working Hydraulic braking system. (Air bleeding of hydraulic brake, Troubleshooting)
8. Study and demonstration of Lead acid Battery. (Troubleshooting)
9. Study and demonstration of electrical charging system. (Troubleshooting)
10. Study and demonstration of electrical starting system. (Troubleshooting)
11. Study and demonstration of
   a) D. C. Electric Horn b) Electric Fuel Gauge c) Flasher Unit. d) Wiper Circuit
12. Study of automobile air conditioning system.

Group B.
1. Experiment on wheel balancing and front wheel alignment.
2. Visit to servicing station for study of vehicle maintenance, repairs and report.
   OR
2. Visit to Automobile manufacturing industry.

Text Books:

Reference Books:
1. “Motor Vehicles”, Newton and Steed
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester VII
4. COMPUTATIONAL FLUID DYNAMICS (ELECTIVE –I)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Theory Paper: 100 Marks
Term work: 25 Marks

Course Objectives:
The course aims to:

1. Provide Fundamental fluid dynamic principles and their applications.
2. Carry out research in the area of Computational Fluid Dynamics.
3. Provide students with the necessary skills to use commercial Computational Fluid Dynamics packages.
4. Introduce the student to widely used techniques in the numerical solution of fluid equations, issues that arise in the solution of such equations, and modern trends in CFD.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Understand of the basic theory of Computational Fluid Dynamics, including discretisation, accuracy and stability.
2. Capable of writing a simple solver and using a sophisticated commercial CFD package.
3. Develop programming skills to solve some specific CFD problems.
4. Ability to assess fluid mechanics problems commonly encountered in industrial and environmental settings, construct and apply computational models, determine critical control parameters and relate them to desired outcomes and write reports.

Unit 1 Introduction to Computational Fluid Dynamics and Principles of Conservation [08]

Unit 2 Basic of Discretization and Grid Generation [06]
Basic aspects of discretization - Discretization techniques Finite difference - Finite volume and Finite element method Comparison of discretization by the three methods, Transformation of non-uniform grids to uniform grids - General transformation of the equations -Form of the governing equations suitable for CFD - Compressed grids - Boundary fitted co-ordinate systems Elliptic grid generation - Adaptive grids - Modern developments in grid generation.

Unit 3 Finite Difference Method [06]
Finite Difference Formulations: Introductory remarks, Taylor Series Expansions, Finite difference equations, Central Forward, Backward Numerical error, Explicit, Implicit, Semi-

Unit 4 Finite Volume Method [08]

i. For Diffusion
Introduction, FVM for 1D steady state Diffusion, FVM for 2D Diffusion

ii. For Convection Diffusion
Introduction, Steady 1-D Convection and Diffusion, Central Differencing, Upwind Differencing, Hybrid Differencing, Power Law Scheme, QUICK scheme.

Unit 5 Introduction to Solution Algorithms for Pressure Velocity Coupling in Steady Flows and Turbulence and Multiphase Modeling (Introductory Treatment) [06]
Introduction, staggered grid, introduction to SIMPLE, SIMLEC, SIMPLER, PISO algorithms, Modeling of multiphase problems, Level set methods, VOF method. Coupled LS+VOF.

Unit 6 Introduction to Turbulence and its Modeling [06]

What is turbulence?; Transition from laminar to turbulent flow; Effect of turbulence on time averaged Navier-Stokes equations; Characteristics of simple turbulent flows; Introduction to Turbulent Models like Mixing length Model, k-epsilon model, Reynolds stress equation models, Algebraic stress equation models; Some recent Advances, introduction to LES, DNS.

Term Work:
1. Simulate and solve two problems, each 2-d and 3-d steady and unsteady flows using any commercial CFD package like Ansys-FLUENT, STAR CCM, FLUIDYNE, Ansys-CFX etc.
2. Write codes using C, C++, SciLab for at least one each, 1-d and 2-d steady flows and do the post processing to verify with analytical results.

Text Books:-

Reference Books:-
Course Objectives:
The course aims to:

1. Acquaint several design codes used in the design process.
2. Study design of process equipment such as pressure vessel, storage tank, heat exchanger etc.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Illustrate understanding of process design parameters.
2. Design and develop pressure vessels.
3. Demonstrate capabilities developed for designing storage tank, agitators.

Unit 1 Process Design Parameters
Basic concepts in process design, block diagrams for flow of processes, material flow balance. Importance of codes and standards and their applications. Pand ID, Process Data Sheet, PFD and other documents used for designing. Review of Design pressures, temperatures, design stresses, factor of safety, minimum shell thickness and corrosion allowance, weld joints efficiency, design loading, stress concentration and thermal stresses, failure criteria. Selection of material for process equipment’s using ASME Codes.

Unit 2 Design of Pressure Vessels
Types of pressure vessels, selection of various parameters for their design Pressure vessel subjected to Internal Pressure: Complete design as per ASME code of Cylindrical and spherical shells. Design of various end closures such as: Flat, Hemispherical, Torrispherical, Elliptical and Conical. Design of openings: nozzles and manholes. Design of Flanged joints; Gasket selection and design. Design of supports for process vessels. Pressure vessel subjected to External Pressure: Design of shell, heads, nozzles, flanged joints and stiffening rings.

Unit 3 Design of Tall Vessels and Large Storage Tanks
Determination of equivalent stress under combined loadings including seismic and wind loads application of it to vertical equipment like distillation column. Design of Storage Tanks: Study of various types of storage vessels and applications. Atmospheric vessels,

Unit 4  Vessel Supports

Unit 5  Unit 5 : Process Piping Design
Flow diagrams and pipe work symbols, design of layout of water, steam and compressed air pipes work, pipe fitting, linings and flanged connections. Types of valves used on pipe line. Fabrication of pipe lines, expansion joints and pipe supports.

Unit 6  Heat Exchangers
Heat exchangers: Design of vessels, Design of Shell and Tube Heat Exchanger, Study and design of various types of jackets like plain half coil, channel, limpet coil.

Agitator
Study of various types of agitators and their applications. Baffling, Power requirement of agitation. General design of agitator including blades, shaft, blade assembly.

Term Work:
Following assignments comprise the laboratory practice:-
1) Design of Pressure vessels and large tanks.
2) Design of Heat exchangers used in industries.
3) Design and development of equipment useful to process industries such as sugar, cement, chemical industries.
4) Preparing flow diagrams of processes, piping layout, etc.
5) Report based on visit to industries such as sugar, cement, chemical industries.
Text Books:
2) “Process Equipment Design”, Browell and Young, Wiley India.
3) “Chemical Equipment Design”, B.C. Bhattacharya.

Reference Books:
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester VII
4. ADVANCED FOUNDRY PROCESSES (ELECTIVE –I)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:

1. Acquaint students with the basic concepts of foundry processes
2. Impart knowledge of ferrous and non ferrous metal processing
3. Study casting design process
4. Analyze casting process

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Understand basic casting design procedure.
2. Understand fundamental knowledge of Ferrous and Non Ferrous Metal.
3. Design of castings for different application.
4. Understand need of castability.

Unit 1  Metal Casting –Overview and Solidification  [07]
Introduction to types of casting processes, Review of various processes, Solidification of Casting: Concept of solidification of metals. Homogenous and heterogeneous nucleation. Growth mechanism, Solidification of pure metals and alloys, Mechanism of columnar and dendritic growth, Coring or Segregation, Solidification time and Chvorinov's rule, Concept of progressive and directional solidifications.

Unit 2  Principles of Gating and Risering  [07]
Principles of Gating and Risering: Purpose of the gating system. Components of the gating System and its functions, Design of the gating System, Different types of gates, Gating ratio and its functions, Definition and functions of the riser, Types of risers and their application. Design of the riser - its shape, Size and location, Use of insulating material and exothermic compounds in risers.

Unit 3  Design of Casting  [06]
Design of Casting: Factors to be considered in casting design. Designconsideration in pattern making, moulding techniques and core making and assembly. Cooling stresses and hot spots in casting and modification in casting geometry to overcome them, Casting Quality Control: Casting defects and factors responsible for them. Different inspection and testing methods to evaluate the casting, Quality control activities in a foundry, Salvaging methods of defective casting.

Unit 4  Melting Practices for Different Alloys  [07]
Melting Practices and Furnaces for Ferrous and Non-ferrous Alloys: Melting practices of Al-alloys, Mg - alloys, Cu - based alloys and Zn- based alloys and SG Iron; Degassing process and
methods in Al – alloys, modification treatment in Al- alloys, use of covering fluxes to avoid oxidation; Desulphurization, spherodisation treatment, inoculation practice, de-oxidation and alloy additions; Principle of working of thermocouples, spectrometers, and C.E. meters – applications; use of pyrometers for temperature measurement and control, energy saving in melting practices, Vacuum casting, Rheo casting.

Unit 5 Foundry Mechanization and Modernization


Unit 6 Quality Control in Foundries

Quality Control in Foundries: Quality specifications in respect of raw materials used in foundry sand, sand additives, furnace charging material, alloys; Q.C. checklists maintained for raw materials, Q.C. checklists for mould – core properties; Heat wise pouring reports, details of melting log sheets, test bars, calibration records of testing equipments (U.T.M., Sand testing equipments); Results of chemical analysis, mechanical properties, test reports, rejection report analysis, defect diagnosis, remedies, use of cause - effect or fish- bone diagrams, Application of S.Q.C. in foundries, control charts

Term Work:
1. Sand moulding laboratory report preparation
2. Design of pattern layout for a given component
3. Design of gating system for a given component (ferrous / non ferrous)
4. Design of risering system for a given component (ferrous / non ferrous)
5. Die design for pressure die casting / centrifugal casting
6. Design of a foundry layout for a given case
7. Study of any one type of melting furnace
8. Study of TS/ISO / QS norms for foundry industry
9. Industrial visit to a modern foundry and its report
(Use of computer in designs is essential)

Text Books:
4) “Foundry Technology” Beelely, P.R., Butterworth.
Reference Books:
5. “AFS and Control Hand Book”, AFS.
Shivaji University Kolhapur  
B.E. (Mechanical Engineering) Semester VII  
4. INTRODUCTION TO AIRCRAFT SYSTEMS (ELECTIVE –I)

### Teaching Scheme:
- Lectures: 3 Hrs/ Week  
- Practical: 2 Hrs/ Week

### Examination Scheme:
- Theory Paper: 100 Marks  
- Term work: 25 Marks

### Course Objectives:
The course aims to:
1. Introduction to the Aircraft History, Industry  
2. Analyze effect of Wind over Aerofoil, Aircraft  
6. Understand the applicability of Design aspects in Aircraft Design.  
7. Relate the theoretical knowledge with the design of Aircraft Structures.

### Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Develop a systems engineering plan for a realistic project.  
2. Judge the applicability of any proposed process, strategy, or methodology for systems engineering using the fundamental concepts from disciplines such as probability, economics, and cognitive science.  
3. Understand system engineers' role and responsibilities. Understand the role of organizations.  
4. Apply systems engineering tools (e.g., requirements development and management, robust design, Design Structure Matrix) to realistic problems.  
5. Recognize the value and limitations of modeling and simulation.  
6. Formulate an effective plan for gathering and using data.  
7. Know how to proactively design for and manage system lifecycle targets.

### Unit 1 Introduction to Aircraft and Principles of Flight [07]

### Unit 2 Aircraft Stability and Control [04]
Lateral, Longitudinal, Directional stability and controls of aircraft, Factors affecting lateral, longitudinal and directional stability. Why different Aircraft’s have different designs- Conventional Aircraft, Un- Conventional Aircraft
Unit 3 Aircraft Systems

(A) Mechanical

(B) Electrical and Electronics

Unit 4 Systems Engineering

Unit 5 Aircraft Systems Design
Introduction to Aircraft Systems design, Development Process, Key elements of design process, System requirements, Fault Tree Analysis (FTA), Dependency Diagram, Failure Modes and Effects Analysis (FMEA), Reliability- Analytical methods, Development verification and validation, reliability, system attributes

Unit 6 Aircraft Systems Development Process
Introduction to Development Process, Product Life Cycle (PLC), Concept Phase, Definition Phase, Design Phase, Build Phase, Test Phase, Operate Phase, Disposal Phase, Development Program, Design and Development verification and validation, Reliability, System attributes.

Term Work:
1. Eight assignments based on above topics.
2. Two reports on Industrial Exposure or visit.

Practical Exposure
With an intent to get some exposure on Aerospace and related industries, the colleges can arrange

- Industry Visits to some of the Industries in Aerospace like HAL(Hindustan Aeronautics Limited),NAL (National Aerospace Limited),ISRO (Indian Space Research Organization) and Students need to submit a report on the learning from the visits

  (OR)

- Visits to Aerospace Museums

  (OR)

- Building miniature Models of Aircraft /Gliders etc as Hands on Exercises conducted as competitions.

Text Books:

Reference Books:

Teaching Scheme:
Lectures: 3 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:
1. Know the concept of total quality and role of quality assurance.
2. Understand planning and controlling techniques for quality
3. Know the reliability approach for quality
4. Realize benefits of taguchi’s quality philosophy
5. Understand the key issues and some popular approaches to TQM implementation
6. Understand the current trends in TQM

Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Understand importance of assuring quality in the service or manufacturing sector and explain Quality assurance system
2. Identify and solve the quality related problems in manufacturing or service sector at various stages by using various TQM tools and techniques,
3. Calculate reliability of system
4. Understand vendor rating and select suitable vendor
5. Interpret various quality attributes and discuss the various quality approaches.

Unit 1 Quality Assurance System:
Concept of total quality, role and objectives of Q.A. Q.A. cycle, process approach to Q.A. (input-process-output), Information feedback, Significance of feedback and field complaints analysis in Q.A., Significance of internal customer approach, Defect prevention programs for Q.A.

Unit 2 Planning and Controlling Techniques for Quality
Planning for quality – The dimensions of Quality(quality of Design, conformance, performance and service) Specifications for quality dimensions, Quality planning activities for new products, Advanced Product Quality Planning (APQP), Planning through trial lots, Quality planning with vendors, Vendor control procedures, Vendor-rating.

Controlling techniques for quality – Seven statistical tools, Process capability analysis, Problem solving new management tools, Six sigma- Concept, Need, Implementation, DPMO, Gradations.

Unit 3 Robust and Reliable Product Approach for Quality
Product and system reliability: Basic concepts, Prediction and evaluation of parallel, Series and combined system reliability, Reliability tests (life testing, burn-in test, accelerated life testing),
FMEA; and FTA, Taguchi’s quality Philosophy, System design, Parameter design, Tolerance design, Orthogonal arrays, S/N ration, Loss functions.

Unit 4  Principles and Approaches to TQM:  
**Basic concepts:** definition of TQM, TQM and traditional management approach, Principles, characteristics, and benefits of TQM.

**Approaches to TQM:** Deming’s approach, Juran’s triology, Crosby and quality improvement, Ishikawa’s CWQC, Feignbaum’s theory of TQC, Schonberger’s action agenda for manufacturing excellence.

Unit 5  The Essentials of TQM:  
**Customer Focus.** Customer perception of quality, Quality policy deployment, Quality function deployment, Voice of customer, Customer satisfaction, Kano’s model of satisfaction, Customer retention.

**TQM Leadership**- Role and commitment and accountability of leadership, Quality policy and objectives, Organizational structure for TQM, Role of HR in TQM, Training for TQM, Developing quality culture.

**Tools and Techniques for TQM** 95: 5-S campaign, TEI, quality circles, QFD, poka-yoke, KAIZEN

Unit 6  Current Trends in TQM:  
**TQM in service sector** 95: Definition and meaning and service, problems in defining service quality, attributes of service quality, SERVQUAL model, Implementing TQM in service industries, Measurement system for service quality.

**Quality Management Systems:**
ISO 9001:2008 Series Standards – Clauses, contents, interpretation and implementation, audit
Sector Specific Standards – AS 9100, ISO/ TS 16949, TL9000,

**Quality Awards:** National and International quality awards, Criteria and case studies.

Term Work:
- Five assignments based on the syllabus
- Four case studies through industrial visits on
  1. Tools and techniques of TQM
  2. TQM implementation in manufacturing sector
  3. TQM implementation in Service Sector
  4. ISO 9001-2008 implantation

(Presentation is preferable for case studies)

Text Books:

Reference Books:
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester –VII
5. INDUSTRIAL PRODUCT DESIGN (Elective –II)

Teaching Scheme:                           Examination Scheme:
Lectures: 3 Hrs/week               Theory Paper: 100 Marks
Practical: 2 Hrs/week               Term Work: 25 Marks

Course Objectives:

The course aims to:
1. Study the various parameters in product design and development like
   • Finding Customer Needs
   • Doing Market Research in various parameters for product
   • Product Specifications criteria
   • Product Architecture and Prototyping
   • Cost and Value Engineering
   • Design for Manufacturing and Assembly
   • Standards in Ergonomics and Industrial Safety
2. Practice exposure to Case Studies and CAD Software with a product case.

Course Outcomes:

Upon successful completion of this course, the student will be able to:


Unit 1  Introduction [06]
Challenges of product development, Identify customer needs, Successful product development, Quality aspect of product design, Market Research, Survey.

Unit 2  Product Development Process and Planning [07]

Unit 3  Product Architecture [07]
Unit 4  **Design for Manufacturing and Assembly**  [07]


Unit 5  **Aesthetics :**  [08]

Aesthetic Considerations, Visual Effects of Form and Color in Product Design.

**Ergonomics :**

Ergonomics and product design and automated systems, Anthropomorphic data and its applications in ergonomic design, Limitations of Anthropomorphic data, General approach to the Man-Machine Relationship - Workstation Design and environment (working position and posture).

**Control and Displays:**

Configurations and sizes of various controls and displays, Design of controls in automobiles, machine tools etc., Design of instruments and controls.

Unit 6  **Industrial Safety:**  [05]

An approach to Industrial Design - Elements of Design Structure for Industrial Design in engineering applications in manufacturing systems.

Personal protective Equipment and Environment Control Prevention and specific safety measures for manufacturing and processing industry and chemical industry.

**Term Work:**

1. Case Study on any **TWO** (by a group, a group of Min.02 and Max. 04 students to be presented in front of all students) covering following points,
   b. Product Architecture.
   c. Design for Manufacturing.
   d. Design for Assembly.
   e. Aesthetic and Ergonomic considerations in Product Design.
   f. Industrial Safety in Machine and Equipment Handling.
   g. Health Safety in Product Design.
   h. Environmental Safety and ISO 14000 Systems.

2. Development of any Product using high end CAD software considering following points.
a) Need of Customer, Methodology of Market Survey.
b) Invention / Innovation of a product with modifications required.
c) Aesthetics (Form and Color) and Ergonomics consideration in design.
d) Preparation of various Views of the product.
e) Design for Assembly Procedures.
g) Product Database Management.

A report should be prepared with details, drawing sheet, Bill of Material, Assembly – Disassembly Procedure, Maintenance Manual and Cost Estimation (if required)

3. Presentation of the product designed.

Text Books:

Reference Books:
### SHIVAJI UNIVERSITY, KOLHAPUR, 
B.E. (Mechanical Engineering) Semester VII 
5. ADVANCED FORMING PROCESSES (ELECTIVE-II)

<table>
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<tr>
<th>Teaching Scheme:</th>
<th>Examination Scheme:</th>
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<tbody>
<tr>
<td>Lectures: 3 Hrs/ Week</td>
<td>Theory Paper: 100 Marks</td>
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<tr>
<td>Practical: 2 Hrs/Week</td>
<td>Term Work: 25 Marks</td>
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### Course objectives:
The course aims to:

1. Understand the fundamentals of various traditional, nontraditional and advanced metal forming processes
2. Study different types of traditional, nontraditional and advanced metal working processes, their advantages, limitations and applications
3. Understand how the processes are carried out in industry

### Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Solve for strain rates, temperatures and metallurgical states in forming problems using constitutive relations
2. Develop process maps for metal forming processes using plasticity principles
3. Estimate formability limits for bulk metals and sheets
4. Evaluate high energy rate deformation process parameters.

### Unit 1  Introduction and Fundamentals of Forming Processes: [05]
Importance of manufacturing technology, Classification of manufacturing processes, Selection of materials and manufacturing processes. Study of various forming processes their significance and comparison of various manufacturing processes on different criteria. Need for near net shape manufacturing.

Theory of elasticity, Simple Stress and Strains- Elastic stresses and strains, Plastic stresses and strains, Poisson’s ratio, True stress and True strain, Empirical relations for the stress strain curve, Idealized stress strain curve. Two and three dimensional stresses and strains- Principal stresses and strains, Mean (Hydrostatic) stress and stress deviators, Principal strains, Equilibrium in Cartesian, cylindrical and spherical coordinates

### Unit 2  Theory of Plasticity [07]

Effect of Temperature on plastic deformation, Cold forming- and effect of annealing on cold formed materials- recovery, Recrystallization and grain growth, warm forming and hot forming. Effect of strain rate on plastic deformation and super plasticity. Effect of friction and lubrication in metal forming. Classification of forming processes on various criteria
Unit 3  Bulk Forming of Metallic Materials  

Forging Processes: Introduction to types of forging and forging equipments, Modeling of forging process, Calculation of forging loads in closed die forging, Effect of forging variables on properties, forging die design, Design principles, Pre form design considerations and die materials, Forging Defects.

Rolling Process: Introduction to types of rolling and rolling mills, Forces and geometrical relationships in rolling, Simplified analyses of rolling load, Variables, Torque and power, Roll pass design, Rolling mill control, Theories of cold rolling, hot rolling, transverse rolling, Rolling of bars and shapes. Rolling defects

Extrusion: Classification and applications, Extrusion equipment. Hot and cold extrusion, hydrostatic extrusion. Patterns of metal deformation in extrusion, Analyses of extrusion process, Extrusion Defects,


Unit 4  Sheet Metal Forming Processes: Introduction and Classification  

Shearing Processes: Classification and applications, Open Contour Shearing, Closed Contour Shearing. Shearing mechanism.


Stretch Forming: Applications, Stretch forming machines and accessories.


Unit 5  High Velocity Forming and High Energy Rate Forming  

Introduction and Classification. Characteristics of HVF and HERF Processes.

High Velocity Forming Machines: Pneumatic (Compressed air) Hammer, Compressed Gas Forming Hammer, Gas Combustion High Speed Hammers,

High Energy Rate Forming Processes: Explosive Forming, Principles and Types of Explosives. Classification of Explosive Forming Methods, Process variables, Failure of Formed products, Advantages and limitations,


Unit 6  Recent Trends in Forming:  

Thixo- forging, isothermal forging, super plastic forming technology, forming of super conductors, forming of ceramics and glasses, Forming of plastics and composite materials-Extrusion, Form moulding, Thermo forming, Cold forming and Solid phase forming, Design and economic considerations.

Rubber Pad Forming (Flexible – Die Forming) and Hydro forming (Fluid forming Processes).

Spinning: Conventional spinning, Flow Turning (Shear spinning), Tube spinning,

**Term Work:**
1. One exercises each on i. Rolling ii. Forging iii. Extrusion, iv. Wire and deep drawing forming processes
2. Four exercises on High velocity and high energy rate forming
3. Industrial visits to observe bulk metal, sheet metal and High velocity and high energy rate forming processes

**Text Books:**

**Reference Books:**
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester -VII
5. DESIGN OF THERMAL SYSTEMS (Elective-II)

Teaching Scheme:
Lectures: 3 Hrs/ week
Practical: 2 Hrs/week

Examination Scheme:
Theory Paper:100 Marks
Term Work: 25 Marks

Course objectives:
The course aims to:

1. Learn thermal system design methodology
2. Understand real life situations and be able to decide an approach for problem solving.
3. Design simple thermal systems with advanced tools where in integration of more than one component is required.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Understand the thermal system design methodology
2. Decide an approach to solve real life thermal system design problems.
3. Design simple thermal systems with advanced computer aided systems

Unit 1 Introduction to Thermal System Design [06]
Classification of design, Optimal and nearly optimal design, Methodology of design, Aspects of thermal system design, Assessment concept and creation, Component modelling

Unit 2 Design of Refrigeration System [07]
Design of basic components of refrigeration system, Design of refrigeration systems: vapour compression system- Household refrigerator, Ice plant, Vapour absorption systems using waste heat and solar energy.

Unit 3 Heat Transfer and Design Analysis of Air Conditioning System [07]

Unit 4 Design of Solar System [07]
Design of solar assisted water heating systems, Preliminary specifications, Concepts development, Detailed design for feasibility study, Component design

Unit 5 Design of Advanced Cooling Systems [06]
Design of advanced heat exchanger networks, Design of electronic miniature cooling systems, Utilization of Nano- Fluids for cooling systems

Unit 6 Design and Economic Analysis of Waste Heat Recovery Systems [07]
Design of waste heat recovery systems, Design specifications, Concept development, Detailed specifications and component design, Thermo Economic Evaluation and additional costing considerations

**Term Work:**
Any six assignments to be completed
1. Design of water chilling plant
2. Design of cold storage plant
3. Design and optimization of fins
4. Design of waste heat recovery system for diesel power plant
5. Design of dehumidification plant used for industrial drying.
6. Design of gas turbine system
7. Design of shell and tube heat exchangers

*(Designing of any one basic component with CAE software like ANSYS, HYPERWORKS)*

**Text Books:**
1. “HVAC System Design Handbook” ASHRAE.

**Reference Books:**
Shivaji University Kolhapur
B.E. (Mechanical Engineering) Semester – VII
5. SMART MATERIALS (Elective – II)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:
1. Study Smart materials and their types
2. Study HBLS and LBHS based smart materials, actuators and sensors.
3. Study use of actuators and sensors in forming a smart system and its applications.

Course Outcomes:
Upon successful completion of this course, the student will be able to:
1. Classify smart materials and explain their functions.
2. Explain the smart materials and their uses
3. Use of different sensors and actuators
4. Should suggest suitable material for actuators

Unit 1 Overview of Smart Materials [06]
Introduction, Components of smart systems – Sensors, actuators, Transducers, MEMS, Introduction to piezoelectric materials, Magnetostrictive smart materials, Active smart polymers, Shape memory alloys

Unit 2 Types of Smart Materials [06]
Introduction to HBLS (high bandwidth low strain) generating smart materials- Piezoelectric and magnetostrictive materials, LBHS (low bandwidth high strain) generating smart materials- Shape memory alloys and electro-active polymers.

Unit 3 Actuators Based on Smart Materials [08]
HBLS based actuators- Piezoelectric actuators- Induced strain actuation model, Unimorph and bimorph actuators, Actuators embedded in composite laminate. Magnetostrictive actuators - Mini actuators, Thermal instabilities, Magnetostrictive composites, MEMS based actuators. LBHS based actuators: Shape memory alloy based actuators, Electro-active polymer.

Unit 4 Sensors Based on Smart Materials [06]
Sensors based on HBLS smart materials- Piezoelectric sensors, Magnetostrictive sensors, MEMS sensors, Sensors based on LBHS smart materials- Shape memory alloy based encoders, EAP based sensors.
Unit 5 Integration of Smart Sensors and Actuators  
Case studies to advanced smart materials - Active fiber composites, Energy harvesting Actuators, energy Scavenging sensors, Self healing smart materials

Unit 6  Applications of Smart Material  
Structural applications of smart materials, Structural acoustic control, and vibration control applications. Aerospace and transportation applications

Term work:
Any eight assignments based on above syllabus

Text Books:

Reference Books:
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester VII
5. DESIGN FOR SUSTAINABILITY (Elective – II)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:

1. Enable student to design products and equipment for sustainability
2. Use appropriate methodology to analyze and improve product design in terms of sustainability issues.
3. Know contextual factors impacting the engineering discipline.
4. Apply systematic engineering synthesis and design processes.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Explain the role of sustainability in the design process
2. Describe principles of materials selection based on sustainable principles
3. Apply a systematic approach to system redesign in terms of energy efficiency, water efficiency and transport efficiency
4. Give examples of engineering innovation
5. Explain principles of disposal and recycling

Unit 1 [06]
Introduction- Definition, Relevance of Sustainable product design, Strategies for design, Impact of sustainable design

Unit 2 [08]
Sustainable design through economic aspects: Energy Conservation Water Conservation Materials Conservation

Unit 3 [06]
Life Cycle Design: Pre-Building Phase, Building Phase, Post-Building Phase

Unit 4 [08]
Human Design: Preservation for Natural Conditions Urban Design and Site Planning. Design for Human Comfort

Unit 5 [06]
Application of sustainable design principles for HVAC products

Unit 6 [06]
Redesigning and benchmarking for sustainable design
Term Work:
Minimum Six assignments based on above syllabus. Preferably the assignment should be Case study.

Text Books:-
1. “Design for Sustainability: A practical approach for developing economics”, M.R.M. Crueland J.C. Diehi, Delf, University of Technology, USA.

Reference Books:
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester VII
5. FLEXIBLE MANUFACTURING SYSTEM (ELECTIVE II)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/Week

Examination Scheme:
Theory Paper : 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:

1. Study fundamental concepts of flexible manufacturing systems
2. Familiarize students to various components of Fms.
3. Impart knowledge of flexible assembly systems.

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Understand meaning of flexible manufacturing system
2. Explain the concept of group technology, and how it relates to cellular manufacturing.
3. Explore primary capabilities of flexibility in the FMS.
4. Know about different types of FMS with components.

Unit 1 Introduction and Control Structure of FMS [07]

Unit 2 Production Planning and Control in FMS [06]
Activities in modern PPC system, Process planning, Computer aided process planning systems-Retrieval and generative, Material requirement planning, and shop floor control, Scheduling algorithms, Heuristic approach and optimized production technology approach to scheduling, Automated scheduling systems, Inventory control in FMS, MRP-II or ERP

Unit 3 Tooling and Fixturing in FMS [07]
Modern cutting tools and tool materials, Tool holders, Modular tooling, Tool monitoring, Presetting and offsets, Wear and radius compensation, Tool magazines, Automatic tool changers, Robotized tool assembly, Tool management system Part holding on Pallets, Standard fixtures, Pallet changers, Pallet pool, Flexible fixturing – Principles and methodologies, Modular fixturing system: Tslot based, Dowel pin based, Fixturing components, Computer aided fixture design – Locating and clamping, Use of GT in fixture design, Fixture database
Unit 4  Group Technology and Material Handling in FMS  [08]
GT concepts, Advantages of GT, Part family formation-coding and classification systems; Part machine group analysis, Methods for cell formation, Cellular vs. FMS production. Quantitative analysis in cellular manufacturing using rene order clustering system and hollien method.

Material Handling in FMS: Functions of an integrated material handling system in FMS, Flexibilities in material handling, Industrial robots for load / unload applications, Robotic cell layouts and FMS layouts, Automatically Guided Vehicles (AGVs) – Types, Features, Guidance technologies and applications; Automated warehousing - AS/RS, storage and retrieval machines in AS/RS.

Unit 5  Automated Inspection Systems  [06]
Online offline infection, Automated inspection techniques, Contact non contact inspection, Application of m/c vision system in inspection, CMM, Study of inspection and post inspection software, FIS (Flexible Inspection System)

Unit 6  Flexible Assembly Systems  [06]
Basic Concepts, Classification, Planning and Scheduling in FAS, Loading and scheduling in F.A. cells. Lean and Agile Manufacturing: Definition and principles of lean manufacturing, Benefits, Methodologies for transferring to lean manufacturing, Definition, Principles of agility, Market forces and agility, Reorganizing the production system for agility, Managing relationships for agility; Comparison of mass, Lean and agile manufacturing

Term Work:
Minimum eight assignments based on the following.
1. Develop a form code using any classification system for 3 parts.
2. Application of rank order clustering algorithm to identify logical part families and machines groups.
3. Exercise on any scheduling algorithm.
4. Exercise on flexible fixturing.
5. Simulation of FMS shop, using Simulation software package (like ARENA, OpenCIM/ OpenFMS or equivalent) using various modules like Arrive, Server, Depart, Simulate modules, Creating models of FMS shops and simulating the performance to obtain output results.
6. Exercises on assessment of performance of batch production systems for the following measures.
   a) Manufacturing lead time, b) Work - in – process, c) Machine utilization

Text Books:

Reference Books:
12. “Design and Operation of SMS”, Rankey, IFS.
Course Objective:
The course aims to:
   1. Familiar the students to realize an industrial work.

Course Outcomes:
Upon successful completion of this course, the student will be able to:
   1. Comprehend the knowledge gained in the course work
   2. Create, select, learn and apply appropriate techniques, resources, and modern engineering tools.

Industrial Training
The students have to undergo an industrial training of minimum two weeks in an industry preferably dealing with Mechanical engineering during the semester break after Sixth semester and complete within 15 calendar days before the start of seventh semester. The students have to submit a report of the training undergone and present the contents of the report before the evaluation committee constituted by the department. An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks at the end of the semester.

It is expected that students should undertake small assignment or work related to any of the course related aspect. Report is based on compilation of work carried out related to facility and layout planning, Industrial engineering- time study and motion study, Line efficiency evaluation and improvement, Process capability evaluation, Industrial automation, Process or machinery modification as identified.

Industrial Training Report Format:
Maximum fifteen students in one batch, involving three groups of maximum five students, shall work under one Faculty. The same group shall work for project under the same guide. However, each student should have different industrial training and its presentation.

The report should be of 20 to 30 pages. For standardization of the report the following format should be strictly followed.
   1. Page Size: Trimmed A4
   2. Top Margin: 1.00 Inch
   3. Bottom Margin: 1.32 Inches
   4. Left Margin: 1.5 Inches
   5. Right Margin: 1.0 Inch
   7. Line Spacing: 1.5 Lines
   9. Headings: Times New Roman, 14 Point ., Bold Face
10. Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/Director.
The entire report should be documented as one chapter with details like
1. “Name of Industry with address along with completed training certificate”
2. Area in which Industrial training is completed

All Students have to present their reports individually.
**Course Objectives:**

The course aims to:

1. Embed the skill in group of students to work independently on a topic/problem/experimentation selected by them and encourage them to think independently on their own to bring out the conclusion under the given circumstances of the curriculum period in the budget provided with the guidance of the faculty.

2. Encourage creative thinking process to help them to get confidence by planning and carrying out the work plan of the project and to successfully complete the same, through observations, discussions and decision making process.

**Course Outcomes:**

Upon successful completion of this course, the student will be able to:

1. Improve the professional competency and research aptitude in relevant area.

2. Develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

**Project Phase I Load:**

A batch of maximum three groups of four to five students per group, shall work under one Faculty member of department. The group of one student is strictly not allowed.

**Project Phase I Definition:**

The project phase I work can be a design project/ experimental project and or computer simulation project on Mechanical engineering or any of the topics related with Mechanical engineering stream. The project phase I work is allotted in groups on different topics. The students groups are required to undertake the project phase-I during the seventh semester and the same is continued in the eighth semester (Phase-II). Project Phase-I consists of reviews of the work carried earlier and the submission of preliminary report. Report should highlight scope, objectives, methodology, approach and tools to be used like software and others, outline of project and expected results and outcome along with timeframe. The project phase I work is to be extended for project phase II at B. E. (Mech.) Sem. VIII with same group working under guidance of same Faculty member assigned for project phase I.

**Project Phase I Term Work:**

The term work under project submitted by students shall include

1. Work Diary: Work Diary maintained by group and countersigned by the guide weekly. The contents of work diary shall reflect the efforts taken by project group for
   a. Searching suitable project work
   b. Brief report preferably on journals/ research or conference papers/ books or literature surveyed to select and bring up the project.
c. Day to day activities carried out related to project work for entire semester.
d. Synopsis.

The group should submit the synopsis in following format

i. Title of Project
ii. Names of Students
iii. Name of Guide
iv. Relevance
v. Present Theory and Practices
vi. Proposed work
vii. Expenditure
viii. References

2. The synopsis shall be signed by the each student in the group, approved by the guide and endorsed by the Head of the Department
3. Presentation: The group has to make a presentation in front of the Faculty members of department at the end of semester.

Project Phase I Report Format:

Project Phase I report should be of 25 to 30 pages (typed on A4 size sheets). For standardization of the project phase I reports the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
7. Line Spacing: 1.5 Lines
9. Headings: Times New Roman, 14 Point , Bold Face
10. References: References should have the following format
    For Books: “Title of Book”, Authors, Publisher, Edition
    For Papers: “Title of Paper, Authors, Journal/Conference Details, Year

Important Notes:

- Project group should continue maintaining a diary for project and should write (a) Book referred (b) Company visited (c) Person contacted (d) Computer work done (e) Paper referred (f) Creative thinking.
- The Diary along with Project Phase I Report shall be assessed at the time of oral examination
- One copy of the report should be submitted to Institute/ Department, One copy to Guide and one copy should remain with each student of the project group.
### Course Objectives:

The course aims to:

1. Produce competent Mechanical engineers with comprehensive knowledge of Mechatronics to enable them to apply the relevant knowledge and technologies for the design and realization of innovative systems and products.
2. Supply qualified personnel to meet the requirement of specialist in Mechatronics.
3. Prepare Mechanical Engineering students for advanced graduate studies in Mechatronics, Manufacturing engineering and related field.

### Course Outcomes:

Upon successful completion of this course, the student will be able to

1. Understand the importance of integration of Mechanical, Electronics and Control in the design of Mechatronics system.
2. Understand key elements of sensors and transducers and interfacing the same with problem under consideration through PLC.

### Unit 1 Introduction


### Unit 2 Signal Conditioning

Signal conditioning process, Operational amplifier (inverting amplifier, Non-inverting amplifier, Summing, Integrating amplifier, Differentiating amplifier, Logarithmic amplifier), Protection, Filtering, Data acquisition, Multiplexer, Analog to Digital Converter (ADC), Digital to Analog Converter (DAC). Oscillators to generator sinusoidal, Square, Triangular and impulse waveforms, 555 timer, Sample and hold, Demultiplexing. Interfacing input output ports, Serial and parallel interfacing requirements, Buffers, Handshaking, Polling and interrupts.

### Unit 3 Digital Circuits, Microprocessor and Microcontroller

Digital logic, Number systems, Logic gates, Boolean algebra, Application of logic gates, Sequential logic, Flip flop, D flip flop, JK flip flop, Master slave flip flop.
Microcontroller: Comparison between microprocessor and microcontroller, Organization of a microcontroller system, Architecture of MCS 51/ATMEL/PIC controller, Pin diagram of 8051, Addressing modes, Instruction types and set, Selection and Applications of Microcontroller

Unit 4 Programmable Logic Controllers (PLC) [07]
Introduction, Definition, PLC system and components of PLC Input output module, PLC advantages and disadvantages. Ladder diagram and PLC programming fundamentals: Basic components and other symbols, Fundamentals of ladder diagram, Machine control terminology, Update – Solve ladder – Update, Physical components Vs. program components, Light control example, Internal relays, Disagreement circuit, Majority circuit, Oscillator, Holding (sealed or latches) contacts, Always ON always OFF contacts, Nesting of ladders.

Unit 5 PLC Programming [07]
PLC Input instructions, Outputs, Coils, Indicators, Operational procedures, Contact and coil input output, Programming example, Fail safe circuits, Simple industrial applications. PLC Functions
PLC timer functions – Introduction, Timer functions, Industrial applications, Industrial process Timing applications, PLC control functions – PLC counters and its industrial applications, Introduction to SCADA and MEMS.

Unit 6 Mechatronics Systems [06]
Traditional Vs Mechatronic Design, Case studies of Mechatronic systems designs, like piece counting system, Pick and place manipulator, Simple assembly task involving a few parts, Part loading / unloading system, Automatic tool and pallet changers etc. Fault finding and troubleshooting.

Term Work:
1. Trial on sensors (minimum four),
2. Assignment on Microprocessor and Microcontroller.
3. PLC Programming on Industrial Applications based on Timers, Counters, Internal Relays (Minimum 4 applications),
4. Fabrication of Simple Mechatronics working project by a group of 4/5 students using hardware and suitable software.
5. Assignment on PLC Data handling and Fault finding,
6. Assignment on SCADA and MEMS,
7. Industrial visit to study Mechatronic system application and submission of visit report.

Note: Mechatronics Laboratory is expected to have a simple 8 input 8 output PLC

Text Books:
4. “Introduction to PLC Programming” NIIT.
Reference Books:
Course Objectives:
The course aims to:

1. Acquire the knowledge of renewable sources of energy and utilization.
2. Enable the student to estimate the potential of energy sources.
3. Study various power stations, Performance and economic analysis
4. Understand the new trends in power and energy sectors.

Course Outcomes:
Upon successful completion of this course, the student will be able to

1. Demonstrate need of different energy sources and their importance
2. Analyze the utilization of solar, wind energy etc.
3. Comprehend various equipments/systems utilized in power plants
4. Illustrate power plant economics

Unit 1 [08]
Introduction to Renewable Energy sources, Solar potential, Solar radiation spectrum, Solar radiation geometry (Numerical on angle of incidence only), Solar radiation data, Solar Collectors (Flat plate, evacuated tube, Cylindrical parabolic, Concentrating paraboloid), Graphical representation of efficiency of various Collectors, Testing of Solar flat plate collectors – BIS code (No numerical), Thermal Energy storage (Introduction and types)

Unit 2 [07]
Operating Principle of Photovoltaic cell concepts, Photo-cell materials, Cell module array, Series and parallel connections, Maximum power point tracking, Design of standalone system with battery and AC or DC load (Descriptive Treatment), Applications, Introduction, Principle and operation of fuel cells, classification and types of fuel cell. Fuel for fuel cells, Application of fuel cells.

Unit 3 [05]
Wind parameters and wind data, Power from wind, Site selection, Wind energy conversion systems and their classification, Construction and working of typical wind mill, Introduction to OTEC and Hybrid systems (Diesel-PV, Wind-PV Biomass-Diesel systems)

Unit 4 [06]
Power scenario in india and world, NTPC, NHPC and their role in Power development in India, Power generation in Private sector, Power distribution, Power grid corporation of India, State
grids, Railway grids and International grids, Different types of power plants – Thermal, Hydro, IC Engine, Gas Turbine, Nuclear and their characteristics, Combined Cycle, Pumped storage, Compressed Air storage power plants and their characteristics. Comparison of Power plants with respect to various parameters. Issues in Power plants.

Unit 5 [09]
i) Load Curves
Load Curves and Load duration curves (Numerical treatments), Performance and operational characteristics of power plants, Peak load, Intermediate load and Base load plants and their characteristics, Input output characteristics of power plants, Economic division of between Base load plant and peak load plants, Tariff methods (Numerical Treatments).

ii) Instrumentation
Flow measurement of feed water, fuel, air, steam with correction factor for temperature, Speed measurement, Level recorders, Radiation detectors, Smoke density measurement, Dust monitor, Flue gas oxygen analyser – Analysis of impurities in feed water and steam – Dissolved oxygen analyser – Chromatography – PH meter-fuel analyser – Pollution monitoring instruments

Unit 6 [05]
Energy Management, Energy Marketing: Selling and marketing in India, Creating supply chain in India, Successfully working with business and virtual teams in India, Navigating the financial, legal and accounting environment, Human Resources issues, India’s business culture in energy sector

Term Work:
1. Demonstration and measurement of solar radiation using pyranometer.
2. Performance on PV Cell (I-V Characteristics curves)
3. Visit to Wind power farm with detailed report
4. Study of Indian electricity grid code 2003 and its amendments
5. Study of combined cycle gas based and coal based Power plant
7. Economic Analysis of power plants and Selection of plant for power generation (Numerical Treatment)
8. Industrial visit to power plant and switch yard
9. Energy Audit - Case study of an organization and report

Text Books:

Reference Books:
SHIVAJI UNIVERSITY, KOLHAPUR,
B.E. (Mechanical Engineering) Semester VIII

3. NOISE AND VIBRATIONS

Teaching Scheme:
Lectures: 3 Hrs/week
Practical: 2 Hrs/week

Examination Scheme:
Theory Paper: 100 marks
Term Work: 25 marks
Oral Exam: 25 marks

Course Objectives:
The course aims to:

1. Study basic concepts of vibration analysis
2. Acquaint with the principles of vibration measuring instruments
3. Create awareness about principles of sound level measurement and noise

Course Outcomes:
Upon successful completion of this course, the student will be able to

1. Develop mathematical model to represent dynamic system
2. Estimate natural frequency of mechanical element/system
3. Analyze vibratory response of mechanical element/system
4. Estimate the parameters of vibration isolation system
5. Carryout measurement of various vibration parameters
6. Understand relevance of noise in mechanical systems

Unit 1
Introduction [04]

Unit 2
Single DOF System [08]
a) Undamped free vibrations, Damped free vibrations, Types of damping, Logarithmic decrement and damping materials.
b) Forced Vibrations: Types of excitation, Forced excitation, Support excitation, Excitation due to unbalance in machines, Response of systems to above types of harmonic excitations, Transmissibility-Force transmissibility and motion transmissibility, Vibration isolators, commercial isolation materials and shock mounts.

Unit 3
Two DOF System [08]
a) Free undamped vibrations – Principal modes and natural frequencies, Co-ordinate coupling and principal co-ordinates.
b) Forced vibrations (Undamped) – Harmonic excitation, Vibration Dampers and absorbers, Dynamic vibration absorber – Tuned and Untuned type
Unit 4
Introduction to Multi DOF System
a) Free vibrations of Multi DOF System-Flexibility and stiffness influence coefficient matrix, Equation of motion
b) Rayleigh’s method, Matrix iteration method and Holzer method

Unit 5
Vibration Measuring Instruments
Instruments for measurement of displacement, velocity, acceleration and frequency of vibration, Sensors and Actuators, Introduction of X – Y plotter, Spectral analyzers, Exciters FFT analyzer. Introduction to Condition Monitoring and Fault Diagnosis

Unit 6
Introduction to Noise
a) Sound Level and Subjective Response to Sound
Frequency dependent human response to sound, Sound pressure dependent human response, Decibel scale, Relation among sound power, Sound intensity and sound pressure level, Octave Band Analysis.
b) Noise- Effects, Rating and regulation
Non auditory effects of noise on people, Auditory effects of noise, Noise standards and limits, Ambient emission noise standards in INDIA, Hazardous noise explosion, Day night noise level, Noise sources and control, Automotive noise control principles, Sound in enclosures, Sound energy absorption, Sound transmission through barriers.

Term Work:
Minimum ten Experiments out of following list.
1. Experiment on equivalent spring mass system.
2. Experiment on study of forced vibration characteristics
3. Determination of logarithmic decrement for single DOF damped system
4. Experiment on torsional vibration of two rotor without damping
5. Experiment on free vibration of a coupled pendulum and/or double pendulum
6. Experiment on torsional vibration of three rotor without damping
7. Use of different types of exciters for vibration analysis
8. Measurement of vibration parameters using vibration measuring instruments
9. Introduction to FFT analyzer, and prediction of spectral response of vibrating machine from workshop.
10. At least two case studies in detail based on Conditioning Monitoring and Fault Diagnosis
11. Measurement of Noise by using noise measuring instruments
12. Vibration analysis of mechanical system using MATLAB minimum two assignments

Reference Books:

Text Books:
2. “Mechanical Vibrations”, G. K. Grover, Published by Nemchand and Brothers, Roorkee.
3. “Mechanical Vibrations”, Dr. V. P. Singh, Published by S. Chand and Sons New Delhi.
SHIVAJI UNIVERSITY, KOLHAPUR
B.E. (Mechanical Engineering) Semester VIII
4. INDUSTRIAL ENGINEERING (ELECTIVE-III)

Teaching Scheme: Examination Scheme:
Lectures: 3 Hrs/ Week Theory Paper: 100 Marks
Practical: 2 Hrs/Week Term Work: 25 Marks

Course Objectives:
The course aims to:

1. Introduce students to the concept of integration of various resources
2. Acquaint the students with tools and technique of industrial engineering.
3. Analyze and design new method of performing job.
4. Understand work measurement techniques

Course Outcomes:
Upon successful completion of this course, the student will be able to

1. Analyze and design new method of performing job.
2. Measure and estimate standard time for job.
3. Understand different types of plant layouts.
4. Interpret job evaluation and merit rating.

Unit 1 Introduction to Industrial Engineering and Productivity [06]
Introduction to Industrial Engineering – Definition, Scope, Responsibilities, Important contributors to I.E., Tools and techniques of industrial engineering.
Productivity – Concept, objectives, Factors affecting productivity, Tools and techniques to improve productivity, Productivity measurement models

Unit 2 Work Study [08]
Historical background, Role of work study in improving productivity, Method study procedure, Selection of jobs, Information, Collection and recording; Recording techniques, Charts, Diagrams, Templates, Models, Critical analysis, Development, Installation, and maintaining better method

Unit 3 Motion Study and Human Factor Engineering (Ergonomics) [06]
A) Motion Study: Principles of motion economy, Micro motion study, SIMO chart, MEMO motion study, Cycle graph, Chronocycle graph
B) Human Factor Engineering (Ergonomics): Introduction, Definition, Man machine system, Physiological work measurement, Design of controls

Unit 4 Work Measurement (Time Study) [08]
Definition, Objectives, Procedure, Time study equipment, Performance rating, Allowances, Concept of normal time and standard time, Calculation of standard time, Work sampling, Predetermined motion time analysis
Unit 5 Facility Design

Plant site selection, Factors influencing the selection, Optimum decision on choice of site and analysis, Types of plant layout, Advantages and disadvantages of layout, Principles and objectives of plant layout, Tools and techniques of layout planning, Material handling

Unit 6 Value Analysis and Job Evaluation and Merit Rating

A] Value Analysis: Definition, Concept of approaches of value analysis and engineering, steps, Evaluation, and applications of value analysis.

B] Job Evaluation and Merit Rating: Definition, Objectives, Procedure of job evaluation, Different schemes and their advantages and disadvantages.

Term Work:

1. Problems on productivity.
2. Two case studies on method study.
3. Man; Machine chart program.
4. Two handed process chart.
5. Stop watch time study for an operation.
6. Work sampling.
7. Plant site location analysis.
9. Case study on Value analysis concept.
10. Case study on job evaluation and merit rating.

Text Books:


Reference Books:

SHIVAJI UNIVERSITY, KOLHAPUR
B.E. (Mechanical Engineering) Semester VIII
4. PRODUCTION MANAGEMENT (ELECTIVE-III)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:
1. Get acquainted with basic aspects of Production management
2. Study various important planning, organizing and controlling aspects of Operations management
3. Study different operational issues in manufacturing and service organizations.

Course Outcomes:
Upon successful completion of this course, the student will be able to
1. The students will have fair understanding of the role of Production / Operations Management played in business processes.
2. Emphasis on both familiarization of various production processes and service systems and quantitative analysis of problems arising in the management of operations.

Unit 1 Introduction to Production Management [07]
Production types, Objectives and scope of Production Management, Production Planning and Control (PPC)- Definition and elements and activities of production planning and production control Relevance, Strategy formulation process, Order qualifiers and order winners, Strategic options for Operations- Product – Process Matrix, Product portfolio, Process technology, WCM practices

Unit 2 Product and Process Design [06]

Unit 3 Capacity and Scheduling of Operations: [07]
Capacity- Definition, Measure of Capacity, Capacity strategies,Estimation of number of machines, Overcapacity and under capacity factors, Aggregate Planning, Aggregate Planning Strategies, Use of transportation model approach to aggregate planning Loading, scheduling and sequencing, Priority sequencing rules. Sequencing problems, n job 2 machines, n Job ‘3’ machines. Forward and backward scheduling, Critical ratio scheduling, Production Control Activities

Unit 4 Supply Chain Management and Advanced Manufacturing Techniques: [08]
Concept of supply chain and supply chain management, Manufacturing supply chain, SCM activities, Supply chain strategies, Managing supply chain, Measuring supply chain performance,
JIT Philosophy, Origin and core logic of JIT, Elements of JIT, Kanban System- Design of Kanban containers, JIT. Implementation issues and performance, Lean Manufacturing- pillars, features and process comparison with Traditional Manufacturing.

Unit 5 Total Productive Maintenance and Replacement: [06]
Introduction, Definition, Six big losses, Stages of maintenance, Pillars stages of TPM Development, Overall Equipment Effectiveness (OEE) Computation Replacement - need, Replacement of items whose maintenance cost increases with time (with and without considering time value of money), Replacement of items that fail suddenly

Unit 6 Production Economics [06]
Demand and supply, Demand curve and supply curve, Equilibrium of supply and demand, Elasticity of demand Production function, Factors of production, Isoquants, Review - Time value of money, Cash flows, Evaluation criteria for capital projects (investment) Payback period, IRR and BCR

Term Work:
1. Presentation on Case study on “Interdepartmental relationship in a business organization”
2. Presentation on Case study on “Design for Manufacturing and Assembly”.
3. Assignment on Demand Forecasting.
5. Presentation on Case study on “Implementation of JIT in a small/medium company”.
8. Presentation on World Class Manufacturing Practices like Toyota Mfg. system, etc.

Text Books:

Reference Books:
Course Objectives:

The course aims to:

1. Define the near field equations to determine the stress strain and load displacement fields around a crack tip for linear elastic cases.
2. Identify and formulate the stress intensity factor (\(K\)) for typical crack configurations.
3. Identify and formulate the strain energy release rate (\(G\)).
4. Identify and formulate \(J\) - integral and the stress and strain fields around a crack tip for non linear and elastoplastic materials.
5. Define fracture toughness of materials using \(K_c\), \(G_c\) and \(J_c\).
6. Employ the standard and non standard fracture mechanics tests to determine the fracture toughness of materials.
7. Predict the fatigue life of structures using fracture mechanics approaches.

Course Outcomes:

Upon successful completion of this course, the student will be able to

1. Understand and account for the theoretical background of linear and nonlinear fracture mechanics.
2. Carry out fracture mechanics analysis and design, using handbooks, of simple crack problems in linear and nonlinear materials.
3. Determine the loading applied on a crack.
4. Evaluate fracture mechanics testing.
5. Carry out analyses of crack growth.
6. Determine whether or not stable crack growth can become unstable.
7. Apply the knowledge from the course on practical cases where linear fracture mechanics is sufficient.

Unit 1 [07]

Theories of Failure: Maximum shear stress theory, Maximum normal stress theory, Maximum distortion energy theory, Maximum strain theory, Applicability of theories of failure.

Unit 2 [06]

Fracture: Type of fracture, Theoretical cohesive strength of metals, Griffith theory of brittle fracture, fracture single crystals, Metallographic aspects of fracture, Dislocation theories of brittle fracture, Ductile fracture, Notch effects, Fracture under combined stresses.
Unit 3 [07]

Elements of Fracture Mechanics: Strain-energy release rate, Stress intensity factor, Fracture toughness, Plane-strain toughness testing, Crack-opening displacement, J-Integral to solve energy of crack formation, R-curves, Toughness of material.

Fatigue Failure: Stress cycle, S-N curve, Description of fatigue fractured parts, Phases of fatigue fracture, Fatigue crack propagation, Effects of metallurgical variables, Temperature, Stress concentration, Size and surface factors, Fatigue under combined stresses.

Unit 4 [07]

Creep Failure: Creep curve, Structural changes and mechanisms during creep, Activation energy for steady-state creep, Fracture at elevated temperature.

Brittle Fracture: Transition temperature curves, Fracture analysis diagrams, Various types of embitterment, Fracture under very rapid loading.

Unit 5 [06]

Ductile Fracture: Condition for necking, Dislocation and void formation activities, Types of fractured parts.

Assessment of Types of Fractures by Observation: Comparison between different fractured parts undergoing various type of fracture.

Unit 6 [07]

Design Application of the Knowledge of Failure: Design considering fatigue-Geber’s parabola, Soderberg equation, Lubricating optimally to combat bearing failures. Selection of materials to prevent seizure, galling, etc. Wear reduction techniques, Fracture toughness consideration in design.

Term Work:

Minimum eight assignments from the following

6. The Evaluation of Fracture toughness by Photo elasticity.
7. The Evaluation of Fracture toughness by Interferometery and Holography.
8. The Experimental evaluation of Fracture toughness by
   a. Plane strain fracture toughness method
   b. J Integral
9. Comparison between computer modeling and Experimental verification of Fatigue properties of S-N diagram, fatigue limit, fatigue crack growth rate, Paris law.
Text Books:-

Reference Books:
1. “Metal Fatigue Design and Theory”, Madoyag, F.
SHIVAJI UNIVERSITY, KOLHAPUR
B.E. (Mechanical Engineering) Semester VIII
4. RELIABILITY ENGINEERING (Elective – III)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Theory Paper: 100 Marks
Term work: 25 Marks

Course Objectives:
The course aims to:
1. Introduce principles of reliability in engineering design.
2. Develop understanding of concepts of failures, maintainability and availability of the intended products/systems and services.
3. Develop an ability to analyze field failure data in order to evaluate system reliability.
4. Develop an ability to apply various reliability techniques to solve interdisciplinary reliability problems.

Course Outcomes:
Upon successful completion of this course, the student will be able to
1. Explain basics of reliability, maintainability and availability and differentiate among them.
2. Apply fundamentals of reliability to estimate reliability of mechanical systems, electronic devices, softwares and human.
3. Analyze field failure data for reliability analysis.
4. Evaluate system reliability using various techniques.

Unit 1 Fundamentals of Reliability and its Measures [07]
Brief history of reliability, Concepts, Terms and definitions, System safety, Quality and reliability, Life cycle cost of a product or system, System effectiveness, Concept of failure, Laws of probability, Random variables, Discrete and continuous probability distributions.
Measures: Reliability function, Hazard rate function, CDF, PDF, MTTF, MTBF, Median time to Failure, Mean, Mode, Median, Skewness, Kurtosis, Variance and standard deviation, Typical forms of hazard rate function, Bathtub curve.

Unit 2 Reliability Distributions [06]
Basic reliability distribution, Conditional reliability, Constant Failure Rate (CFR) model, Binomial distribution, Normal, Poisson, Lognormal, Rayleigh, Weibull etc., Fitting probability distributions graphically and estimation of distribution parameters, Calculation of R(t), F(t), f(t), λ(t), MTTF, tmed, tmode for above distributions.
Unit 3  Reliability Evaluation of Systems[07]
System Reliability block diagram- Series configuration, Parallel configuration, Mixed configurations, Redundant systems, Standby redundant, Load sharing systems etc. High level versus low level redundancy, k-out-of-n redundancy, Network reduction and decomposition methods, Cut and tie set approach for reliability evaluation. Fault tree analysis (FTA), Success tree method, Failure mode and effect analysis (FMEA), Failure modes effects and criticality analysis (FMECA), Markov analysis, Monte Carlo simulation.

Unit 4  Maintainability and Availability [07]
Maintainability - Objectives of maintenance, Types of maintenance, Concept of maintainability, factors affecting maintainability, System downtime, Measures of maintainability, Mean time to repair (MTTR), Analysis of downtime, Repair time distributions, Stochastic point processes, Reliability centered maintenance (RCM).
Availability - Availability concepts and definitions, Important availability measures, Inherent, achieved and operational availability.

Unit 5  Reliability Testing and Data Analysis [06]
Reliability Testing - Life testing, Burn-in testing, Acceptance testing, Accelerated life testing, highly accelerated life testing (HALT) and reliability growth testing.
Data Collection and Analysis - Data collection, Empirical methods, Estimation of performance measures for ungrouped compete data, Grouped complete data, Analysis of censored data, Pareto analysis, and Goodness-of-fit tests.

Unit 6  Interdisciplinary Approach and Life Cycle Cost (LCC) [07]
Electronics - Reliability of electronic components, Component types and failure mechanism.
Software – Introduction, errors, Software testing, Hardware/ software interface.
Human reliability analysis (HRA) - Introduction, human error in maintenance, Impact on system reliability. Reliability costs, effect of reliability on LCC, Categories of costs, Calculation of LCC.

Term Work:
A. Any Four Assignments out of following.
   2. Fitting probability distributions graphically and estimation of distribution parameters.
   4. Maintainability and availability
   5. Reliability testing
B. Any Two Case Studies:

1. Reliability Analysis of Mechanical Systems
2. Reliability centered maintenance (RCM)
3. Life cycle cost analysis.

Text Books:


Reference Books:

SHIVAJI UNIVERSITY, KOLHAPUR
B.E. (Mechanical Engineering) Semester VIII
4. ADVANCED I C ENGINES (Elective III)

Teaching Scheme:
Lectures: 3 Hrs/Week
Practical: 2 Hrs/Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:
1) Understand modern fuel injection systems.
2) Understand thermodynamics of combustion phenomenon.
3) Understand cause of emission and its control.
4) Understand alternative fuels for I C engines.

Course Outcomes:
Upon successful completion of this course, the student will be able to
1) Analyze fuel injection system of IC engines
2) Analyze the combustion in thermodynamic point of view.
3) Know design aspects of combustion chamber.
4) Know new trends in IC engines.
5) Know the modification in engines for alternative fuels.
6) Know advanced emission control methods

Unit 1 SI Engines [06]

Unit 2 CI Engines [06]
Review of CI engine, Electronic fuel injection system, ECU, sensors and transducers, Feedback system, Fuel spray behavior, Recent fuel injector and injection timing, Advanced diesel fuel injection pump, Advance turbo charging system.

Unit 3 Combustion [08]
SI engine combustion phenomenon, Turbulence characteristics, Combustion chamber design using simulation software’s (Introductory), Chamber optimization Strategy, Thermodynamic analysis of SI engine combustion (Combustion Analyzer)
CI Engine combustion phenomena, Swirl, Swirl Measurement, Generation of Swirl during induction, Swirl within cylinder, Combustion chamber design using simulation software’s (Introductory), Chamber optimization Strategy, Thermodynamic analysis of CI engine combustion (Combustion Analyzer)
Unit 4  Alternate Fuels  [07]

Unit 5  Engine Emission, Pollution And Its Controls  [07]
Formation of HC, NOx, CO mechanism, Smoke and Particulates emission, Methods of Controlling Emissions, Measuring Equipment’s and methods, International and National Emission Norms

Unit 6  Trends In IC Engines  [06]

Term Work:
Seven assignments (One Assignment on each unit and two assignments on unit three) and One case Study.

Text Books:

Reference Books:
2. “Diesel and High Compression Gas Engines”, P. M. Kates.
SHIVAJI UNIVERSITY, KOLHAPUR
B.E. (Mechanical Engineering) Semester VIII
4. MACHINE TOOL DESIGN (Elective III)

Teaching Scheme:
Lectures: 3 Hrs./Week
Practical: 2 Hrs./Week/ Batch

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:
1. Know the classification, requirements and design considerations of machine tools.
2. Understand various motions, drives, and transmissions of machine tools and their design
3. Study parameters and procedure for design of machine tool structures
4. Understand the design procedure of other functional elements of machine tools
5. Understand the source and effect of vibrations in machine tools
6. Study various control systems and their application in automation.

Course Outcomes:
Upon successful completion of this course, the student will be able to

1. Identify, formulate and solve engineering problems
2. Identify areas for research oriented work based on the course content
3. Apply the knowledge of the course in solving real life problems
4. Apply the knowledge of machine tool designing
5. Design a machine tool to meet the desired needs such as manufacturability and sustainability.
6. Use techniques, skills and modern engineering tools necessary for engineering practice.
7. List down the factors that influence the application of the course content in the industrial environment,

Unit 1 Introduction to Machine Tool Design [05]
Classification of machine tools based on their construction, Precision, Control, Drives and rate of production. Elements of machine tools, General requirements of machine tool design, Engineering design process applied to machine tools, Layout of machine tools, Various motions introduced in machine tools, Parameters defining limits of motions.

Unit 2 Design of Machine Tool Drives [09]
Requirements of machine tools drives, Mechanical and hydraulic transmission used in machine drives, their elements, Selection of speed and feed, Types of Speed and feed regulation, Stepped, step-less, mechanical, electrical, Hydraulic methods of speed regulation and their comparison. Stepped drives of machine tools- Gear drives, Gear box design, Graphical representation of gear box operation with ray diagram, Structural diagram, Deviation diagram. Drives for CNC machine tools- AC and DC servomotors, Stepper motors.
Unit 3 Design of Machine Tool Structures [06]
Functional requirements of machine tool structures, Consideration used in design for strength and rigidity, Design procedure for machine tool structures, Materials for machine tool structures, Design of beds, columns and housings.

Unit 4 Design of Guide ways, Slide ways, Spindles and Spindle Supports [08]

Functions of spindle unit and requirements, Materials, Machine tool compliance and machining accuracy, Design calculations of spindles, Bearings for spindles, Sliding bearing used for spindles.

Unit 5 Dynamics of Machine Tools[07]

Unit 6 Machine Tool Control and Automation [05]

Automation: Systems such as mechanical, electrical, electronics, optical, pneumatic/hydraulic used for position control, their application in automation, Degree of automation, Semi automation.

Term Work:
1. Design of at least two elements of machine tool - analytical and numerical using FEA
2. Design of one sub- assembly like gear box, feed box, with design report containing all calculations, Sketches for design; and sheet of A2 size containing drawing of details and assembly.
3. Any four assignments on the following
   (a) Transmission used in machine drives.
   (b) Design of power screws for a machine tool.
   (c) Machine tool compliance and machining accuracy in a machine tool.
   (d) Design of guide-ways based on wear resistance and stiffness.
   (e) Vibration analysis of machine tool structure.
   (f) Machine tool control and Automation
*Standard Design data books for all above experiments should be used.
Text Books:

Reference Books:
**SHIVAJI UNIVERSITY, KOLHAPUR**  
**B.E. (Mechanical Engineering) Semester VIII**  
**4. DESIGN OF AIRCRAFT SYSTEMS (ELECTIVE – III)**

<table>
<thead>
<tr>
<th>Teaching Scheme:</th>
<th>Examination Scheme:</th>
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</thead>
<tbody>
<tr>
<td>Lectures: 3 Hrs/ Week</td>
<td>Theory Paper: 100 Marks</td>
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<tr>
<td>Practical: 2 Hrs/ Week</td>
<td>Term work: 25 Marks</td>
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**Course Objectives:**
The course aims to:

1. Study the fundamentals of aircraft design and structural analysis
2. Study the aircraft materials and processes
3. Study structural analysis of various components like plates, shells, beams.
4. Know about airworthiness
5. Study aircraft structural repair

**Course Outcomes:**
Upon successful completion of this course, the student will be able to

1. Understand the basics of aircraft systems and aircraft structures.
2. Know industry practices on design of aircraft structures and systems.
3. Understand the applicability of design aspects in aircraft design.
4. Relate the theoretical knowledge with the design of aircraft structures and systems.

**Unit 1 Fundamentals of Aircraft Design and Structural Analysis** [06]
Review of Hooke’s Law, Principal stresses, Equilibrium and Compatibility, Determinate Structures, St Venant’s Principle, Conservation of Energy, Stress Transformation, Stress Strain Relations.

**Unit 2 Aircraft Structures and Loads** [07]
Types of Structural members of Fuselage and wing section Ribs, Spars, Frames, Stringers, Longeron, Splices, Sectional Properties of structural members and their loads, Types of structural joints, Type of Loads on structural joints

**Unit 3 Aircraft Materials and Manufacturing Processes** [07]
Unit 4 Structural Analysis of Aircraft Structures - I  [08]
Theory of Plates - Analysis of plates for bending, stresses due to bending, Plate deflection under different end conditions, Strain energy due to bending of circular, rectangular plates, Plate buckling, Compression buckling, shear buckling, Buckling due to in plane bending moments, Analysis of stiffened panels in buckling, Rectangular plate buckling, Analysis of Stiffened panels in Post buckling, Post buckling under shear
Theory of Shells- Analysis of Shell Panels for Buckling, Compression loading, Shear Loading / Shell Shear Factor, Circumferential Buckling Stress.

Unit 5 Structural Analysis of Aircraft Structures - II  [08]
Theory of Beams- Assumptions in theory of Bending, Moment of resistance, Section modulus, Neutral axis, Stress distribution diagram for cantilever and simply supported beam. Equation of Bending. Symmetric Beams in Pure Bending, Deflection of beams, Unsymmetrical Beams in Bending, Plastic Bending of beams, Shear Stresses due to Bending in Thin Walled Beams, Bending of Open Section Beams, Bending of Closed Section Beams, Shear Stresses due to Torsion in Thin Walled Beams

Theory of Torsion- Assumptions in theory of pure torsion, Torsion equation for solid and hollow circular shaft. Shafts of Non-Circular Sections, Torsion in Closed Section Beams, Torsion in Open Section Beams, Multi Cell Sections

Unit 6 Airworthiness and aircraft Structural Repair  [04]
Airworthiness Regulations, Regulatory bodies, Type Certification, General Repair, Airframe Requirements, Landing Requirements, Fatigue and Failsafe Requirements. Types of Structural damage, Nonconformance, Rework, Repair, Allowable Damage Limit, Repairable Damage Limit, Overview of ADL Analysis, Types of Repair, Repair Considerations and best practices

Term Work:

Eight Assignments based on the Syllabus.
Out of eight, two assignments should contain the following:

- Hands-on calculation on Exercises related to Fundamentals of Structural Analysis
- Hands-on Calculation on Exercises involving, plate theory, beam theory and shell theory, Panel buckling, Shear flow Exercises in Aircraft Structures.

Industrial Visits
With an intent to get some exposure on Aerospace and related industries, arrange

- Industry Visits to some of the Industries in Aerospace like HAL (Hindustan Aeronautics Limited), NAL (National Aerospace Limited), ISRO (Indian Space Research Organization)  OR
- Visits to Aerospace Museums  OR
- Building miniature Models of Aircraft /Gliders etc as a Hands on Exercises conducted as competitions
Text Books:


Reference Books:

SHIVAJI UNIVERSITY,KOLHAPUR
B.E. (Mechanical Engineering) Semester VIII
5. INDUSTRIAL AUTOMATION AND ROBOTICS (Elective-IV)

Teaching Scheme:                      Examination Scheme:
Lectures: 3 Hrs/ Week                Theory Paper: 100 Marks
Practical: 2 Hrs/ Week               Term Work: 25 Marks

Course Objectives:
The course aims to:
1. Introduce automation and basic elements of automated systems.
2. Get knowledge of advanced automated and levels of automations.
3. Introduce the industrial robotics and its applications.
4. Knowledge of programming associated with robo-control.

Course Outcomes:
Upon successful completion of this course, the student will be able to
1. Design techniques for the analysis and control of discrete event system
2. Apply knowledge of automation tools and other equipments for manufacturing and assembly components
3. Operate in research and development centre for automation
4. Identify efficiencies and limitation and provide in depth evaluation of robotic system for automated manufacturing applications

Unit 1 Introduction to Automation [06]

Unit 2 Industrial Control and Transfer Line [08]
A. Industrial control systems in process and discrete manufacturing industries, Continuous and discrete control; Computer process control.
B. Fundamentals of transfer lines, Configurations, Transfer mechanisms, Storage buffers, Control, Applications; Analysis of transfer lines with and without storage buffers.

Unit 3 Assembly Automation [06]
Assembly Automation: Types and configurations, Parts delivery at workstations, Various vibratory and non-vibratory devices for feeding and orientation, Product design for automated assembly, Quantitative analysis of assembly system.

Unit 4 Fundamentals of Industrial Robots [06]
of robots—stability, Control resolution, Spatial resolution, Accuracy, Repeatability, Compliance, Work cell control, Interlocks.

**Unit 5 Robotic End Effectors and Sensors**

Transducers and sensors- Sensors in robotics and their classification, Touch (Tactile) sensors, Proximity and range sensors, Force and torque sensing, End Effectors- Types, grippers, Various process tools as end effectors; Robot End effector interface, Active and passive compliance, Gripper selection and design, Transformation, Relative transformation, Direct and inverse kinematics solutions, DH representation and displacement matrices for standard configuration (theoretical treatment).

**Unit 6 Robot Teaching**

Introduction, Various teaching method, Task programming, Survey of Robot level programming languages, A Robot program as a Path in space, Motion interpolation, WAIT, SIGNAL and DELAY commands, Branching, Robot language structure, Various textual robot, Languages such as VAL II, RAIL, AML and their features, Typical programming examples such as palletizing, Loading a machine etc., Application of Robot.

**Term Work:**

1. A Case study on low cost automation
2. Study of part delivery system at work stations in automated assembly.
3. Problems on analysis of transfer line
4. One Programming exercise on lead through programming.
5. Two Programming exercises using various commands of VAL II.
6. Demonstration of various robotic configurations.
7. One Industrial visit for Industrial automation and robotic application

**Text Books:**


**Reference Books:**

Teaching Scheme:
Lectures: 3 hours/Week
Practical: 2 hours/Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 marks

Course Objectives:
The course aims to:

1. Enable the students to analyze and solve cryogenics related problems by applying principles of mathematics, science and engineering.
2. Prepare students to use modern tools, techniques and skills to fulfill industrial needs related to low temperature systems.
3. Effective communication skill to demonstrate cryogenics theories.
4. Develop skills in the analysis of cryogenics systems in research or design.
5. Develop a professional approach to lifelong learning in the cryogenics to include the awareness of social and environment issues associated with engineering practices.

Course Outcomes:
Upon successful completion of this course, the student will be able to

1. Describe: different Cryogenic systems.
2. Understand and interpret the analysis report in the field of Cryogenic.
3. Apply knowledge of mathematics, science, and engineering for the needs in Cryogenic.
4. Design systems as per the desired needs based on economical, social, and environmental issues associated with engineering practices.
5. Communicate required information to develop various ideas related to design/research in different Cryogenic systems.

Unit 1
Introduction: Introduction, Industrial applications, Recent development, Properties of cryogenic Fluids, Applications of cryogenics in different areas such as Space, Medical, Manufacturing processes, Mechanical Design
Behavior of Structural Materials at Cryogenic Temperature: Mechanical properties, Thermal properties, Thermoelectric properties.

Unit 2
Liquefaction of Cryogenic Gases: Ideal cycle, System performance parameters, Joule Thomson effect, Adiabatic expansion, Liquefaction systems; Simple Linde-Hampson system, Precooled Linde-Hampson system, Cascade system, Claude system, Comparison of above systems.
Unit 3

Unit 4

Unit 5
Gas Separation and Purification: Thermodynamic Ideal refrigeration system, Temperature composition diagram, Principles of Gas separation, Principles of Rectifiers column, Separation column design; Plate calculation, Types of rectification columns, Single column and double column air separation systems, Cryogenic air separation plants, Linde single Column separation system, Gas Purification methods

Unit 6
Insulation: Cryogenic fluid storage, Vacuum insulation, Fibrous materials, Solid foams, Gas filled power, Comparison, Critical thickness.
Vacuum Technology: Importance, Pump down time, Flow regimes, Components of vacuum systems, Mechanical Vacuum pumps, and Ion pumps

Term Work:
Any six experiments/ tutorial based on above syllabus

Text Books:
5. “Introduction to Cryogenics” B. S. Gawali, Mahalaxumi Publication.

Reference Books:
SHIVAJI UNIVERSITY, KOLHAPUR
B.E. (Mechanical Engineering) Semester VIII
5. ENTERPRISE RESOURCE PLANNING (ELECTIVE-IV)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:

1. Know the basics, evolution, importance of ERP
2. Correlate ERP and related technology
3. Understand manufacturing perspectives of ERP
4. Know business modules of ERP
5. Understand the key implementation issues and some popular products in ERP
6. Understand implementation of ERP package

Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Understand the structure of an ERP system and know how process chains in materials management, production, controlling and sales are implemented in an ERP system
2. Implementation and customize an ERP system using the appropriate modeling methods, that are Entity Relationship Modeling (ERM) and Event-Driven Process Chains (EPC)
3. Understand the customization of an ERP system and customize essential parts of materials management, production, controlling and sales in SAP ECC
4. Understand software design issues in state-of-the-art business software and realize the importance of project management in an ERP implementation project
5. Understand what to expect, and not to expect, from a consultant implementing an ERP system
6. Understand the importance of IT governance in long-term relationships with a software vendor, such as SAP

Unit 1 Introduction to ERP:
Unit 2  ERP and Related Technologies  [08]
Data warehousing, Data mining, OLAP, Business Process Reengineering (BPR), Management Information System (MIS), Supply Chain Management (SCM), Decision Support System (DSS), Executive Information System (EIS), Customer relationship management (CRM),

Unit 3 ERP – A Manufacturing Perspective  [05]
CAD/CAM, MRP, MRP II, Distribution Requirement Planning (DRP), Product Data Management (PDM).

Unit 4 ERP Modules  [07]
Introduction and study of Business modules like Finance, Mfg. and Production, HR, Plant maintenance, Quality and Material Management, Sales and Distribution.

Unit 5 ERP Implementation Life Cycle  [07]
Introduction, Pre-evaluation Screening, Package evaluation, Project planning, Gap Analysis, Re-engineering, Configuration, Team training, Testing, End user training and Post-implementation phases, Expanding ERP boundaries, Service oriented architecture, Enterprises application integration.

Unit 6 ERP Market and Case Studies  [06]
Brief account of ERP market, various ERP packages like SAPAG, Oracle, PeopleSoft, etc. Indian scenario for ERP implementation, Case studies based on implementation of ERP for various areas in mfg., Marketing and other businesses, E-commerce, cloud based ERP system.

Term Work:
1. Six assignments on each of above units.
2. Detailed study of implementation of ERP and its benefits for any suitable application.

Text Books:

Reference Books
5. MICRO-ELECTRO-MECHANICAL SYSTEMS (MEMS) (Elective IV)

Teaching Scheme:
Lectures: 3 Hrs/ Week
Practical: 2 Hrs/ Week

Examination Scheme:
Theory Paper: 100 Marks
Term Work: 25 Marks

Course Objectives:
The course aims to:
1. Understand the concepts and context of MEMS
2. Understand various MEMS fabrication technologies
3. Understand MEMS-specific design issues, constraints and dynamics and modeling of Microsystems
4. Understand applications of microsensors and microactuators
5. Getting access to fabrication and testing in academia and industry

Course Outcomes:
Upon successful completion of this course, the student will be able to
1. Gain a fundamental understanding of standard microfabrication techniques and the issues surrounding them
2. Know the major classes, components, and applications of MEMS devices/systems and to
3. Demonstrate an understanding of the fundamental principles behind the operation of these devices/systems
4. Understand the unique requirements, environments, and applications of MEMS
5. Apply knowledge of microfabrication techniques and applications to the design
6. Manufacturing of an MEMS device or a microsystem

Unit 1 Introduction [06]
Introduction to Micromachining and MEMS, IC Fabrication, Essential technical background for lithography-based micromachining, Glimpses of Microsystems, Scaling effects, Distributed and lumped modelling approaches used in MEMS analysis and simulations

Unit 2 Microsensors and Microactuators [08]
Microsensors: Chemical sensors, Optical sensors, Pressure sensors, Thermal sensors – Thermopiles, Thermistors, Micromachined thermocouple probes, Thermal flow sensors, MEMS magnetic sensor, Microactuators: Capacitance, Piezomechanics, Piezoactuators as grippers, Microgippers, Micromotors, Microvalves, Micropumps, Microaccelerometers, Shape memory alloy based optical switch, Thermally activated MEMS relay, Microspring thermal actuator, Microsystems: some examples

Unit 3 Microfabrication Processes[06]
Structure of silicon and other materials, Silicon wafer processing, Thin-film deposition, Lithography, Wet etching and Dry etching, Process integration, Bulk micromachining and Surface micromachining, Wafer-bonding, LIGA and other moulding techniques, Soft lithography
and polymer processing, Thick-film processing, Low temperature co-fired ceramic processing.

**Unit 4 Mechanics of Solids**

Stresses and deformation: Bars and beams, Microdevice suspensions: Lumped modelling, Residual stress and stress gradients, Poisson effect, Anticlastic curvature, Examples of micromechanical structures, Thermal loading: Bimorph effect, Dealing with large displacements, In-plane and 3D elasticity equations, Vibrations of bars and beams, Gyroscopic effect, Frequency response, Damping, Quality factor, Basic micro-flows for damping calculation.

**Unit 5 Thermal, Fluid Flow and Electrostatic Applications in MEMS**

Thermal sensors and actuators and their analysis, Microfluidics, Flow through microchannels, Miniature heat exchangers, Electrostatic actuation (parallel plate), Electrostatic actuation (comb drive), Electrostatic sensing, Piezoelectric actuation, Piezoelectric sensing.

**Unit 6 Electronics and Packaging**


**Term Work:**

1. Case study of MEMS Sensors (Pressure sensor/ Accelerometer/ Gyroscope).
3. Case-study of System on chip e.g., Drug delivery system.
4. Visit to Microfabrication facility.
5. Visit to MEMS characterization and testing facility.
7. Introductory modelling of MEMS in multiphysics software e.g. ANSYS COVENTORWARE, INTELLISUITE, etc.

**Reference Books:**

SHIVAJI UNIVERSITY, KOLHAPUR  
B.E. (Mechanical Engineering) Semester VIII  
5. ADVANCED REFRIGERATION (Elective IV)

Teaching Scheme:  
Lectures: 3 hrs/week  
Practical: 2 hrs/week  

Examination Scheme:  
Theory Paper: 100 Marks  
Term Work: 25 Marks

Course Objectives:
Refrigeration and air conditioning subject is compulsory subject covered in final year of engineering graduation in mechanical engineering stream. This subject is designed to introduce theory behind the application in the field of Refrigeration and air conditioning. Refrigeration and air conditioning is fastest expanding field in the mechanical engineering stream with many new applications coming up in the field of ventilation, food processing and special purpose units. Also because of global warming and effects on the environment, conventional technology is also changing rapidly. To address all above problems and to impart latest knowledge to the students, who wish to take up their career in the field of RAC industries this elective subject **Advanced Refrigeration** is introduced. Syllabus is designed in such a way that it includes case studies to impart practical knowledge to the students who has opted for this elective subject. This subject is expected to impart advanced knowledge to the students in the design of various refrigeration systems.

Course Outcomes:
Upon successful completion of this course, the student will be able to

1. Update their knowledge in the subject and will bridge the gap between academics and industry
2. Aware about market trends in the field of RAC and availability of various components in the market
3. Impart knowledge of RAC system design for various applications.
4. Improve utility of the students to RAC industry and will improve employment opportunity for the students.

Unit 1  
**Multistage Systems:**  
[06]  
Multi-evaporator system; Multi expansion system; Cascade systems; Study of P-h; T-s; h-s and T- h charts for various refrigeration cycles, Heat Pump (Analytical Treatment)

Unit 2  
**Vapour Absorption Refrigeration:**  
[06]  
Standard cycle and actual cycle, Thermodynamic analysis, Li-Br-water, NH3-water systems, Three fluid absorption systems, Half effect, Single effect, Single-double effect, Double effect, and triple effect system

Unit 3  
[08]
**Refrigerants:** Refrigerant recycling, Reclaim and charging, Alternative refrigerants, Refrigerant-lubricant mixture behavior, Synthetic Lubricants, Blending of refrigerants, Secondary refrigerants.

**Non-Conventional Refrigeration System (Principle and Thermodynamic Analysis Only):** Thermoelectric refrigeration, Thermo-acoustic refrigeration, Adsorption refrigeration, Steam jet refrigeration, Vortex tube refrigeration, and Magnetic refrigeration.

**Unit 4**

**Refrigeration Equipments:** Study and Selection of Reciprocating, Screw, Scroll and Centrifugal Compressor based on applications.

**Motor Selection:** Selection of Single phase, Three phase, Starters, Constant speed and Variable speed Drive.

**Unit 5**

**Evaporators:** Design and Selection, Types, Thermal design, Effect of lubricants accumulation, Draining of lubricants, Selection and capacity control

**Condenser:** Design and selection, Types, Thermal design, Purging, Selection and capacity Control, Selection of expansion devices, Design of refrigerant piping, Refrigeration system controls and safety devices, Solenoid valves, Suction and evaporator pressure regulators

**Control and Instrumentation:** Refrigeration system controller, High pressure receiver, Thermal design of low pressure receiver, Accumulator, Filters, Driers, Oil separators, Relief valves, Safety valves, High and low pressure cut out, Thermostats, Water regulators, System controller.

**Cooling Load Estimation Equipment Selection and Design:** Component Balancing, Analysis of designed equipment (Thermodynamic), Cost and feasibility analysis for designed equipments, Tools and equipments used in refrigeration.

**Unit 6**

Selection and design of various components for various Industrial refrigeration applications: Cold storage, Process applications - Textile, Pharmaceuticals, Chemical, Transport, Food preservation, Dairy etc. Application and selection softwares of refrigeration system.

**Term Work:**
Eight Assignments/Practical’s / Tutorials based on above syllabus
1. Study and trial on cascade refrigeration system.
2. Study and trial on multi evaporator system.
3. Study and Trial on multi compressor system.
4. Study and trial on nonconventional refrigeration system.
5. Component selection case study.
6. Industrial visit and report.
7. Case study on design of commercial refrigeration system.
8. Case study of cold room.
Text Books:

Reference Books:
8. “ISHRAE Handbooks”
9. “ARI Standards”,
SHIVAJI UNIVERSITY, KOLHAPUR
B.E. (Mechanical Engineering) Semester VIII
5. TRIBOLOGY (Elective IV)

Teaching Scheme:                Examination Scheme:
Lectures: 03 Hrs/Week           Theory Paper: 100 Marks
Practical: 02 Hrs/Week           Term Work: 25 Marks

Course Objectives:
The Course aims to:
   1. Make student aware about Importance, scope and application of this subject
   2. Introduce the concepts of wear friction and lubrication and its application in design of tribological systems.

Course Outcomes:
Upon successful completion of this course, the student will be able to

   1. Awareness about the field of Tribology
   2. Understand basis of friction, wear processes and lubrication
   3. Aware about tribological issues in the design of machine components such as journal bearing, thrust bearing, and roller element bearing
   4. Familiarize with antifriction and anti wear components of the material and the lubricants used therein
   5. Design the tribological system from strength point of view

Unit 1 [06]
Introduction to Tribology
IntroductionDefinition of tribology, Friction, wear and lubrication, Importance of the tribological studies. Properties of oils and equation of flow: Viscosity, Newton’s Law of Viscosity, Hagen-Poiseuille Law, Flow between parallel stationary planes, viscosity measuring apparatus. Lubrication principles, Classification properties and applications of lubricants. Regimes of lubrication,

Unit 2 [05]
Friction and Wear
Wear: Types of wear, Various factors affecting wear, Measurement of wear, Wear between solids and liquids, Theories of wear.

Unit 3 [09]
Hydrodynamic Lubrication
Friction forces and power loss in lightly loaded bearing, Petroff’s law, Tower’s experiments, mechanism of pressure development in an oil film, Reynold’s investigation and Reynold’s equation in 2D. Numerical problems.
Idealized Journal Bearing
Introduction to idealized journal bearing, Load carrying capacity, Condition for equilibrium, Sommerfeld’s numbers and significance of it; Partial bearings, End leakages in journal bearing, Numerical problems

Unit 4
Slider / Pad Bearing With a Fixed and Pivoted Shoe
Pressure distribution, Load carrying capacity, Coefficient of friction, Frictional resistance and loss of Power in a pivoted shoe bearing, Numerical examples.

Unit 5
Hydrostatic Lubrication:
Introduction to hydrostatic lubrication, Hydrostatic step bearings, Load carrying capacity and oil flow through the Hydrostatic step bearing. Numerical Examples

Unit 6
Bearing Materials:
Commonly used bearings materials, Properties of typical bearing materials. Advantages and disadvantages of bearing materials. Tribological considerations in the design of gears, cams, reciprocating components, etc. Engine Tribology basics Tribology aspects of engine components such as bearings, piston assembly, valve train and drive train components etc.

Termwork:
Practicals and assignments/Seminars based on following: (Any 5 out of 1 to 7)

1. Journal Bearing Apparatus
2. Tilting pad and thrust Bearing Apparatus
3. Study of lubrication systems.
5. Four Ball Tester
6. Coefficient of friction using pin on disc type friction monitor
7. Industrial visit to study techniques of coating – case study.
8. Assignments based on topics in the syllabus. (Minimum 5)

Text Books:
Reference Books:

7. “Lubrication”, Fuller D.D.

Web Resources:

1. NPTEL Lectures series on Tribology by Dr.Harish Hirani, IIT, New Delhi
Course objectives:
The course aims to:

1. Study the basics of precision engineering and different manufacturing technique in precision engineering
2. Get acquainted with various techniques of precision engineering like nano technology etc.
3. Understand importance of accuracy, influence of static stiffness, vibration accuracy etc.

Course Outcomes:
Upon successful completion of this course, the student will be able to

1. Specify what is meant by a precision engineering and list the basic components of an precision engineering
2. Explain how precision engineering can be specified.
3. Outline the Major issues of planning for the creation of precision engineering.
4. State points that arise from precision engineering quantitative analysis.

Unit 1  Accuracy and Alignment Tests  [08]
General concept of accuracy – Spindle rotation accuracy – Test methods- Displacement accuracy – Clamping errors - Setting errors -Location of rectangular prism, Cylinder-Basic type of tests – Measuring instruments used for testing machine tools - Alignment tests-Straightness, Flatness, Parallelism, Squareness, Circularity, Cylindricity.

Geometric Dimensioning and Tolerancing
Tolerance Zone Conversion-Surfaces, Features, Features of Size, Datum Features- Datum Oddly Configured and Curved Surfaces as Datum Features, Equalizing Datums - Datum Feature of Representation Form Controls, Orientation Controls-Logical Approach to Tolerancing.

Unit 2  Precision Machining  [06]
Introduction - Top down and bottom up approach - Development of Nanotechnology - Precision and micromachining -Diamond turning of parts to nanometer accuracy- Stereo microlithography- Machining of micro-sized components-Mirror grinding of ceramics-Ultra precision block gauges.

Unit 3  Nano Measuring Systems  [06]
In- process measurement of position of processing point - Post process and online measurement of dimensional features - Mechanical measuring systems - Optical measuring systems - Electron beam measuring systems – Pattern recognition and inspection systems.
**Unit 4  Lithography**

**Unit 5  Reliability Engineering**
Introduction to reliability, System reliability, Quantification of reliability: MTBF, MTTF, Analytical treatment based on series, Parallel and combination systems, Failure modes, FMECA, calculation of Risk Priority Number (RPN).

**Unit 6  Tolerance Analysis**

**Term Work:**
1. Various alignment test for sample component to check parallelism, circularity, straightness, flatness, surface finish and tolerance.
2. Understanding of fits with some practical hand on based on sample components and brief write up based on above.
3. Visit to suitable set up/industry/Research and Development Laboratory where nanotechnology is used.
4. Numericals based on system reliability for series, parallel and combination (Min. Two problems on each type).
5. Numericals on tolerance analysis for any sample component.
6. Assignment on tolerance stacking.

**Text Books:**

**Reference Books:**
SHIVAJI UNIVERSITY, KOLHAPUR  
B.E. (Mechanical Engineering) Semester VIII  
6. PROJECT PHASE– II

Teaching Scheme:  
Practical: 4 Hrs/Week/Batch

Examination Scheme:  
Term Work: 50 Marks  
Oral Exam: 75 Marks

Course Objectives:  
The course aims to:

1. Embed the skill in group of students to work independently on a topic/ problem/ experimentation selected by them and encourage them to think independently on their own to bring out the conclusion under the given circumstances of the curriculum period in the budget provided with the guidance of the faculty.

2. Encourage creative thinking process to help them to get confidence by planning and carrying out the work plan of the project and to successfully complete the same, through observations, discussions and decision making process.

Course Outcome:  
Upon successful completion of this course, the student will be able to

1. Improve the professional competency and research aptitude in relevant area.
2. Develop the work practice in students to apply theoretical and practical tools/techniques to solve real life problems related to industry and current research.

Project Phase II Load:  
A batch of maximum three groups of four to five students per group, shall work under one Faculty member of department. The group of one student is strictly not allowed. Same groups of Seventh Semester shall work under same faculty member of department.

Project Phase II Definition:  
Project phase-II is a continuation of project phase-I started in the seventh semester. Before the end of the eighth semester, there will be two reviews, one at start of the eighth semester and other towards the end. In the first review, progress of the project work done is to be assessed. In the second review, the complete assessment (quality, quantum and authenticity) of the thesis is to be evaluated. Both the reviews should be conducted by guide and Evaluation committee. This would be a pre qualifying exercise for the students for getting approval for the submission of the thesis. The final evaluation of the project will be external evaluation.

Project Phase II Term Work:  
The term work under project submitted by students shall include
1. Work Diary: Work Diary maintained by group and countersigned by the guide weekly. The contents of work diary shall reflect the efforts taken by project group for  
a. Brief report preferably on journals/ research or conference papers/ books or literature surveyed to select and bring up the project.
   c. Brief report of feasibility studies carried to implement the conclusion.
   d. Rough Sketches/ Design Calculations/ Testing reports/ Experimentation results.
Project Report:
Project report should be of 50 to 60 pages (typed on A4 size sheets). For standardization of the project reports the following format should be strictly followed.

1. Page Size: Trimmed A4
2. Top Margin: 1.00 Inch
3. Bottom Margin: 1.32 Inches
4. Left Margin: 1.5 Inches
5. Right Margin: 1.0 Inch
6. Para Text: Times New Roman 12 Point Font
7. Line Spacing: 1.5 Lines
9. Headings: Times New Roman, 14 Point Bold face
10. Certificate: All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal/Director

11. Index of Report:
   i) Title Sheet
   ii) Certificate
   iii) Acknowledgement
   iv) Table of Contents.
    v) List of Figures
    vi) List of Tables

    1. Introduction
    2. Literature Survey/Theory
    3. Design/ Fabrication/ Production/ Actual work carried out for the same and Experimentation.
    4. Observation Results
    5. Discussion on Result and Conclusion

12. References: References should have the following format
   For Books: “Title of Book”, Authors, Publisher, Edition
   For Papers: “Title of Paper, Authors, Journal/Conference Details, Year

13. The Project report shall be signed by the each student in the group, approved by the guide and endorsed by the Head of the Department
14. Presentation: The group has to make a presentation in front of the faculty of department at the end of semester.

Important Notes:
- Project group should continue maintaining a diary for project and should write (a) Books referred (b) Company visited (c) Person contacted (d) Computer work done (e) Paper referred (f) Creative thinking.
- The Diary along with Project Report shall be assessed at the time of oral examination
- One copy of the report should be submitted to Institute/Department, One copy to Guide and one copy should remain with each student of the project group.
# B.E. Mechanical Semester VII

## EQUIVALANCE

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### Shivaji University, Kolhaour
Faculty of Engineering and Technology
Electrical Engineering
Structure for BE Electrical

#### Semester VII

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**Elective I**

1. FACTS
3. Industrial Automation and SCADA
4. Restructured Power Systems
## Semester VIII

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**Elective II**
1. Embedded Systems
2. High Voltage Engineering
3. Advanced Relaying
4. Electrical maintenance and electrical energy audit.
SEMESTER I

1. INDUSTRIAL TRAINING

Assessment of Industrial training report will be done by the faculty incharge by conducting presentations of the students and report and presentation should consists of 1. Brief overview of the industry, 2. Product Details, 3. Production Practices, 4. Type of electric supply and its utilization, 5. Details of Electric tariff, 6. Practices used for electric safety and maintenance, 6. Energy auditing
2. ECONOMICS FOR ENGINEERS

Teaching Scheme: Lectures:2 Hours /week
Examination Scheme: Paper: 50 Marks

Objectives:

The objective of this course is to familiarize the prospective engineers with elementary principles of economics. It also deals with acquainting the students with standard concepts and tools that they are likely to find useful in their profession when employed in the firm/industry/corporation in public or private sector. It also seeks to create and awareness about the status of the current economic parameters /indicators/ policy debates. All of this is a part of the quest to help the students imbibe soft skills that will enhance their employability.


(12 Lectures)


(11 Lectures)


(11 Lectures)


(11 Lectures)

Text/Reference Books:
3. ADVANCED SWITCHGEAR AND PROTECTION

Teaching Scheme:  
Lectures: 4 Hours/week  
Practical: 2 Hours/week

Examination Scheme:  
Paper: 100 Marks  
T.W.: 25 Marks  
POE: 50 Marks

1. Circuit Breakers:  
a) Voltage-current characteristics of arc, Principles of DC and AC arc interruption, high resistance and current zero interruption, arc voltage, Transient Restriking Voltage (TRV), Recovery voltage, RRRV, current chopping, resistance switching, capacitive current interruption. (6Hrs)  
b) Classification of circuit breakers, brief study of construction and working of bulk oil and minimum oil CB, Air break and Air Blast CB, SF6 and Vacuum CB, HVDC breakers, ratings of CB and testing of CB (6Hrs)  
c) Fuse: Rewirable and HRSC fuse, fuse characteristics, application and selection of fuse. (6Hrs)

2. Relays:  
Selectivity, sensitivity, reliability and speed of operation of a relay, CT burden calculation, attracted armature, balanced beam, moving coil relays, theory and construction of induction disc and induction cup relays, numerical relays, microprocessor based relaying. (6Hrs)

3. Over current Protection:  
Plug setting, time setting, radial feeder and ring mains protection, earth fault and phase fault, Directional relay, and microprocessor based o/c relay. (4Hrs)

4. Differential Relays:  
circulating current and opposed voltage principles, percentage differential relay, line protection, carrier aided protection scheme. (4Hrs)

5. Transformer protection:  
Problems associated with percentage differential protection, harmonic restraint and harmonic blocking schemes, restricted earth fault protection, Buchholz relay for incipient faults. (4Hrs)

6. Generator protection:  
stator earth fault, phase fault, stator current unbalance (NPS) protection, Rotor overheating, earth fault protection, excitation failure and protection against motoring, generator-transformer unit protection. (4Hrs)  
Distance protection: Impedance, reactance and admittance characteristics, relay settings for 3-zone protection, out of step blocking scheme, blinder relay, numerical relays for transmission line protection, microprocessor based impedance, reactance and mho relays. (4Hrs)  
Over voltage Protection: Causes of over voltages, surge arrestors and absorbers, metal oxide (ZnO) arrestors, insulation co-ordination in a power system. (4Hrs)
List of Experiments:

1) Drawing sheet showing construction of MOCB, ABCB, SF6 CB and Vacuum CB.
2) Drawing sheet for Generator and transformer protection schemes.
3) Study of construction and working of induction disc type relays.
4) Plotting of I α t characteristics of an IDMT over current or E/F relay.
5) Experimental study of working of electromechanical overvoltage relay.
6) Experimental study of working of a Directional over current relay.
7) Experimental realization of microprocessor based over current relay.
8) Experimental realization of microprocessor based over-voltage/Under Voltage relay.
9) Experimental realization of microprocessor based impedance relay.
10) Experimental realization of microprocessor based Directional over current relay.

Textbooks and References:

1) Power System Protection and Switchgear: B.Ram and B.N. Vishwakarma
4) Digital Protection: L.P.Singh
5) Switchgear and Protection: M.V. Deshpande
4. POWER QUALITY AND HARMONICS

Lecture: 3 period/week
TUT: 1 period/week

Unit I 08 hours
Introduction to Power Quality: Desired feature of Electrical Power Supply, Power Quality related issues in distribution systems, loads and theirs characteristics, electromagnetic phenomena, voltage sags/swells, waveform distortions, unbalance, flicker, notches, unbalance and load balancing.

Unit II 08 hours
Fundamental of Harmonics: causes for generation of harmonics, effect of harmonic on systems, types and characterization of Harmonics, THDs, influence on power factor, interference with communication network and harmonic indices.

Unit III 09 hours
Harmonics Suppression Filters: Shunt Passive Filters, Design Considerations and case studies, Voltage / Current Source active filters, types: shunt, series and Hybrid Filter, their characteristics and comparison.

UNIT IV 08 hours
Mitigation of Voltage Sag and interruptions: End user issues, UPS systems, Ferro resonant Transformers, Super Conducting Storage Devices, Dynamic Voltage Restorer and Application of DSTATCOM.

UNIT V 07 hours

UNIT VI 08 hours

Textbook
2. Dr. Mahesh Kumar, IIT Chennai, Power Quality in Distribution Systems.

References:
5. COMPUTER METHODS IN POWER SYSTEMS.

Teaching Scheme

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Unit 1:- Network Topology 8 Hrs
Introduction, Basic Principles in Power System Analysis, Elementary Graph Theory, Incidence Matrices, Connectivity, Primitive Network, Singular Transformation, Non-singular Transformation, Numerical Treatment Expected

Unit 2:- Computer Solution Methods Using the Admittance Matrix 6 Hrs
Introduction, Formation of $Y_{BUS}$ by inspection- Modeling of transmission lines, Modeling of transformer, Modeling of shunt elements, Modeling of loads, Modeling of generator internal impedance, Step by Step Algorithm for Formation of $Y_{BUS}$, Numerical treatment expected

Unit 3:- Computer Solution Methods Using the Impedance Matrix 8 Hrs
Impedance matrix in shunt fault computations, impedance matrix algorithm, adding a radial impedance to the reference node, adding a radial branch to a new node, closing a loop to the reference, closing a loop not involving the reference, adding a mutually coupled radial element, adding a group of mutually coupled lines, comparison of admittance and impedance matrix techniques, Numerical treatment expected

Unit 4:- Computer techniques for Power flow analysis 8 Hrs
Introduction, Impact of computers, orientation of engineering problems to computers, Power Flow equation, Classification of buses, Operating constraints, Data for load flow, Formulation of load flow problem, solution technique using bus admittance matrix in the bus frame of reference, solution technique using bus impedance matrix in the bus frame of reference, Numericals expected to be solved up to first iteration.

Unit 5:- Simultaneous Faults 10 Hrs
Simultaneous Faults by Two-Port Network Theory- Two port networks, interconnection of two port networks, simultaneous fault connection of sequence networks, series-series connection (Z-type faults), Parallel -parallel connection (Y-type faults), series-parallel connection (H-type faults), Simultaneous faults by matrix transformations- constraint matrix for Z-type faults, constraint matrix for Y-type and H-type faults, Numerical treatment expected
Unit 6: Analytical Simplifications

Two Component Method
Shunt Faults - SLG Fault, LL Fault, DLG Fault, Three phase fault, Shunt Faults - 2LO Fault, 1LO Fault, Change in symmetry with two component calculations - phase shifting transformer relations, SLG faults with arbitrary symmetry, DLG faults with arbitrary symmetry, series faults with arbitrary symmetry.

Term-work:
Minimum 8 experiments based on analysis using Computer Software such as MATLAB/ Simulink, ETAP etc.

Reference Book
2. Circuits Analysis of A.C. power system VOL-II by Edith Clarke
3. Introduction to Matrices & Power System by R.Bruce Shipley
6. ELECTIVES I

FACTS

Teaching scheme:

Lectures: 4 hrs / week                                           Theory: 100 Marks

UNIT I 07 Hours

1. *Introduction to FACTS*: Need of transmission interconnection, power flow in ac system, loading limit, importance of FACTS, transmission network, introduction to basic types of FACTS controller, comparison of HVDC and FACTS.

UNIT II 08 Hours

2. *Statics shunt compensators, SVC*: Objectives of the shunt Compensation, Static VAR compensators (TSC, TCR, FC-TCR, TSC, TCR), switching transient in TSC, functional control Scheme for FC-TCR and TSC-TCR.

UNIT III 10 Hours

3. *Static Synchronous compensator STATCOM*: basic principal and control scheme for STATCOM, hybrid var generation, comparison between STATCOM and SVC.

UNIT IV 08 Hours

4. *Static Series compensators*: objectives of the Series compensation, variable impedance type series compensator GCSC
and TSSC, operating control schemes for GCSC and TSSC, SSR (sub synchronous resonance), switching converter type series compensators SSSC, internal schemes for SSSC, external control schemes for series reactive compensators, characteristics of series compensator.

UNIT V 08 Hours

5. **Static voltage and phase angle regulation TCVR and TCPAR:** Objective of voltage and phase angle regulators, thyristor controlled voltage and phase angle Regulator, switching converter based voltage and phase angle regulators.

UNIT VI 07 Hours

6. **Combined compensator: UPFC and IPFC.** UPFC - basic principle and reactive Power control scheme for UPFC, comparison of UPFC to Series compensator and phase angle regulations. IPFC-basic operating principle, control structure and its applications.

**TEXTS AND REFERENCES:**

- Understanding FACTS - Concept and Technology of flexible AC Transmission systems. N.G. Hingorani & L. Gywgyi IEE Press.
- Static Reactive power compensation : T.J.E. Miller, John Wiley and sons New
- FACTS : Yong Hua soug, Allan Johns
- Facts Controller In Power Transmission And Distribution by K.R.Padiyar Edited by New Age International Publishers
- Flexible AC Transmission System By Sushmita Panda
6. ELECTIVE-I

SIGNAL PROCESSING FOR ELECTRICAL ENGINEERING

Teaching Scheme: Lectures: 4 hrs / week

Examination Scheme: Theory: 100 Marks

UNIT-1 Digital Signals and Systems (08 Hrs)
DSP system concept, properties of DSP system, types of systems, Interconnection of DSP systems, Recursive and Non recursive system, Some elementary signals and their responses.

UNIT-2 The Discrete Fourier Transform and Fast Fourier Transform (08 Hrs)
DFT, Relation between DFT and Z-transform, Properties of DFT, Linear Convolution Circular Convolution-DFT, FFT Algorithms, Use of DFT as Linear Filtering, DIT (Decimation in time), DIF (Decimation in frequency), Implementation aspects, Fast convolution signal segmentation (overlap save algorithm overlap-add algorithm), Correlation-Circular correlation, DFT property of circular correlation.

UNIT-3 Realization and Application of Digital Linear System (06 Hrs)
Filter categories, IIR direct form structures, cascade, parallel realization, FIR filter realization, Different Forms of Realization (Direct and its Transposed, Series, Parallel, lattice). Application of DSP: measurement, Radar system, image processing..

UNIT-4 FIR Filter Design (08 Hrs)

UNIT-5 IIR Filter Design (08 Hrs)
Impulse Invariant Technique, Bilinear transformation, Frequency band transformation, Analog filter approximation, (Butterworth, Chebyshev, Elliptic), (sin x)/x Digital Correction, Filter. Quantization and Rounding Problems, effects of Finite Word length on stability and frequency response.

UNIT-6 Multirate DSP System & TMS 320 DSP Controller: (06 Hrs)
Concept of Sampling Theorem (Nyquist Criterion), Requirement of changing sampling rate, Various methods of sampling rate conversion (Decimation, Interpolation), Benefits of up sampling and down sampling, Introduction, architecture and applications of TMS 320 DSP Controller.

Reference Books:

6. ELECTIVE-I

INDUSTRIAL AUTOMATION AND SCADA

Teaching Scheme:    Examination Scheme:
Lectures: 04 hrs/week    Theory: 100 marks

**Unit 1: Introduction to Automation**

**Unit 2: Sensors and Transducers**
Sensor and Transducer, Performance terminologies, Static and dynamic characteristics, Basic Relay operation: NO & NC, Selection of sensors, Displacement, position and proximity sensors, Velocity and motion sensors, Force sensor, field pressure sensor, Liquid flow sensors, Liquid level sensors, Temperature sensors, Lightsensors. (12 Hr)

**Unit 3: Programmable Logic Controllers**
Programmable logic controller, Various brands of PLC, Basic PLC structure, Types of PLC, Inputs and Outputs, Remote I/O, Sourcing and Sinking, Ladder Programming, Verification of Logic functions, Latching and internal relays, Timers, Counters, Comparators, Jump and call, Subroutine, Examples of Ladder programs with Industrial applications. (10 Hr)

**Unit 4: Introduction to SCADA systems**
Evolution of SCADA system, SCADA definition, System architecture of SCADA, Overview of SCADA System Security Issues, SCADA and IT Convergence, Conventional IT Security and Relevant SCADA Issues, Desirable properties of SCADA system, Interfacing of SCADA with PLC and External hardware. (06 Hr)

**Unit 5: SCADA systems in industries**

**Unit 6: Power system planning and automation**
Introduction, Factors affecting system planning, Present planning techniques in power system, Planning models, Future trends in power system planning, systems approach, Substation and distribution system automation. (08 Hr)

**Text books:**

**Reference books:**
6. ELECTIVE – I

RESTRUCTURED POWER SYSTEMS

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<th>Teaching Scheme</th>
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<td>Theory: 100</td>
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<td>Tutorial: --</td>
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<td>Practical: --</td>
<td>POE: --</td>
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<tr>
<td>Total: 4 Hr/Week</td>
<td>Total: 100</td>
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SECTION I

Unit 1 (10 hrs)
Overview of Restructured Power System

Unit 2 (10 hrs)
Economic Considerations in Restructured Power System
Introduction, Consumer and Supplier behavior, Demand elasticity, Supply elasticity, Short-run and Long-run costs, various costs of production. Electricity pricing: Electricity pricing in Generation, Transmission and Distribution, Introduction to Marginal cost, opportunity Costs, Dynamic pricing mechanism (ABT), Price elasticity of demand, Tariff setting principles, Distribution tariff for H. T. and L. T. consumers

Unit 3 (6 hrs)
Global Models of Restructured Power System
Market Evolution and Deregulation in UK, USA, South America, Nordic pool, China, PJM ISO, and New York Market.

SECTION II

Unit 4 (8 hrs)
Indian Power Market Evolution
Electricity Act 2003 and various national policies and guidelines, Ministry of Power, Role of CEA, CERC, state ERC, Load Dispatch Centers etc., Implications of ABT tariff on Indian power sector, Introduction to Indian Power Exchange

Unit 5 (8 hrs)
Transmission Pricing and Congestion Management
Transmission price components, various transmission pricing mechanisms, Tracing of power, Network usage and Loss Allocation. Introduction to Congestion in Transmission network, methods of Congestion Management

Unit 6 (6 hrs)
OASIS
Introduction of OASIS, Structure of OASIS, Pooling of information, Transfer capability on OASIS and various concepts like ATC, TTC, TRM, and CBM
Text Books
1. Mohammad Shahidehpour, Muwaffaq Alomoush, "Restructured electrical power systems: operation, trading and volatility", Marcel Dekker.
2. “Know Your Power”, A citizens Primer on the Electricity Sector, PRAYAS Energy Group, Pune

Reference Book
5. Loi Lei Lai, “Power System Restructuring and Deregulation” John Wiley and Sons

6. Seminar
The topic of the seminar shall be selected by reviewing minimum 5 references from reputed journals. The seminar should be presented along with bound report before end of semester. The faculty incharge should see that the topics for seminar shall cover recent advancement in electrical engineering and its applications.
The seminar should be delivered for minimum of 20 minutes followed by question and answer session.
It is mandatory for all students to attend the seminar.

7. PROJECT I
The project work should be based on hardware assembly. In first phase, the batch of maximum 5 students should finalize the theme of the project in consultation with guide. The circuit should be finalized and the results of simulation shall be presented in the report of project phase I.
SEMESTER II

LAW FOR ENGINEERS

Teaching Scheme: 2 Hours /week
Examination Scheme: Paper: 50 Marks

The objective of the course is to familiarize students (Prospective engineers) with elementary knowledge of laws that would be of utility in their profession. The syllabus covers Constitution of India and new areas of law like IPR, ADR, Human Rights, Right to Information, Corporate law,

Module 1: Constitutional Law and Law of Contract covering the Preamble; Fundamental Rights, Judicial Structure, Types of Petition, Structure of Legislation

General Principles of Contract under Indian Contract Act, 1872 covering General principles of contract – Sec. 1 to 75 of Indian Contract Act and including Government as contracting party, Kinds of government contracts and dispute settlement, Standard form contracts; nature, advantages, unilateral character, principles of protection against possibility of exploitation, judicial approach to such contracts, exemption clauses, clash between two standard form contracts;

(6 Lectures)


(5 Lectures)

Module 3: Law relating to Intellectual property covering Introduction – meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Other new forms such as plant varieties and geographical indications; International instruments on IP – Berne convention, Rome convention, TRIPS, Paris convention and international organizations relating IPRs, WIPO, WTO etc; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright – literary, dramatics and musical works, sound records and cinematographic films, computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet – Remedies and procedures in India; Law relating to Trademarks under Trademark Act, 1999 including Rationale of protection of trademarks as Commercial aspect and Consumer rights, Trademarks, registration, procedures, Distinction between trademark and property mark, Doctrine of deceptive similarity, Passing off an infringement and remedies; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of
obtaining patent – application, examination, opposition and sealing of patents, Patent cooperation
treaty and grounds for opposition, Rights and obligations of patentee, Duration of patents – law
and policy considerations, Infringement and related remedies; (8 Lectures)

Module 4: Right to Information Act, 2005 covering, Evolution and concept; Practice and
procedures; Official Secret Act, 1923; Indian Evidence Act, 1872; Information Technology –
legislation and procedures, Cyber crimes – issues and investigations; (3 Lectures)

Module 5: Labour Laws, covering Industrial Disputes Act, 1947; Collective bargaining;
Industrial Employment (Standing Orders) Act, 1946; Workmen’s Compensation Act, 1923;
(3 Lectures)

Module 6: Corporate Law, covering Meaning of corporation; Law relating to companies, public
and private (Companies Act, 1956) general provisions; Law and multinational companies –
International norms for control, FEMA 1999, collaboration agreements for technology transfer;
Corporate liability, civil and criminal; (4 Lectures)

Text/Reference Books:
1. B. K. Goel, Business Law for Managers Biztantra, Indian Test edition
8. Bare text (2005), Right to Information Act
10. K.M. Desai (1946), The Industrial Employment (Standing Orders) Act
2. H.V.D.C. SYSTEMS [New 2016]

Teaching Scheme:  
Lectures: 4 Hours /week  
Practical: 2 Hours/week  

Examination Scheme:  
Paper: 100 Marks  
POE- 50 MARKS  


2. Grid Control and Characteristics: Grid control of thyristor, valve-Analysis with grid control with no overlap, overlap less than 60 degrees and overlap greater than 60 degrees. Basic means of control, Power reversal, manual control and its limitations-constant current versus constant voltage Control, desired features of control, actual control characteristics-constant minimum ignition angle, current and extinction angle controls –power control and current limits. Voltage Dependant Current Limiter (VDCOL), Comparison of Converters - CSC & VSC systems  

3. Protection: Disoperation of converters-short circuit on a rectifier – commutation failure, causes and remedies – Protection of HVDC system, d.c. rectors, damper circuits, Over current protection and over-voltage protection, clearing fault and reenergizing the line.  

4. Harmonics and Filters: Characteristic and uncharacteristic harmonics-causes, consequences and suppression-Troubles caused by harmonics, Harmonic filters- Types, Location, series or shunt, sharpness of tuning, Quality Factor Q for L, C & RLC filter.  


TERM WORK:
Minimum 8 experiments to be performed based on simulation:

A] MATLAB/SIMULINK/PSCAD/EMBTC or PSPICE may be used for simulation.

1. Study state & transient performance of 12 pulse HVDC transmission system.
2. Study & Simulation of Thyristor Based HVDC Model.
3. Simulation to study Vd-Id characteristics with constant minimum ignition angle control for controlled rectifier.
4. Study Simulation model of HVDC system (with bridge Rectifier and SPWM Inverter).
5. Simulation to Study Vd-Id characteristics with constant extinction angle control of inverter.
6. Simulation to study three phase SPWM Inverter.
7. Study of effect of angle of advance and extinction angle on reactive power on the converter and inverter side.
8. Simulation to Study of harmonics generated on converter and inverter side due to angle of advance and extinction.
9. Simulation to study effect of Tuned Filters on the converter harmonics.
10. Simulation to study Low AC Voltage Detection & Voltage Dependant Current Order Limiter (VDCOL)
11. Simulation to Study working of Commutation Failure Prevention Control (CFPREV)
12. Simulation to study AC line to ground fault on inverter Side
13. Study and simulation of 6 pulse HVDC system & observe Vd-Id characteristics.
14. Simulation to study on three phase controlled rectifier & observe Vd-Id characteristics
15. Harmonic analysis on sinusoidal waveform and working of sinusoidal PWM inverter.
16. Simulation to study 12 pulse converter with 2 six pulse converter & observe Vd-Id characteristics
17. Study & Simulation of VSC based HVDC transmission link & observe Vd-Id characteristics
18. Study & Simulation of Simulation of single phase SPWM Inverter & observe Vd-Id characteristics

B] Compulsory One field visit to HVDC Station.

Text Books:

1. Edward Wilson Kimbark “Direct Current Transmission” Wiley publication Inter science
2. K R Padiyar “HVDC power transmission systems” second edition, New Age International (p)Ltd

Reference Books:

1. S. Rao“ EHVAC and HVDC Transmission Engineering and Practice” –Khanna publication,
1990
2. J. Arrillaga “HVDC Transmission” – Wiley publication Inter science
5. J. Arrillaga, Y. H. Liu, N. R. Watson, ”Flexible Power Transmission: The HVDC Options” Wiley publication Inter science
2. EHVAC

Teaching Scheme:                                                                 Examination Scheme:
Lectures: 4 hrs / week                                                           Theory: 100 Marks

UNIT-1 Introduction to EHVAC & Calculation of line and ground parameters (10 Hrs)
Engineering aspect and growth of EHVAC Transmission line trends and preliminaries, power
transferability, transient stability, transient stability limit, and surge impedance loading.
Resistance power loss, temperature rise properties of bundled conductors, Inductance and
Capacitance, calculation of sequence inductions and capacitance line parameters for modes of
propagations, resistance and inductance of the ground return.

UNIT-2 Voltage gradients of conductor (8 Hrs)
Charge potential relations for multi-conductor lines, surface voltage gradients on the conductor
line, surface voltage gradients on conductors, distribution of voltage gradients on sub conductors
of bundle. I*R and corona loss corona loss formula charge voltage diagram with corona,
attenuation of traveling waves due to corona loss Audible noise, corona pulses, Their generation
and properties, limit for radio interface fields.

UNIT-3 Theory of the Traveling waves and standing (6 Hrs)
The waves at the power frequency, differential equations and solutions for general case,
standing waves and natural frequencies open ended line double exponential response, response to
sinusoidal Excitation, line energization with trapped charge voltage, Reflection and refraction of
traveling waves.

UNIT-4 Lighting and lighting protection & Insulation Co-ordinations (10 Hrs)
Lighting strokes to lines, their mechanism, General principal of the lighting protections
problems, low footing resistance, lighting arrestor and protection characteristics different
arrestors and their characteristics. Insulation level, Voltage withstands levels of protected
equipments and insulation condition based on the lighting.

UNIT-5 Over voltage in EHV system covered by switching operation (8 Hrs)
Over voltage in EHV system covered by switching operations over –voltage their types, recovery
voltage and circuits breaks, Ferro resonance over voltage and calculations of switching surges
single phase equivalents.

UNIT-6 Power frequency voltage control and over voltages (6 Hrs)
Generalized constants, charging current, power circle diagram, and its use, Voltage control shunt
and series components, Sub synchronous resonance in series capacitor compensated lines and
static reactive compensating systems.

Texts and references:
1. Rakosh Das Begamudre ,“Extra high voltage AC transmission engineering”, New Age
   Publication
2. EHV –AC and HVDC Transmission Engineering &Practice : S.V. Rao
3. EHV -AC and HVDC transmission system engineering analysis and design: John Wiley
   & sons.
3. ELECTRICAL GENERATION & UTILIZATION

Teaching Scheme

Lectures: 4 Hrs / week
Tutorial: 2 Hrs / week

Examination Scheme

Theory: 100 Marks
TW: 50 Marks

Unit I: Electrical Energy Generation using Conventional Energy Sources: 8hr

Unit II: Solar Energy: 8hr
C) PV module power output, IV curve for PV module, batteries for PV cell, Battery charge controllers, Types of PV systems: Grid tie PV system, Stand alone PV system, direct PV system.

Unit III: Wind Energy: 8hr
A) Introduction, Principle of wind energy conversion, power duration & velocity duration characteristics of wind, advantages & disadvantages of WECS, Classification of wind mills, basic components of wind mill, aerodynamic forces acting on wind mill blades, Design considerations of horizontal axis & vertical axis wind mill, Wind Data & site selection considerations, Social economic & environmental considerations.

Section –II

Unit-IV: Electric Heating and Welding 8hr
Classification of electric heating, heating methods, Resistance heating, design of heating element, Arc furnaces, induction heating, Induction furnaces, Dielectric heating, Electric arc
welding, welding transformer, Power supply and control of electric welding, Laser beam welding.

**Unit-V: Electric traction**

DC, AC and composite traction systems, main line and suburban systems, Comparison with Diesel-Electric traction, traction equipments, Trolley wire, catenaries, Feeding and distribution systems, negative booster, overhead lines, current collectors, traction substations.

**Unit-VI**

A) **Train movement and Energy consumption:** Trapezoidal and quadrilateral speed-time curves, Maximum, average and scheduled speeds, Mechanics of train movement, tractive effort calculation, Power and energy output from driving axles, Specific Energy Output.

B) **Braking & control of traction motors:** Vacuum brake and Air brake systems, regenerative braking, calculation of energy returned during regenerative braking. D.C. series, A.C. series and 3 Phase Induction motors for traction, Brief introduction to rheostatic speed control methods, drum controller, Multiple Unit Control, Static control of traction motors. Use of microprocessors for control of traction motors.

**Texts and references:**

5. A course in Electrical Power: Soni, Gupta and Bhatnagar
5. Elective- II

Embedded System

Teaching Scheme:
Lectures: 04 hrs/week
Practical: 02 hrs/week

Examination Scheme:
Paper: 100 marks
Term work: 50 marks.

UNIT -1

UNIT -2
Embedded Systems-Application-and Domain-Specific: Washing Machine-Application-Specific Embedded System, Automotive-Domain-Specific Examples of Embedded System,

UNIT - 3

UNIT - 4
Embedded Firmware Design and Development: Embedded Firmware Design Approaches, Embedded Firmware Development Languages, Programming in Embedded C.

UNIT - 5
The Embedded Product Development Life Cycle (EDLC): What is EDLC?, Why EDLC, Objectives of EDLC, Different Phases of EDLC, EDLC Approaches (Modeling the EDLC),

UNIT - 6
ARM Processors: Introduction to ARM Family of Processors, programming.
Design Case Studies: Digital Clock, Battery-Operated Smartcard Reader, Automated Meter Reading System(AMR), Digital Camera.

Term Work: List of Experiments:
Total of 08 experiments to be carried out. 04 based on ARM processor / any processor other than 8051 preferably with interfacing, 04 on IDE simulation.

Texts and references:
2. ARM system developers guide designing & optimizing system software: Andrew N, Dominic Sloss and Chris Wright.
5. Elective- II
HIGH VOLTAGE ENGINEERING [New 2016]

Teaching Scheme: Examination Scheme: Paper: 100 Marks
Lectures: 4 Hours /week T.W.: 50 Marks
Practical: 2 Hours/week

COURSE OUTCOME:-
After learning the course the students should be able to
1. Understand the basic generation and measurement of High voltage and High current for
testing purposes
2. Comprehend Breakdown phenomenon in air, solid and liquid insulation
3. Test & analyse high voltage electrical Equipment with various testing devices.
4. Design different types of HV generators

1. Electrostatic fields and field stress control:
   Electrical field distribution and breakdown strength of insulating materials - fields in
   homogeneous, isotropic materials - fields in multi-dielectric, isotropic materials - numerical
   method: Finite difference method, charge simulation method (CSM)

2. Electrical breakdown in gases, liquid and solid dielectrics
   Gases as insulating media - ionization and decay processes, Townsend first ionization
   coefficient, photoionization, ionization by interaction of metastable with atoms, deionization by
   recombination, photoelectric emission, thermionic emission, Townsend second ionization
   coefficient, the Townsend mechanism, examples - the streamer or ‘kanal’ mechanism of spark,
   Paschen’s law,
   Liquid as insulators, breakdown in liquids - electronic breakdown, suspended solid
   particle mechanism, cavity breakdown, transformer oil filtration, transformer oil test,
   Breakdown in solids, intrinsic breakdown, streamer breakdown, electromechanical
   breakdown, breakdown due to treeing & tracking, thermal breakdown, solid dielectrics used in
   practice.

3. Generation of high voltages:
   Generation of high direct voltages, half and full wave rectifier circuits, voltage multiplier
   circuits, Cockroft-Walton Voltage Multiplier Circuit working, Van de Graaff generators, Tribo-
   electric Effect, electrostatic generators, generation of alternating voltages, cascaded
   transformers, resonant transformers- series, parallel, impulse voltages, Standard lightning and
   switching surge, impulse voltage generator circuits, Analysis of circuit “a”, Marx circuit,
   operation, impulse current generator.

4. Measurement of high voltages:
   High direct voltage measurement, peak voltage measurements by spark gaps, sphere gaps,
   reference measuring systems, uniform field gaps, rod gaps, factors affecting sphere gap
   measurements, examples, electrostatic voltimeters, generating voltimeters and field sensors,
   Potential Dividers for Impulse Voltage Measurements- resistance & Capacitance voltage divider,
   Measurement Of High D.C., A.C. And Impulse Currents- hall generators, rogowski coil,
   Faraday Generator, the measurement of peak voltages, the Chubb–Fortescue method, Surge
   Recorder (Klydonograph) with Litchenberg Pattern.
5. **Over voltages, insulation coordination & Non-destructive insulation tests:** 8 lec
Natural causes for over voltages, Lightning phenomenon, Overvoltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems

6. **High voltage testing:** 6 lec
Testing of insulators and bushings, testing of isolators and circuit breakers, Testing of cables, testing of transformers - testing of surge diverters
   Planning and layout of high voltage laboratory:- Classification of High Voltage Laboratories, Layout of High Voltage Laboratories, working of Faradays Cage.

**TERM WORK:**
**A) List of Experiments:**
1. Partial Discharge Measurements of Transformer windings and Cables
2. Impulse Tests on Transformers
3. Capacitance Measurement of Cables
4. Condition Monitoring Of Transformers
5. Transformer oil Testing
6. Measurement of Dielectric properties with Schering Bridge
7. Insulation Testing of Cables, wires
8. A report on visit to high voltage laboratory

**Texts and references :**
5. Elective II
Advanced Relaying

Teaching Scheme:
Lectures: 4 Hours/week  
Practical: 2 Hours/week

Examination Scheme:  
Paper: 100 Marks  
T.W.: 50 Marks

1. **Introduction to Digital Relay:** Introduction, Basic Components of Digital Relays with block diagram advantages of microprocessor technology, microprocessor application to protection, measures of noise and surge immunity, desirable features in a protection scheme, integrated hierarchical computer control and protection, subsystems of a digital relay, operating algorithms, substation digital protection system, adaptive relaying, simulators for testing.

(9Hr)

2. **Coordination of Inverse Definite Minimum Time (IDMT)/Directional Over Current (DOC) Relays in an Interconnected Power System Network:** Protection of an interconnected system, Link net structure, Flowchart of Primary/ Backup relay pairs, Flowchart of Time Multiplier Setting. Examples based on existing power system network

(5Hr)

3. **Current Voltage Transformers:** Introduction, current transformers, equivalent circuits, transient performance, modeling for transient simulation, use of mimic impedance, voltage transformers, VT model, modeling for transient simulation, wound voltage transformers, relay performance, dynamic compensation for CTs and PTs, compensating algorithms for CTs and dynamic compensation of CTs, analysis of simulation results. Study of electromagnetic CT & PT, Steady state & Transient state analysis of CVT, Study of residual voltage transformer, natural CT, Mixing Transformer, summation transformer, Optical CT

(9Hr)

4. **Comparator:** Characteristic & study of different types of two input phase & amplitude Comparator, Study of multi input comparator

(3Hr)

5. **Auto-reclosing and Synchronizing**
Introduction, history of auto-reclosing, advantageous of auto-reclosing, classification of auto-reclosing, auto-reclosing based on number of phases, auto-reclosing based on number of attempts, auto-reclosing based on speed, factors to be considered during reclosing such as choice of zone in case of distance relay, dead time, reclaim time, instantaneous, trip lockout, intermediate lockout, breaker supervision function

(6Hr)

6. **Protection of Power System Components:** Introduction, bus bar protection, digital protection schemes for bus bars.

(4Hr)

a) **Transformer Protection:** Introduction, digital techniques for protection of transformers, harmonic restraint percentage differential protection, voltage restraint technique, flux restraint approach. (4Hr)
b) **Digital Relays for Synchronous Generators Protection**: Introduction, multifunction protection scheme, differential protection of stator windings, 100% stator ground fault protection, negative sequence protection, under impedance protection, out of set generator protection, over-fluxing detection algorithm.

(4Hr)

c) **Protection Features in Numerical Distance Relays**: Relaying algorithms, distance relay characteristics, multiprocessor based poly-phase numerical distance relay, feeder protection, introduction, special over current relay characteristics, typical numerical over-current relay, motor protection.

(4Hr)

**REFERENCE BOOKS**

5. Elective II
ELECTRICAL MAINTENANCE AND ENERGY AUDIT

Unit 1: Maintenance: Types of maintenance, maintenance schedules, procedures, Maintenance of Motors: Overhauling of motors, preventive maintenance, trouble shopping of electric motors. Maintenance of Transmission and Distribution System, danger notice, caution notice permit to work, arranging of shutdowns personally and temporary earths cancellation of permit and restoration of supply, Patrolling and visual inspection of lines – points to be noted during patrolling from ground: special inspections and night inspections, Location of faults using Meggar, effect of open or loose neutral connections provision of proper fuses on service lines and their effect on system, causes and dim and flickering lights. (10)

Unit 2: Maintenance of Distribution Transformers: Transformer maintenance and points to be attended to in respect of various items of equipment, Checking of insulation resistance transformer oil level and BDV test of oil, measurement of earth resistance. (08)

Unit 3: Maintenance of Grid Substations: Checking and maintenance of bus bars, isolating switches, HT/LT circuit breakers, LT switches, Power Transformers. (06)

Unit 4: General Aspects of Energy Management and Energy Audit (6)
Definition, Need and types of energy audit. Energy management (audit) approach-understanding energy costs, benchmarking, energy performance, matching energy use to requirement, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments.

Unit 5: Energy Audit Methodology & Recent Trends (10)
Current Practices, Integration of two or more systems, Switching of Energy Sources, Report-writing, preparations and presentations of energy audit reports, Post monitoring of energy conservation projects, MIS, Case-studies / Report studies of Energy Audits. Guidelines for writing energy audit report, data presentation in report, findings recommendations, impact of renewable energy on energy audit recommendations. Case studies of implemented energy cost optimization projects in electrical utilities as well as thermal utilities.

Unit 6: Energy Efficiency in Electrical Utilities (8)

Electrical system: Electricity billing, electrical load management and maximum demand control, selection and location of capacitors, performance assessment of PF capacitors, distribution and transformer losses.


Fans and blowers: Types, performance evaluation, efficient system operation, flow control strategies and energy conservation opportunities.
**Lighting System:** Light source, choice of lighting, luminance requirements, and energy conservation avenues.

**Practical Exercise:**
1. Identification of tools and equipment used for installation and maintenance of electrical equipment.
2. Study of codes and practices pertaining to safety in installation and maintenance of electrical equipment.
3. Study of electrical equipment by visiting a grid power station/sub station and to prepare a report of maintenance system adopted there.
4. Study of the testing of electrical equipment by visiting a grid power station/sub station and to prepare a report.
5. Study of motors and their repair and overhauling by visiting a repair workshop or manufacturing unit.
6. Study of maintenance of electrical distribution system by visiting a sub station and to prepare a report.
7. Study of Power factor improvement of a single-phase load using capacitor bank.

B) One field visit to substation for study of maintenance work.

**Reference Books:**

4) Energy Management: W.R. Murphy, G. Mckay (Butterworths).

**6. Project Phase II**

The assembly of components shall be done in project II. The testing shall be completed and necessary changes, if required shall be made. The project should be presented before the external examiner in working condition along with documents showing evidences of participation in state/ National level project competition. A journal/conference paper published/presented on project work is expected. The project batch shall be eligible to get more than 80% of marks in term work/external examination if above conditions are satisfied.
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<td>Signal Processing</td>
<td>Signals and systems</td>
</tr>
<tr>
<td>For Electrical Engg.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEM VI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power System Stability and Control</td>
<td>Power Systems II</td>
<td>Advanced Electrical Measurements</td>
</tr>
<tr>
<td>Control Systems Design</td>
<td>Control System II</td>
<td>Communication Engineering</td>
</tr>
<tr>
<td>Power Electronics</td>
<td>Power Electronics</td>
<td>Electrical Machine Design</td>
</tr>
<tr>
<td>Microcontroller and its applications</td>
<td>Digital Electronics and Microcontroller</td>
<td>Power Systems III</td>
</tr>
<tr>
<td>Communication Engineering</td>
<td>Communication Engineering</td>
<td>Electrical Drives</td>
</tr>
<tr>
<td>BE OLD</td>
<td>EQUIVALENT</td>
<td>BE NEW</td>
</tr>
<tr>
<td>--------------------------------------------</td>
<td>------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>SEMVII</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial Drives and Control</td>
<td>Electrical Drives</td>
<td>Advanced Switchgear and Protection</td>
</tr>
<tr>
<td>High Voltage Engineering</td>
<td>High Voltage Engineering (Elective)</td>
<td>Power Quality and Harmonics</td>
</tr>
<tr>
<td>Advanced Switchgear and Protection</td>
<td>Advanced Switchgear and Protection</td>
<td>Computer Methods in Power Systems</td>
</tr>
<tr>
<td>Renewable Energy Sources</td>
<td></td>
<td>Elective-I</td>
</tr>
<tr>
<td>Elective-I</td>
<td></td>
<td>1. FACTS</td>
</tr>
<tr>
<td>2. Digital Control System</td>
<td></td>
<td>3. Industrial Automation and SCADA</td>
</tr>
<tr>
<td>5. Thermal Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEM VIII</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electrical Utilization and traction</td>
<td>Electrical Generation and Utilization</td>
<td>HVDC Systems</td>
</tr>
<tr>
<td>HVDC Systems</td>
<td>HVDC Systems</td>
<td>EHVAC</td>
</tr>
<tr>
<td>Electrical Installation, testing and maintenance</td>
<td>Electrical maintenance and electrical energy audit.</td>
<td>Electrical Generation and Utilization</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td><strong>Elective -II</strong></td>
<td></td>
<td>Elective II</td>
</tr>
<tr>
<td>1. EHVAC</td>
<td>EHVAC</td>
<td>1. Embedded Systems</td>
</tr>
</tbody>
</table>
Shivaji University, Kolhapur  
Revised Syllabus Structure of Final Year Engineering (BE) (w. e. f. July 2016)  
Electronics and Telecommunication Engineering Course  
Scheme of Teaching and Examination  

**Semester-VII**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject</th>
<th>Teaching Scheme (Hrs.)</th>
<th>Examination Scheme (Marks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>Satellite Communication</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Embedded System</td>
<td>4</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>Computer Communication Networks</td>
<td>4</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>RF &amp; Microwave Engineering</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Elective-I</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Industrial Training</td>
<td>--</td>
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</tr>
<tr>
<td>7</td>
<td>Project Phase-I</td>
<td>--</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
<td>2</td>
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</tbody>
</table>

* Assessment will be carried out with Project Phase – I By Internal Guide.

**Semester-VIII**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Subject</th>
<th>Teaching Scheme(Hrs.)</th>
<th>Examination Scheme(Marks)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>1</td>
<td>Video Engineering</td>
<td>4</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>Wireless Mobile Communication</td>
<td>4</td>
<td>--</td>
</tr>
<tr>
<td>3</td>
<td>Digital Image Processing</td>
<td>4</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>Elective-II</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Project Phase – II</td>
<td>--</td>
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</tr>
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<td>15</td>
<td>01</td>
</tr>
</tbody>
</table>

**BE Part-I (Elective-I)**

1. Robotics  
2. Speech processing  
3. MEMS  
4. Radar & Navigation Aids

**BE Part-II (Elective-II)**

1. Mechatronics  
2. Artificial Neural Network  
3. Remote Sensing & GPS  
4. Operating System
Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- I (w. e. f. July 2016)

1. Subject: Satellite Communication

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 3 hrs / week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Tutorial: 1 hr / week</td>
<td>TW: 25 Marks</td>
</tr>
</tbody>
</table>

### Course Objectives:
The course aims:

1. To introduce the fundamental concept in the field of satellite communication.
2. To enable the student know how to place satellite in orbit.
3. To know the concept of space subsystem.
4. To analyze, design and evaluate satellite communication subsystem.
5. To examine concept of satellite networking.

### Course Outcomes:
Upon successful completion of this course, the student will be able to:

1. Understand Orbital aspects involved in satellite communication.
2. Understand Power budget calculation.
3. Understand Satellite system and services provided.
4. Analyze the performance satellite communication system.

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction of Satellite Communication: Introduction, basic concept of satellite communication, Orbital Mechanics, Look angle determination, Orbital perturbation, Orbital determination, Launchers and Launch vehicles, Orbital effects in communication system performance.</td>
<td>07</td>
</tr>
<tr>
<td>II</td>
<td>Satellite subsystem: Satellite Subsystem, Attitude and control system(AOCS), Telemetry, Tracking, Command and Monitoring, Power systems, Communication subsystem, Satellite antennas, Equipment reliability and space qualification.</td>
<td>07</td>
</tr>
</tbody>
</table>
### Satellite Networks:
Reference architecture for satellite networks, basic characteristics of satellite networks, Onboard connectivity with transparent processing, analogue transparent switching, Frame organization, Window organization, On board connectivity with beam scanning.

### Low Earth Orbit and Non Geo-Stationary satellite system:
Introduction, Orbit considerations, Coverage and Frequency Consideration, Delay and Throughput Consideration, Operational NGSO constellation design: Iridium, Teledesic.

### Satellite Radio and GPS:

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**Text Books:**

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Satellite Communications-Timothy Pratt, Charles Bostian, Jeremy Allnut John Wiley &amp; Sons (II Edition)(For chapters I,II,III,IV,VI)</td>
</tr>
<tr>
<td>2</td>
<td>Satellite Communications-Anil k. Maine and Varsha Agaraval, Wiley Publications (All chapters)</td>
</tr>
</tbody>
</table>

**Reference Books:**

<table>
<thead>
<tr>
<th>No.</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Satellite Communications- Dennis Roody McGraw Hill(All Chapters)</td>
</tr>
<tr>
<td>2</td>
<td>Satellite Communications- Gerard Maral and Michel Bousquet, Wiley Publication (5th Edition For chapter IV)</td>
</tr>
<tr>
<td>3</td>
<td>Satellite Communications systems Engineering, 2nd edition- Wilbur L. Pritchard, Henri G. Suyderhoud and Robert A. Nelson. (Chapter I)</td>
</tr>
</tbody>
</table>

**Note:**

1. Students, as a part of their term work, should visit satellite earth station and submit a report of visit.
2. Minimum 8 tutorials / assignment based on above syllabus.

**Note for question paper setter:** 92 marks theory +8 marks problem.
Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- I (w. e. f. July 2016)

2. Subject: Embedded Systems

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 4 hrs / week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Practical: 2 hrs / week</td>
<td>TW: 25 Marks</td>
</tr>
<tr>
<td></td>
<td>POE: 50 Marks</td>
</tr>
</tbody>
</table>

Course Objectives:
The course aims to:
1. Study different features of PIC 16F877
2. Study different features of ARM7
3. Understand real time programming using PIC and ARM
4. Basic concepts of RTOS

Course Outcomes:

Upon successful completion of this course, the student will be able to:
1. Apply knowledge of PIC and ARM to develop embedded system designs.
2. Students will understand the advantages of ARM architecture and can use the same knowledge to build their projects.
3. They’ll be able to write codes for programs in assembly language for ARM core
4. Students will learn use of concepts of RTOS in developing software

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>I/O’s and Peripherals: I/O ports &amp;TRIS registers, External Interrupts, Timers, CCP Module: Programmable period scalar, Event Counter, Sleep Mode, PWM mode, ADC: Features, ADC use. Configuration word, Oscillator configuration, Reset alternatives, low power operation, I2C, SPI, Associate registers, [Note: Syllabus need to be covered with reference to PIC 16FX]</td>
<td>08</td>
</tr>
<tr>
<td>III</td>
<td>Introduction to Embedded Systems Embedded system (ES) definition, Characteristics of Embedded systems, Components of an Embedded system, Embedded system design issues &amp; Design flow, Design</td>
<td>08</td>
</tr>
</tbody>
</table>
metrics, Introduction to Embedded s/w development process and tools, Linking and Locating s/w, getting Embedded s/w into the target system, Issues in Hardware-Software design and co-design. Introduction to IDE.

<table>
<thead>
<tr>
<th>IV</th>
<th>Embedded Processor:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ARM Architecture Details: RISC architecture design philosophy, register banking, CPSR and SPSR, Pipelining, Exceptions Interrupts &amp; vector Table. ARM data flow model.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V</th>
<th>LPC 2148 Microcontroller:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ARM7TDMI-S microcontroller LPC-2148: Architecture details, SFR’s, Port structure, Timer, Counter, PWM module, Embedded C programming for interfacing LED’s, LCD, Keyboard, ADC.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VI</th>
<th>Real Time Operating System (RTOS):</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Introduction to RTOS concept, embedded software architectures: Round robin, round robin with interrupts, Function queue scheduling and real time operating system, Tasks and task states, Task scheduling, shared data and reentrancy, semaphores and shared data using semaphores, protecting shared data. Introduction to RTOS programming.</td>
</tr>
</tbody>
</table>

**Text Books:**

2. Embedded System Design By Frank Vahid / Tony Givargis, Wiley Publication
3. An Embedded Software Primer, David E. Simon Pearson Education, Asia Publication
4. ARM System Developers Guide Designing & Optimizin g System Software By Andrew N., Dominic Sloss, and Chris Wright

**Reference books:**

1. Embedded systems by Raj Kamal, McGraw Hill

**Note for paper setter: 30% programming.**

**Note:** Any 08 experiments/Tutorials based on above syllabus.

**List of experiments:**

1. Four experiments based on assembly language.
2. Four experiments based on Embedded C language.
3. Two Experiments using ARM Boards.
4. Two Experiments based on Bus communication Protocols. (Use Assemblers, Compilers, Flash Programmers, Debuggers & ARM Boards)

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- I (w. e. f. July 2016)

3. Subject: Computer Communication Networks

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 4 hrs / week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Practical: 2 hrs / week</td>
<td>TW : 25 Marks</td>
</tr>
<tr>
<td></td>
<td>OE : 25 marks</td>
</tr>
</tbody>
</table>

**Course Objectives:** The course aims to:
1. Provide an introduction to networking concepts, topologies.
2. Explain Various Transmission Media & Network Devices.
4. Describe various routing algorithms and congestion control mechanism.
6. Explain network security mechanism.

**Course Outcomes:** Upon successful completion of this course, the student will be able to:
1. Describe and differentiate types of networks such as LAN, WAN, MAN and network topologies like star, bus, ring etc. Explain and distinguish between OSI and TCP/IP reference model.
2. Summarizes guided & unguided transmission media and different networking devices used at physical layer.
3. Explain error detection & correction mechanisms and frame formats at data link layer.
4. Explain various routing algorithms like shortest path, distance vector, link state etc and congestion control algorithms viz. leaky bucket, token bucket used at network layer.
5. Illustrate different TCP/IP protocols like IP, ARP, RARP, TCP, UDP etc.

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
</table>
| I       | **Introduction to computer networks**
Networks definition & requirements, Networks topologies, Types of networks, network software issues, reference models- OSI TCP/IP and Hybrid. | 07           |
| II      | **Physical layer- Transmission media**
Guided media-twisted pair, coaxial cable, optical fiber, unguided media-RF allocation, terrestrial microwave, satellite communication, cellular telephone, EIA 232 D interface standard, | 10           |
modem-types, block schematic & standards network device: network connectors, Hubs, Switches, Routers, Bridges, NIC, Fast Ethernet, Gigabit Ethernet.

<table>
<thead>
<tr>
<th>III</th>
<th><strong>Data Link Layer</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design issues, error detection and correction, elementary data link protocols, sliding window protocols, HDLC-types of stations, modes of operation, HLDC frame formats, additional features, Medium access sub layer – channel allocation problem, multiple access protocols, IEEE 802 standards for LANS &amp; WANS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IV</th>
<th><strong>Networks Layer</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Design issues, Routing algorithms – shortest path, distance vector routing, link state routing, flow based routing, routing for mobile hosts, Congestion control – congestion prevention policies-leaky bucket algorithm, token bucket algorithm, congestion control in virtual circuit subnet and choke packets, RSVP.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>V</th>
<th><strong>TCP/IP Protocol suit overview</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TCP/IP and internet, IP protocol and it’s header format, addressing, subetting, other networks layer protocol – ARP, RARP, ICMP, IGMP, TCP, UDP DHCP, Domain name system (DNS), EMAIL, HTTP, IPV.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>VI</th>
<th><strong>Network security</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cryptography, Symmetric-key algorithms, Public-key algorithms, Digital signatures, Managements of publics keys, communications security, Authentication Protocols.</td>
</tr>
</tbody>
</table>

**Text Books:**

| 1   | Computer Networks Andrew S. Tanenbaum, Fourth Edition, PEARSON |
| 2   | Data Communication and Networking, Fifth Edition, Behrouz A. Forouzan, TMH |
| 4   | Computer Networks, Natalia Olifer, Wiley Publication, 2014 |

**Reference Books:**

| 7   | Computer Networking A top down approach, James F. Kurose, Person, Fifth Edition |
### List of Experiments:

<table>
<thead>
<tr>
<th>Practical No.</th>
<th>Title of Experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Study of Networking</td>
</tr>
<tr>
<td>2</td>
<td>Introduction to Network Simulator</td>
</tr>
<tr>
<td>3</td>
<td>Study of LAN</td>
</tr>
<tr>
<td>4</td>
<td>Study of Installation of Windows 2003 Server &amp; introduction to DHCP</td>
</tr>
<tr>
<td>5</td>
<td>• Character transfer using Simplex method</td>
</tr>
<tr>
<td></td>
<td>• Character transfer using Full-Duplex method</td>
</tr>
<tr>
<td>6</td>
<td>• Simulation and implementation of bit stuffing</td>
</tr>
<tr>
<td></td>
<td>• Simulation and implementation of CRC</td>
</tr>
<tr>
<td>8</td>
<td>Study of Medium Access sub layer protocols and simulate using Network Simulator</td>
</tr>
<tr>
<td>9</td>
<td>Simulation and implementation of</td>
</tr>
<tr>
<td></td>
<td>• Stop-and Wait protocol</td>
</tr>
<tr>
<td></td>
<td>• Go-Back-N protocol</td>
</tr>
<tr>
<td></td>
<td>• Selective repeat Protocol</td>
</tr>
<tr>
<td>10</td>
<td>Simulation and implementation of</td>
</tr>
<tr>
<td></td>
<td>a) Distance Vector Routing Algorithm</td>
</tr>
<tr>
<td></td>
<td>b) Link State Routing algorithm</td>
</tr>
<tr>
<td>11</td>
<td>Study of Token Bucket Algorithm</td>
</tr>
<tr>
<td>12</td>
<td>Study of TCP/IP Protocol Suite and Simulation Address resolution protocols.</td>
</tr>
</tbody>
</table>

**Note:** Any 8 experiments.

### Instructions to Paper Setter:

Question Paper must contain 90% theory questions & 10% problems.

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**Shivaji University, Kolhapur**

**B.E. (Electronics and Telecommunication) Part- I (w. e. f. July 2016)**

**4.Subject: RF & Microwave Engineering**

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 4hrs / week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Practical: 2 hrs / week</td>
<td>TW: 25 Marks</td>
</tr>
</tbody>
</table>

**Course Objectives:** The course aims to:

1. To make students aware of the fundamentals of microwave engineering in order to reach the desire industry skills sets.
2. To introduce the students about various microwave amplifiers and oscillators to know their applications in various domains.
Aware students about different types of Microwave Hazards.
To introduce manufacturing technique of MMIC.

**Course Outcomes:** Upon successful completion of this course, the student will be able to:

1. Explain the different types modes propagation in waveguides
2. Select the appropriate component for various applications.
3. Measure the various microwave parameters.
4. Explain the different microwave Hazards.
5. Demonstrate the application of Microwave Engineering to various field.

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Content</th>
<th>No. of Hours</th>
</tr>
</thead>
</table>
| I       | **Microwave Wave Guides:**  
Rectangular and circular wave guides: TE, TM and TEM modes in wave guides, power transmission in wave guide, power losses in wave guide, excitation modes in wave guide, Characteristics of standard wave guides. | 08           |
| II      | **Microwave Components**  
Scattering parameters, microwave cavities, microwave hybrid circuits, directional coupler, two hole directional coupler, circulators and isolators, microwave attenuators(fixed and Variable Type), slotted lines, parallel, coplanar & shielded micro strip lines.(Operating principle & S-parameter equations of above mentioned microwave components.) | 09           |
| III     | **Microwave Tubes**  
*Linear beam:* Klystrons, Reflex Klystrons, TWTs.  
*Microwave Crossed Field Tubes:* Magnetron, Rising Sun&bootstrap Magnetron, forward wave crossed field amplifier (FWCFA), m-carcinotron oscillator. (Operating principle, construction & analytical treatment of above mentioned microwave tubes.) | 09           |
| IV      | **Microwave Solid State Devices**  
Microwave tunnel diodes, microwave FETs, Gunn effect diodes, RWH Theory, LSA diodes, InP diodes, CdTe diodes, IMPATT diodes, PIN diodes, HBT, MESFETs and HEMT.(Operating principle, construction & analytical treatment of above mentioned microwave devices.) | 08           |
| V       | **Microwave Measurements and Microwave Applications**  
Detection of microwave power: measurement of microwave power bridge circuit, thermistor parameters, waveguide thermister mounts, barreters, theory of operation of barreters, directreading barreters bridges,  
Measurement of wavelengths: single line cavity coupling system, Transmission cavity wavemeter & reaction wavemeter, measurement of VSWR, measurements of | 07           |
attenuation, free space attenuation,  
**ISM Applications**: Industrial, Scientific, medical, confocal Microwave Tomographic Applications.

<table>
<thead>
<tr>
<th>VI</th>
<th>Monolithic Microwave Integrated Circuits &amp; Hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Materials: substrate, conductor dielectric &amp; resistive MMIC growth, thin film formation, hybrid microwave I.C. fabrication Microwave hazards:- HERO , HERF &amp; HERP</td>
</tr>
</tbody>
</table>

### Text Books:
1. Microwave Engineering: Sushrut Das, Oxford Publication  
2. Microwave Devices and Circuit – Samul Liao (Prentice hall of India)  
3. Microwave Engineering-Annapurna Das ,TMH Publications

### Reference Books:
2. Microwave Engineering-David M. Pozer., Wiley Publications  
3. Techniques of Microwave Measurement-Carol G. Montgomery  
4. Microwave Active Devices vaccum and solid state – M.L. Sisodia  
5. Basic laboratory microwave techniques- Manual, Sisodia and Raghuvanshi Wiley  
6. Microwave Engineering:Dr.K.T.MathewsWiley Publications

### List of Experiments: Any 08 experiments based on above syllabus

<table>
<thead>
<tr>
<th>Exp. No.</th>
<th>Name of Experiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Study of Microwave Test Bench.</td>
</tr>
<tr>
<td>2.</td>
<td>Study of Characteristics of reflex klystron</td>
</tr>
<tr>
<td>3.</td>
<td>Study of measurement of Unknown frequency by direct method (Wavemeter).</td>
</tr>
<tr>
<td>4.</td>
<td>Study of measurement of Unknown attenuation.</td>
</tr>
<tr>
<td>5.</td>
<td>Study of measurement of wavelength by slotted line method.</td>
</tr>
<tr>
<td>6.</td>
<td>Study of measurement of VSWR by using slotted line.</td>
</tr>
<tr>
<td>7.</td>
<td>Study of characteristics of variable attenuator.</td>
</tr>
<tr>
<td>8.</td>
<td>Study of characteristics of directional coupler.</td>
</tr>
<tr>
<td>9.</td>
<td>Study of characteristics of E-Plane Tee and H-Plane Tee.</td>
</tr>
<tr>
<td>10</td>
<td>Study of characteristics of Magic Tee.</td>
</tr>
<tr>
<td>11</td>
<td>Study of Characteristics of Horn Antenna.</td>
</tr>
<tr>
<td>12</td>
<td>Study of Characteristics of Gunn Oscillator.</td>
</tr>
</tbody>
</table>

### Note Question Paper: 60% theory and 40% Problems.
Shivaji University, Kolhapur

B.E. (Electronics and Telecommunication) Part- I (w. e. f. July 2016)

5. Subject: Robotics (Elective I)

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures : 3hrs / week</td>
<td>Theory : 100 Marks</td>
</tr>
<tr>
<td>Tutorial : 1 hr/week</td>
<td>TW : 25 Marks</td>
</tr>
</tbody>
</table>

Course Objectives: The course aims to:

1. Understand Industrial Atomization, classifications & Robotic technology
2. Understand Implementation of control strategy, Sensors & Electronics devices
3. Develop software which requires for automation
4. Design & Development of Robot for particular applications

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Student can understand basics concept of industrial atomization & Robotic technology
2. Students can able to select different sensors, electronics systems for Robot
3. Student can develop software for particular robotic applications
4. Students will understand robot applications & develop robot for particular applications

<table>
<thead>
<tr>
<th>Unit no</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction and Classification of Robots</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>Automation and robotics, A brief history of Robotics, Robot drive systems, Robotic sensors, Classification by co-ordinate system, Classification by control method</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Robotic Technology</td>
<td>08</td>
</tr>
<tr>
<td></td>
<td>Basic control systems concepts and models, Controllers, Control system analysis, Robot activation and feedback components, Position sensors, Velocity sensors, Actuators, Power transmission systems, Robot joint control design</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Robotic Sensory Devices</td>
<td>05</td>
</tr>
<tr>
<td></td>
<td>Non optical position sensors, Optical position sensors, Velocity sensors, Accelerometers, Proximity sensors, Touch and Slip sensors</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Robot End Effectors</td>
<td>05</td>
</tr>
<tr>
<td></td>
<td>Types of End Effectors, Mechanical grippers, Other types of grippers, Tools as end effecters, Robot/end effecter interface, Consideration in gripper selection and design</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Robot Programming</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>Method of Robot programming, Leadthrough programming methods, Robot program as a path and space, Motion Interpolation, WAIT, SIGNAL, and DELAY commands, Branching, Capabilities and</td>
<td></td>
</tr>
</tbody>
</table>
Limitation of Lead through methods, Textual Robot language, Generation of Robot programming language

6 **Robot Application**
General consideration in robot material handling, Material Transfer Applications, Machine loading and unloading, Spot welding, Spray coating, Other processing operations using robots

**Text books:**

1. Industrial Robotics: Technology, programming and applications. Mikell P. groover, tata macgrawth hill

2. Robotic Engineering: An integrated approach Richard D. kalfter, PHI

3. Introduction to robotics analysis, control and applications Saeed B. Niku: willey publication

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- I (w. e. f. July 2016)
5. Subject: Speech Processing (Elective-1)

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lectures</strong>: 3hrs / week</td>
<td><strong>Theory</strong>: 100 Marks</td>
</tr>
<tr>
<td><strong>Tutorial</strong>: 1 hr/week</td>
<td><strong>TW</strong>: 25 Marks</td>
</tr>
</tbody>
</table>

**Course Objectives:** The course aims to:

1. Explain acoustic theory and time domain models for speech processing.
2. Understand sampling, quantization and different modulation techniques.
3. Apply STFT analysis, Homomorphic Speech processing and speech synthesis.
4. Explain linear predictive coding as well as different techniques to enhance speech quality.

**Course Outcomes:** Upon successful completion of this course, the student will be able to:

1. Understand acoustic theory
2. Distinguish time domain modules
3. Analyze and distinguish different modulation techniques
4. Analyze and synthesizes speech using STFT, homomorphic processing.
<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Digital models for the speech signal:</strong> Process of speech production, Acoustic theory of speech production, Lossless tube models, and Digital models for speech signals. <strong>Time domain models for speech processing:</strong> Time dependent processing of speech, Short time energy and average magnitude, Short time average zero crossing rate, Speech vs silence discrimination using energy &amp; zero crossings, Pitch period estimation, Short time autocorrelation function, Short time average magnitude difference function, Pitch period estimation using autocorrelation function, Median smoothing.</td>
<td>09</td>
</tr>
<tr>
<td>II</td>
<td><strong>Digital representations of the speech waveform</strong> Sampling speech signals, Instantaneous quantization, Adaptive quantization, Differential quantization, Delta Modulation, Differential PCM, Comparison of systems, direct digital code conversion.</td>
<td>07</td>
</tr>
<tr>
<td>III</td>
<td><strong>Short time Fourier analysis:</strong> Linear Filtering interpretation, Filter bank summation method, Overlap addition method, Design of digital filter banks, Implementation using FFT, Spectrographic displays, Pitch detection, Analysis by synthesis, Analysis synthesis systems.</td>
<td>05</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Homomorphic speech processing</strong> Homomorphic systems for convolution, complex cepstrum, Pitch detection, Formant estimation, Homomorphic vocoder.</td>
<td>04</td>
</tr>
<tr>
<td>V</td>
<td><strong>Linear predictive coding of speech</strong> Basic principles of linear predictive analysis, Solution of LPC equations, Prediction error signal, Frequency domain interpretation, Relation between the various speech parameters, Synthesis of speech from linear predictive parameters, Applications.</td>
<td>05</td>
</tr>
<tr>
<td>VI</td>
<td><strong>Speech Enhancement:</strong> Spectral subtraction &amp; filtering, Harmonic filtering, parametric re-synthesis, Adaptive noise cancellation. <strong>Speech Synthesis:</strong> Principles of speech synthesis, Synthesizer methods, Synthesis of intonation, Speech synthesis for different speakers, Speech synthesis in other languages, Evaluation, Practical speech synthesis.</td>
<td>06</td>
</tr>
</tbody>
</table>
Text Books:


Reference Books:

4. Speech and audio processing by Dr. Shaila D. Apte

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- I (w. e. f. July 2016)

5. Subject: Micro Electro Mechanical Systems and Systems on chip (Elective I)

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 3hrs / week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Tutorial: 1 hr / week</td>
<td>TW: 25 Marks</td>
</tr>
</tbody>
</table>

Course Objectives: The course aims to:

1. Provide an introduction and basic understanding of MEMS and types of MEMS.
2. Provide basic understanding of sensors and Actuators.
3. Develop student ability to apply basic design procedure of fabrication steps.
4. Design electronic circuits to meet the desired specifications.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Apply knowledge of mathematics, science, and engineering to design MEMS small systems.
<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Control and Materials of MEMS</strong>&lt;br&gt;Introduction, semiconductors and their processing, Ceramics, silicon micromachining techniques, Polymers and their synthesis,</td>
<td>07</td>
</tr>
<tr>
<td>II</td>
<td><strong>Smart Materials and Systems</strong>&lt;br&gt;Thermo responsive Materials, Piezoelectric Materials, Electrostrictive/Management Materials, Rheological Materials</td>
<td>04</td>
</tr>
<tr>
<td>III</td>
<td><strong>Transducers, Sensors and Actuators</strong>&lt;br&gt;Introduction, Principles of sensing and actuation, Beam and Cantilever, Microplates, Capacitive effects, Flow measurement using Integrated paddle-cantiliver structure, MEMS Gyroscopes.&lt;br&gt;Chemical and Biological Transducers: basic concepts of cellular biology, chemical sensors, molecule-based biosensors, cell-based biosensors</td>
<td>07</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Silicon Fabrication Techniques</strong>&lt;br&gt;ASICs micromachining processes: substrates, lithography: lithography, Mask formation, Wafer bonding, wet/dry etching processes, Deposition processes: Metallization, CVD of dielectric, Thermal oxidation, film stress, and exotic process.</td>
<td>06</td>
</tr>
<tr>
<td>V</td>
<td><strong>Polymeric Fabrication Techniques</strong>&lt;br&gt;Microstereolithography: introduction, MSL by scanning method&lt;br&gt;Micromolding of polymeric 3D structure: Micro-injection molding, Micro-photomolding&lt;br&gt;Polymeric Process: burnout and sintering, Jet molding, powder injection molding</td>
<td>06</td>
</tr>
<tr>
<td>VI</td>
<td><strong>Integration and Packaging</strong>&lt;br&gt;Integration of MEMS-MEMS First process, MEMS packaging: objective, special issue, types of packaging&lt;br&gt;Packaging Techniques: Flip-chip assembly, ball grid array, embedded overlay</td>
<td>06</td>
</tr>
</tbody>
</table>
Text Books:


Reference Books:

2. K.J. Vinoy, S. Gopalkrishnan, Vijay K Varadan “Smart Material systems and MEMS”.

NOTE FOR PAPER SETTER: Question paper based on 100% Theory

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- I (w. e. f. July 2016)
5. Subject: Radar & Navigation Aids (Elective-I)

Teaching Scheme | Examination Scheme
-----------------|------------------
Lectures: 3 hrs/week | Theory: 100 Marks
Tutorial: 1 hrs/week | TW: 25 Marks

Course Objectives: The course aims:
1. To gain in depth knowledge about fundamental of radar
2. To study different types of radar and their operations
3. To gain knowledge radar’s measurement and tracking
4. To become familiar with radar networking

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Acquired knowledge about radar and radar equation
2. Understanding the working principal of Doppler radar
3. Ability to work for measurement and tracking signal
4. Foster ability to work instrument landing system

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Antennas- Aperture Antennas, Radiation Intensity Pattern, Pattern Function Relationship, Fundamental Pattern Parameters, Apertures with constant Polarization, Factorable Illumination Function, Sidelobe</td>
<td>08</td>
</tr>
</tbody>
</table>
Control in One-Dimensional Apertures, Circularly Symmetric Illuminations, Some Example Antennas, Of The Reflector, Array Antennas, Rectangular Planner Array, Linear Array

III Radar Equation-
Radar Equation, Important Networks Definition, Incremental Modeling Of Noise Sources, Incremental Modeling Of Noisy Networks, Practical Modeling Of Noisy Sources and Networks

IV Radar Signals and Networks-

V Radar Resolution-
Range Resolution, Doppler Frequency Resolution, Simultaneous Range and Doppler Resolution, Resolution and RMS Uncertainty, Overall Radar and Angle Resolution.

VI Frequency Measurement and Tracking-
Definition Of Optimum Frequency Measurement, Optimum Filter For Doppler Measurement, Some Practical Considerations, Practical Noncoherent Implementation For Doppler, Optimum Coherent Doppler Measurement

Reference Books:

1  “Radar Principles” By Peyton Z.,Peebles,Jr. Wiley India
2  Introduction of Radar system By Skolnik (McGraw Hill)

Shivaji university, kolhapur

(B.E .(Electronics and Telecommunication) Part- 1
6. Subject : Project
w.e.f July 2016

Practical :2 hr s / week       TW : 25 Marks       OE:50 Marks

a) The project is to be carried out in two semester of B.E (Electronics and Tele communications ) Part-I and Part-II. The practical batch size for project will be of 15 students. The project batch will be preferably divided into groups each consisting of not more than 3 students. In semester one, group will select a project with the approval of guide and submit the
synopsis of project in the month of August. The group is expected to complete detail system design, layout etc. in semester one, as a part of the term work in the form of joint report. In addition all students of project groups will deliver the seminar on the proposed project only.

Hardcopy of project diary should be maintained GroupWise, where report of every week activity should be maintained, which should be presented at the time of examination. The format of project diary is attached with syllabus.

b) Guide of the project batch should take presentation and report of industrial training to which students should go after end of the third year. They should consider marks of the same in termwork of project phase-I and give marks our of 25

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part-II (w.e.f. July 2016)
1. Subject: Video Engineering

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 4 hrs/week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Practical: 2 hrs/week</td>
<td>TW: 25 Marks POE: 50 Marks</td>
</tr>
</tbody>
</table>

Course Objectives: The course aims to:
1. Study basics of TV system.
2. Study color TV transmission and reception.
3. Study concept of digital TV system.
4. Study concept of high definition TV.
5. Study advanced TV systems like LCD, plasma, LED, CCTV, etc.

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Describe picture and sound transmission and reception.
2. Explain color composite video signal.
3. Describe principle of digital TV system.
4. Explain high definition television system.
5. Describe advanced TV system like LCD, plasma, LED, CCTV, etc.

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Fundamentals of television system</td>
<td>09</td>
</tr>
</tbody>
</table>

Picture and sound transmission and reception, aspect ratio, horizontal and vertical resolution, video bandwidth and interlaced scanning, composite video, signal, H & V sync details, CCIR-B standards, VSB transmission and channel bandwidth.
<table>
<thead>
<tr>
<th>II</th>
<th>Color signal transmission and reception</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Color TV camera, Color Picture Tubes, picture tubes purity &amp; convergence, automatic degaussing, Composite color signals, compatibility considerations, frequency interleaving process, color mixing theory, characteristics of color, color difference signals, chromaticity diagram, color signal transmission-bandwidth and modulation of color difference signals, color TV system: NTSC, PAL – D &amp; SECAM.</td>
</tr>
<tr>
<td></td>
<td>09</td>
</tr>
<tr>
<td>III</td>
<td>Digital TV Transmission and Reception</td>
</tr>
<tr>
<td></td>
<td>Digital system hardware, Signal quantization and encoding, Digital signals and parameters, Digital Satellite Television, Digital TV. Receiver system, Merits of Digital TV receiver.</td>
</tr>
<tr>
<td></td>
<td>08</td>
</tr>
<tr>
<td>IV</td>
<td>High Definition TV</td>
</tr>
<tr>
<td></td>
<td>Component coding, MAC signals, MAC encoding format, scanning frequencies D2-MAC Packet Signal, Duo binary Coding, HDTV Standards &amp; compatibility, colorimetric characteristics &amp; parameters of HDTV systems</td>
</tr>
<tr>
<td></td>
<td>08</td>
</tr>
<tr>
<td>V</td>
<td>Digital video system</td>
</tr>
<tr>
<td></td>
<td>Video conferencing, Interactive video and multimedia, Videophone, 3D TV</td>
</tr>
<tr>
<td></td>
<td>07</td>
</tr>
<tr>
<td>VI</td>
<td>Advanced TV systems</td>
</tr>
<tr>
<td></td>
<td>07</td>
</tr>
</tbody>
</table>

Reference Books:


Reference Books


**Note:** Any 10 experiments based on above syllabus.
List of experiments

1. To Study H sync and V sync details.
2. To Study color composite video signal.
3. To Study RF tuner section.
4. To Study horizontal section of color TV receiver.
5. To Study vertical section of color TV receiver.
6. To Study chroma section of color TV receiver.
7. To Study VIF section of color TV receiver.
8. To Study SIF section of color TV receiver.
10. To Study digital TV receiver.
11. To Study CCTV.

Note for paper setter: Paper should be based on as per weight-age given in the syllabus.

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- II (w. e. f. July 2016)
2. Subject: Wireless Mobile Communication

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 4 hrs / week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Practical: 2 hrs / week</td>
<td>TW: 25 Marks</td>
</tr>
</tbody>
</table>

Course Objectives: The course aims to:
1. Focus on basic fundamentals of wireless communication.
2. Explain large & small scale radio wave propagation.
3. Understand basic mobile communication and its multiple access techniques.
4. Understand mobile network and its connectivity.

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. List basic fundamentals of wireless communication.
2. Analyze large & small scale radio wave propagation.
3. Apply multiple access techniques to mobile communication.
4. Create mobile network.

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section</td>
<td>Topic</td>
<td>Details</td>
</tr>
<tr>
<td>---------</td>
<td>-------</td>
<td>---------</td>
</tr>
<tr>
<td>II</td>
<td>Mobile Radio Propagation</td>
<td>Small-Scale Fading and Multipath: Small-Scale Multipath Propagation, Impulse Response Model of a Multipath Channel, Small-Scale Multipath Measurements, Parameters of Mobile Multipath Channels, Types of small-Scale Fading, Rayleigh and Ricean Distributions, Statistical Models for Multipath Fading Channels.</td>
</tr>
<tr>
<td>IV</td>
<td>Introduction to Mobile Communication &amp; Multiple Access Technique</td>
<td>Mobile and Personal Communication, mobile and wireless devices, Specialized packet and mobile radio networks, circuit switched data services on cellular networks, packet switched data services on cellular networks, Multiple Access Technique-FDMA, TDMA, SDMA, CDMA, spread spectrum multiple access</td>
</tr>
<tr>
<td>V</td>
<td>Wireless LAN</td>
<td>Introduction, Infrared radio transmission infrastructure and ad-hoc networks, Detailed study of IEEE 802.11, HIPER LAN, Bluetooth, Wireless ATM</td>
</tr>
<tr>
<td>VI</td>
<td>Mobile Network &amp; Transport Layer</td>
<td>Mobile IP, DHCP (Dynamic Host Control Protocol), Mobile ad hoc networks, Bluetooth &amp; Wi-Fi network Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast and Selective retransmission and recovery, Transaction oriented TCP, TCP over 2.5/3G wireless networks.</td>
</tr>
</tbody>
</table>

**Text Books:**

2. *Mobile Communications* - Jachen Schiller (Addison Westy)

**Reference Books:**

3 Wireless communication and Networks by Upena Dalal (Oxford)
4 Wireless and Mobile network by Manvi (Wiley India)

List of Experiments: (Any 8 Experiments)
1. ISDN Trainer kit Hardware & Software Setup
2. Study of Architecture of ISDN kit
3. Analog & Digital Subscriber Link establishment using ISDN trainer kit
4. Study of numbering plans in ISDN trainer kit
5. Establishment point to point & Multidraft Links using ISDN
6. Study of Protocol Analysis (based on any protocol)
7. Study of Mobile Communication Set up (Study of Link Mobile Trainer Kit, Handset)
8. Study of Multiple Access Techniques (Any one)
9. Visit to Mobile Company Like BSNL, Airtel, Idea
10. Implementation of outdoor propagation Model (Any one) using Matlab.
11. Implementation of Free Space propagation model using Matlab

Note for Paper Setter: 92 marks Theory + 8 Marks Problem.

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- II (w. e. f. July 2016)
3. Subject: Digital Image Processing

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 4 hrs / week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Practical: 2hrs/week</td>
<td>TW: 25 Marks</td>
</tr>
<tr>
<td></td>
<td>OE: 50 Marks</td>
</tr>
</tbody>
</table>

Course Objectives: The course aims to:
2. Understand and apply different image transforms as well as filtering techniques.
3. Understand different morphological operations and segmentation techniques.
4. Explain different color image processing techniques.

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. List fundamental steps involved in Digital Image Processing.
2. Apply different image transforms and filtering techniques on an image.
3. Apply and analyze image enhancement techniques.
4. Demonstrate an application based on image processing.
5. Perform operations on color image processing.
<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Digital Image Fundamentals.</strong>&lt;br&gt;Fundamentals steps in DIP, Components of image processing system, Elements of Visual Perception, Image sensing and acquisition, image sampling and quantization, basic relations between pixels.</td>
<td>08</td>
</tr>
<tr>
<td>II</td>
<td><strong>Image Transforms</strong>&lt;br&gt;Basic intensity transformation: image negation, Log transformation, power law transformation, Piecewise linear transformation functions, arithmetic and Logic operation, Histogram processing (equalization and matching) , sine cosine, Hadamard, Haar, Slant transform .</td>
<td>08</td>
</tr>
<tr>
<td>III</td>
<td><strong>Image filtering</strong>&lt;br&gt;Fundamentals of spatial filtering, smoothening and Sharpening in spatial domain, smoothening and Sharpening in frequency domain.</td>
<td>07</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Morphological image processing</strong>&lt;br&gt;Dilation &amp; erosion, opening and closing operation, Hit- or –miss transformation. Basic morphological algorithms: Boundary extraction, region filling, thinning and thickening, skeletons.</td>
<td>08</td>
</tr>
<tr>
<td>V</td>
<td><strong>Image segmentation</strong>&lt;br&gt;Detection of discontinuities: Point detection, line detection, edge detection, (Sobel, Prewitt, Laplacian), global and adaptive thresholding, Region based segmentation (region growing, region splitting and merging).</td>
<td>08</td>
</tr>
<tr>
<td>VI</td>
<td><strong>Image Compression</strong>&lt;br&gt;Fundamentals, Coding redundancy , interpixel redundancy, fidelity criteria , image compression model, lossless predictive coding, Lossy predictive coding&lt;br&gt;<strong>Color Image Processing</strong>&lt;br&gt;Color fundamentals, Color models , psudicolor, image processing, full color image processing, Color transformations</td>
<td>09</td>
</tr>
</tbody>
</table>

**Text Books:**

1. Digital image processing : Rafael C Gonzalez , Richard E. Woods: Pearson Publication Image
2. Digital image processing and Analysis- B. Chanda , D. Datta , majnudar
Reference Books:

1. Digital image processing- S. Jayraman, S Esakkiarajan , Veerakumar: MGH
2. Digital image processing and Analysis- B. Chanda , D. Datta, majnudar: PHI
3. Digital image processing using Matlab- Rafael C Gonzalez.
5. Digital Image Processing- S. Shridhar
6. Digital Image Processing – Pratt

Practical based on MATLAB programs: Any 8experiments based on above syllabus

1. Reading and Displaying of image (Various image file format)
2. Simple gray level transformation
3. Histogram processing
4. Image smoothening operation
5. Edge detection
6. Morphological operation
7. Segmentation using thresholding
8. Based on image compression
9. Image transforms
10. Color image Processing

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- II (w. e. f. July 2016)
4. Subject: Mechatronics (Elective II)

Teaching Scheme | Examination Scheme
--- | ---
**Lectures**: 3 hrs / week | **Theory**: 100 Marks
**Tutorial**: 1 hr/week | **TW**: 25 Marks

Course Objectives: The course aims to:
1. Study of different Mechanical operations & Processes
2. Study of different Mechanical, Electrical, Chemical Actuators used for mechanical operations.
3. To understand PLC & its applications
4. To study of different types of CNC, DNC machines & its Design

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Student can learn Basic mechanical operations & Processes
2. Students can understand & implement actuators according to need
3. Student can learn understand PLC , its requirements & development of PLC software
4. Students can Design & Develop Electro-mechanical System
<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td><strong>Introduction to mechatronics</strong>&lt;br&gt;What is mechatronics, design of process, systems, measurement of system, Control system, Programmable logic controllers.</td>
<td>06</td>
</tr>
<tr>
<td>II</td>
<td><strong>Actuators and Mechanisms</strong>&lt;br&gt;Introduction, Actuators Types and Application Areas, Electro-mechanical Actuators, DC motor, AC motor, Piezoelectric Actuators, Chemical Actuator, Bearings, Gears.</td>
<td>07</td>
</tr>
<tr>
<td>III</td>
<td><strong>Process Controllers</strong>:&lt;br&gt;Controller Principles, Two position controller (ON/OFF controller), Proportional controller, Integral controller, Derivative controller, Pneumatic controllers, PID controller tuning</td>
<td>06</td>
</tr>
<tr>
<td>IV</td>
<td><strong>Programmable Logic Controllers</strong>:&lt;br&gt;Introduction to PLC, Basic structure of a PLC, Principle of Operation, PLCs versus computer, PLC programming.</td>
<td>06</td>
</tr>
<tr>
<td>V</td>
<td><strong>Introduction to CNC machines</strong>:&lt;br&gt;CNC machines, NC machines, CNC machines, DNC machines, machine structure, Robotics.</td>
<td>06</td>
</tr>
<tr>
<td>VI</td>
<td><strong>Design of Mechatronics system</strong>:&lt;br&gt;Introduction, Mechatronics approach into design, Case Examples, Future Trends-smart homes.</td>
<td>05</td>
</tr>
</tbody>
</table>

**Books:**

2. Mechatronics Integrated mechanical electronic system, K.P Ramachandan, G.K Vijayaraghavan Willey India
4. Programmable logical controller, Reis Webb, Prentice Hall
5. Mechatronics – Appu Kuttam, Oxford publications
Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- II (w. e. f July 2016)
4. Subject: Artificial Neural Networks (Elective-II )

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures : 3 hrs / week</td>
<td>Theory : 100 Marks</td>
</tr>
<tr>
<td>Tutorial : 1 hr/week</td>
<td>TW : 25 Marks</td>
</tr>
</tbody>
</table>

Course Objectives: The course aims to:
1. To understand basic concept of human neurons.
2. Important Terminology of Neural Network
3. Various Learning algorithm of Neural Network.
4. Know the use of ANN for classification

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Use analogy of human neural network for understanding of artificial learning algorithms
2. The student will show skills for using back propagation algorithm.
3. The student will exhibit the knowledge of radial basis function network
4. The student will show understanding of self organizing maps.

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction to Artificial Neural Network</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>Neural Networks, fundamental concept, Evaluation &amp; Basic models of Neural Networks, Important terminology of ANN, McCulloch-Pitts Neurons, Hebb Network</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Supervised Learning Network</td>
<td>06</td>
</tr>
<tr>
<td></td>
<td>Introduction, Perceptron Networks, Adaptive Linear Neuron (Adaline), Multiple Adaptive Linear Neurons</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Back –Propogation Network</td>
<td>07</td>
</tr>
<tr>
<td></td>
<td>Theory, Architecture, Flowchart, Training Algorithm, Learning Factors of Back propogation Network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Radial Basis Function Network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Theory, Architecture,Flowchart for training Process, Training Algorithm</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Associative Memory Network</td>
<td>07</td>
</tr>
<tr>
<td>V</td>
<td>Unsupervised Learning Networks:</td>
<td>07</td>
</tr>
<tr>
<td></td>
<td>Introduction, Fixed Weight Competitive Nets, Kohonen Self-Organtizing Feature Maps, Learning Vector Quantisation, Counterpropagation Networks, Adaptive Resonance Theory Network</td>
<td></td>
</tr>
</tbody>
</table>
VI Application Of ANN
Introduction, Direct Application, Application Areas

Text Books:

2. **Artificial Neural Networks**, B. Yegnanarayana, PHI publication

Reference Books:

1. **Artificial Intelligence**, Third Edition, Elaine Rich, Kevin Knight,
3. **Introduction to Neural Networks** Using MATLAB, Sivanandam, Deepa, TMH publication

Shivaji University, Kolhapur
B.E. (Electronics and Telecommunication) Part- II (w. e. f. July 2016)
4. Subject: Remote Sensing & GPS (Elective-II)

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures: 3 hrs / week</td>
<td>Theory: 100 Marks</td>
</tr>
<tr>
<td>Tutorial: 1 hr/week</td>
<td>TW: 25 Marks</td>
</tr>
</tbody>
</table>

Course Objectives: The course aims to:

1. To provide exposure to students in gaining knowledge on concepts and applications leading to modelling of earth resources management using Remote Sensing.
2. To acquire skills in storing, managing digital data for planning and development.
3. To acquire skills in advance techniques such as hyper spectral, thermal and LiDAR scanning for mapping, modelling and monitoring.

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Fully equipped with concepts, methodologies and applications of Remote Sensing Technology.
2. Prepare the candidates for National and Global Employability.
3. Acquire skills in handling instruments, tools, techniques and modeling while using Remote Sensing Technology.
4. It empowers the candidate with confidence and leadership qualities.
## Unit No | Contents | No. of Hours
--- | --- | ---
II | Types Of Remote Sensing- Classification based on platform, Classification Based on Energy Source, Classification based on Imaging Media, Radar Development, Side looking, Radar System Operation, Geometric characteristics Of Radar Imagery, Transmission characteristics Of Radar System | 08 |
III | Microwave Remote Sensing- Introduction, Passive microwave Sensing, Active microwave Remote Sensing, Radar Imaging, Radar System | 06 |
IV | Data Integration, Analysis and Presentation- Introduction, Multi-approach of Remote Sensing, Integration with ground truth and other acillary data, Transformed data, Integration with GIS, Process of remote sensing data, Limitation of remote sensing Data analysis. | 05 |
V | Application Of Remote Sensing- Introduction, Land Cover and use, Agriculture forestry ,Geology | 03 |

### Text Books:

2. Text Book on remote sensing -Agrawal & gerg
3. Basics of remote sensing and GIS – Dr F Kumar

### Reference Books

1. Remote sensing and image interpretation-lelli sand& keifer
2. Remoter sensing for environment- genson
### Shivaji University, Kolhapur

**B.E. (Electronics and Telecommunication) Part- II (w. e. f. July 2016)**

#### 4. Subject: Operating System (Elective-II)

<table>
<thead>
<tr>
<th>Teaching Scheme</th>
<th>Examination Scheme</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Lectures</strong></td>
<td><strong>Theory</strong></td>
</tr>
<tr>
<td>3 hrs / week</td>
<td>100 Marks</td>
</tr>
<tr>
<td><strong>Tutorial</strong></td>
<td><strong>TW</strong></td>
</tr>
<tr>
<td>1 hrs / week</td>
<td>25 Marks</td>
</tr>
</tbody>
</table>

**Course Objectives:** The course aims to:

1. To understand the concept of operating systems
2. To use knowledge of Operating systems in Hardware systems
3. To understand memory & I/O issues in OS
4. To compare different OS environments

**Course Outcomes:** Upon successful completion of this course, the student will be able to:

1. Know the architecture of operating system
2. Understand Processes & Threading environment in operating systems
3. Know the memory & I/O issues in OS
4. Compare different operating systems

<table>
<thead>
<tr>
<th>Unit No</th>
<th>Contents</th>
<th>No. of Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I</strong></td>
<td><strong>Introduction To Operating System:</strong></td>
<td><strong>06</strong></td>
</tr>
<tr>
<td></td>
<td>Introduction, Operating System: Need, Evolution, Types, Architecture: bootloader, kernel root file system; Hardware Support for Operating System</td>
<td></td>
</tr>
<tr>
<td><strong>II</strong></td>
<td><strong>Process &amp; Threads:</strong></td>
<td><strong>07</strong></td>
</tr>
<tr>
<td></td>
<td>Fundamentals Of Process, Process Scheduling, Process Communication And Synchronization, Threads usage, Implementing threads in user space &amp; kernel space, Multi threading.</td>
<td></td>
</tr>
<tr>
<td><strong>III</strong></td>
<td><strong>Process Management:</strong></td>
<td><strong>06</strong></td>
</tr>
<tr>
<td></td>
<td>Concurrency and race conditions, mutual exclusion requirements, s/w and h/w solutions, semaphores, monitors, classical IPC problem and solutions, Dead locks - characterization, detection, recovery, avoidance and prevention.</td>
<td></td>
</tr>
<tr>
<td><strong>IV</strong></td>
<td><strong>Memory Management:</strong></td>
<td><strong>05</strong></td>
</tr>
<tr>
<td></td>
<td>Memory partitioning, swapping, paging, segmentation, virtual memory - Concepts, Overlays, Demand paging, Performance of demand paging, page replacement algorithm, Allocation algorithms</td>
<td></td>
</tr>
<tr>
<td><strong>V</strong></td>
<td><strong>I/O SYSTEMS</strong></td>
<td><strong>06</strong></td>
</tr>
<tr>
<td></td>
<td>Principles of I/O hardware - I/O devices - device controller - direct memory access Principles of I/O software – Goals -</td>
<td></td>
</tr>
</tbody>
</table>
### Advanced Operating Systems

- Distributed OS, Multiprocessor OS, Mobile OS, RTOS, Multimedia OS
- Case Study: Linux, Windows, Android

### Text Books:


### Reference Books:


### Note:
Minimum 8 tutorials based on above syllabus covering all units.

### Instruction to paper setter:
100% theory

---

**Shivaji university, Kolhapur**

(B.E. (Electronics and Telecommunication) Part- II)

5. Subject: Project

w.e.f July 2015

Practical: 8 hrs/week

TW: 100 Marks

OE: 100 Marks

The project group of semester one will continue the project work in semester two and complete the project in all respect (assembly, testing, fabrication, tabulation, test results etc). Hardcopy of project diary should be maintained GroupWise, where report of every week activity should be maintained, which should be presented at the time of examination. The project work along with project report should be submitted as part of Semester two on or before the last day of the semester -II.
Academic Year: 

Title of project: 

Name of students: 

1. ph.No. Email ID 

2. ph.No. Email ID 

3. ph.No. Email ID 

Student Photographs (ID size, separate) 

Name of the Guide: 

Project Photo with Guide & Students: 

Sign of Guide 

Sign of H.O.D
Conceptual Design of the Project

Block Diagram:
Flow Diagram of the project
Weekly Project Progress Report  (Separate page for each week)

- Date:
- Work Done:

- People Visited:

- Project Notes Prepared:

- Sign of Students:

- Sign of Guide:
**Distribution of Project Term Work Marks:**

<table>
<thead>
<tr>
<th>Roll number</th>
<th>Circuit Diagram</th>
<th>Component Details</th>
<th>Flow Diagram</th>
<th>Programming</th>
<th>Hardware</th>
<th>Total (25)</th>
<th>Round-II</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Semester-I</th>
</tr>
</thead>
<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>Semester-II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<tr>
<td></td>
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</tbody>
</table>

**Note:** Above table can be taken as reference for giving marks for projects

1. For project-I -75 marks of two rounds should be converted to 25 and give training 25 marks as it is.

2. For Project –II -75 marks of two rounds should be converted to 100. There are no training marks in second sem.
Shivaji University, Kolhapur

Revised Syllabus Structure of Final Year Engineering (BE) (w. e. f. 2015)

Electronics and Telecommunication Engineering Course

**Subject Equivalence**

<table>
<thead>
<tr>
<th>Serial Number</th>
<th>New Subject</th>
<th>Old Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Satellite Communication</td>
<td>Satellite Communication</td>
</tr>
<tr>
<td>2</td>
<td>Embedded System</td>
<td>Embedded System</td>
</tr>
<tr>
<td>3</td>
<td>Computer Communication Networks</td>
<td>Computer Communication Networks</td>
</tr>
<tr>
<td>4</td>
<td>RF &amp; Microwave Engineering</td>
<td>Microwave Engineering</td>
</tr>
<tr>
<td>5</td>
<td>Elective-I</td>
<td>Elective-I</td>
</tr>
<tr>
<td>6</td>
<td>Industrial Training</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Project Phase-I</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Video Engineering</td>
<td>Audio &amp; Video Engineering</td>
</tr>
<tr>
<td>9</td>
<td>Wireless Mobile Communication</td>
<td>New</td>
</tr>
<tr>
<td>10</td>
<td>Digital Image Processing</td>
<td>Image Processing</td>
</tr>
<tr>
<td>11</td>
<td>Elective-II</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Project Phase – II</td>
<td></td>
</tr>
</tbody>
</table>
# All India Council for Technical Education

Nelson Mandela Marg, Vasant Kunj, New Delhi-110070

**Academic Calendar 2021-22**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Event for Technical Institutions (Not applicable for Standalone PGDM/PGCM Institutions)</th>
<th>Proposed Schedule for A/Y 2021-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Last date for Grant of Approval to Technical Institutions</td>
<td>30&lt;sup&gt;th&lt;/sup&gt; June, 2021</td>
</tr>
<tr>
<td>2.</td>
<td>Last Date for grant of Affiliation by Universities / Board</td>
<td>15&lt;sup&gt;th&lt;/sup&gt; July, 2021</td>
</tr>
<tr>
<td>3.</td>
<td>Last Date for Completion of First Round of Counselling / Admission for Allotment of Seats</td>
<td>31&lt;sup&gt;st&lt;/sup&gt; August, 2021</td>
</tr>
<tr>
<td>4.</td>
<td>Last Date for Commencement of Classes for Existing Students of Technical Courses</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; September, 2021</td>
</tr>
<tr>
<td>5.</td>
<td>Last Date for Completion of Second Round of Counselling / Admission for Allotment of Seats</td>
<td>9&lt;sup&gt;th&lt;/sup&gt; September, 2021</td>
</tr>
<tr>
<td>6.</td>
<td>Last Date for Cancellation of Seats for Technical Courses with FULL Fee Refund</td>
<td>10&lt;sup&gt;th&lt;/sup&gt; September, 2021</td>
</tr>
<tr>
<td>7.</td>
<td>Last Date up to which First Year Students can be Admitted against Vacancies</td>
<td>15&lt;sup&gt;th&lt;/sup&gt; September, 2021</td>
</tr>
<tr>
<td>8.</td>
<td>Last date for Commencement of Classes for First Year Students of Technical Courses</td>
<td>15th September, 2021</td>
</tr>
<tr>
<td>9.</td>
<td>Last Date for Lateral Entry Admission to Second Year Courses for Newly Admitted Students</td>
<td>20&lt;sup&gt;th&lt;/sup&gt; September, 2021</td>
</tr>
</tbody>
</table>

**Events for Standalone PGDM/PGCM Institutions**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Event for Technical Institutions (Not applicable for Standalone PGDM/PGCM Institutions)</th>
<th>Proposed Schedule for A/Y 2021-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Last Date for Grant of Approval to Standalone PGDM/PGCM Institution</td>
<td>30&lt;sup&gt;th&lt;/sup&gt; June, 2021</td>
</tr>
<tr>
<td>2.</td>
<td>Standalone Technical Institutions conducting PGDM/PGCM Courses shall NOT Initiate the admission before</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; April, 2021</td>
</tr>
<tr>
<td>3.</td>
<td>Commencement of Classes for Existing &amp; New Students in Standalone PGDM / PGCM Institutions</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; July, 2021</td>
</tr>
<tr>
<td>4.</td>
<td>Last date for Cancellation of Admission for Courses in PGDM / PGCM Institutions including FULL Fee Refund</td>
<td>5&lt;sup&gt;th&lt;/sup&gt; July, 2021</td>
</tr>
<tr>
<td>5.</td>
<td>Last Date for Admission to courses in PGDM / PGCM Institutions</td>
<td>10&lt;sup&gt;th&lt;/sup&gt; July, 2021</td>
</tr>
</tbody>
</table>

**Events for Institutions with ODL / Online Programme(s) / Course(s)**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Event for Technical Institutions (Not applicable for Standalone PGDM/PGCM Institutions)</th>
<th>Proposed Schedule for A/Y 2021-22</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Last date for Grant of Approval to institutions Offering ODL / Online Course(s)</td>
<td>30&lt;sup&gt;th&lt;/sup&gt; June, 2021</td>
</tr>
<tr>
<td>2.</td>
<td>Last Date for Admission to Courses in Open and Distance Learning / Online Learning Mode (First Session)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; September, 2021</td>
</tr>
<tr>
<td>3.</td>
<td>Last Date for Admission to Courses in Open and distance Learning / Online learning Mode (Second session)</td>
<td>1&lt;sup&gt;st&lt;/sup&gt; February, 2022</td>
</tr>
</tbody>
</table>

**Note:**

- All the AICTE Approved Institutions / Universities are requested to follow AICTE / UGC Guidelines on Examinations issued from time to time in view of Pandemic.
- The Classes may be started in Online/Offline (Class Room) or Blended mode (Online + offline) following the prescribed protocols / guideline related to pandemic.
- The Academic Calendar may change Subject to the conditions existing due to Pandemic and guideline issued by the Ministry of Health, Ministry of Home & Ministry of Education from time to time.
- Institutions Admitting students without prior approval shall be subjected to punitive action.

(Prof. Rajive Kumar)
Member Secretary, AICTE
<table>
<thead>
<tr>
<th>विद्यालय</th>
<th>प्रथम सत्र</th>
<th>द्वितीय सत्र</th>
<th>सत्रांत्र</th>
<th>सत्रसमाप्ति</th>
</tr>
</thead>
<tbody>
<tr>
<td>कला, नागिनत्व, विज्ञान, सामाजिक शास्त्र आदि (पदवी अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>पद्यपूर्तर अध्यापक (विद्यापीठ और महाविद्यालय)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>कला और ललितकला (गै.आधु.डी. और गै.विद्या.पदवी अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>वाणिज्य और व्यवसायन (गै.वी.ए., गै.वी.एी.ए., पदवी अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>व्यवसाय (पद्यपूर्तर अध्यापक एवं गै.वी.ए., गै.वी.एी.ए.)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>समाजवादी (पदवी अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>समाजवादी (पद्यपूर्तर अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>सिविल (पदवी अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>सिविल (पद्यपूर्तर अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>अभियुक्तीको, टेस्टिंग, विज्ञान, वाङ्गल आदि (पदवी अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>अभियुक्तीको, टेस्टिंग, विज्ञान, वाङ्गल आदि (पद्यपूर्तर अध्यापक)</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
<tr>
<td>आंतरिकिय आधिकृत अध्यापक केन्द्रांगित अध्यापक</td>
<td>22/6/2020</td>
<td>20/3/2021</td>
<td>22/3/2021</td>
<td>20/6/2021</td>
</tr>
</tbody>
</table>

डॉ. कि. कि. नामस्थलकर
कुलशिव

प्रथित,
1. प्राचार्य/संसाधक, सबसे संलग्न महाविद्यालय/ मान्यताप्राप्त विश्वास संस्था.
2. विभागाध्यक्ष, सबसे अधिविद्यालय, विद्यार्थी विद्यापीठ, कोल्हापुर.
3. विभागाध्यक्ष, सबसे प्राचार्यीय विमान, विभागाध्यक्ष, विद्यापीठ, कोल्हापुर.

समर्थक पर्यावरण विद्यापीठ पर लेखक wwww.unishivaji.ac.in - Affiliation-Affiliation
T-1 Circulars के साथ उम्मीद आहेत.

481 D/UGC & Other/PSP/Legal Letter
परिपत्रक

सन 2020-2021 सर्व विद्यालयांच्या पदवी व पदव्युत्तर प्रश्न वाचाच्या सत्तारंभ व सत्तासमापती तारखा खातील प्रमाणे राहतील.

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टीप-1) विद्यापीठ अनुदान आयोगाच्या दिनांक 9/8/2018 वा अधिसूचनेने सत्तारंभ 94.9 नुसार सत्तारंभ व सत्तासमापती तारखा दस्ते विद्यालयांविषयी प्रश्नवस्ती राहतील. 2) सत्तारंभ विद्याशास्त्रीय साहित्यकी सूटी वेळ अर्थात तिथ्या ती काही लोकांना प्रामाणिक कार्यक्रमांतोहात आहेत. 3) विद्यापीठ अनुदान आयोगाच्या अधिसूचनेसारखे पदव्युत्तर सारखे 252 व पदवी सारखे 270 दिवस कामकाज आवश्यक असलेल्या सत्तारंभ व सत्तासमापती तारखावर पदव्युत्तरसारखे व पदवीसारखे दिवस साठी उपलब्ध आहेत. तिथी, 1. प्राध्यापक/वंचनालक, सर्व संलग्न महाविद्यालयांला मान्यताप्राप्ती विषयक संदर्भ. 2.विद्यापीठाचे, सर्व अधिभाषिक, शिक्षावी, विद्यापीठ, कोल्हापुर. 3. विनिमयमुळे, सर्व प्रथमीय विषय, शिक्षणी विद्यापीठ, कोल्हापुर. सदर्शें सूचना विद्यापीठांच्या संबंधितविभागांनी www.unishivaji.ac.in - Affiliation-Affiliation T-1 Circulars म्हणजेच उपलब्ध आहेत. 482 D/UGC & Other/PSP/Legal Letter
<table>
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<tr>
<th>Term Commencement on 22 June 2020</th>
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<td>14 15 16 17 18 19 20</td>
<td>22-Jun-20 Staff Meeting Regarding Academic with Principal</td>
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<td>28 29 30</td>
<td>22-Jun-20 Term Commencement on 22 June 2020</td>
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<td><strong>Number of Academic Days = 08</strong></td>
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| **Jul-20**                       |                             |
| S M T W T F S                     |                             |
| 1 2 3 4 5 6 7                     |                             |
| 13 14 15 16 17 18 19             | 13, 14 & 15 Jul-20 M.T. Term Student Feedback |
| 20 21 22 23 24 25 26             | 18-Jul-20 Meeting of Anti-Ragging Committee |
| 27 28 29 30                      | 20, 21 & 22 July-20 Class Test I |
| **Number of Academic Days = 27** | Last week of July 2020 Bridge Course and Induction Program for First Year B Tech students |

| **Aug-20**                       |                             |
| S M T W T F S                     |                             |
| 30                               |                             |
| 2 3 4 5 6 7 8                     | 1-Aug-20 Bakari Eid |
| 9 10 11 12 13 14 15              | 2-Aug-20 Fresher’s Welcome Function |
| 16 17 18 19 20 21 22             | 15-Aug-20 Independence Day (Flag hoisting at 07:30 AM in SGM campus) |
| 23 24 25 26 27 28 29             | 28, 29 & 31 Aug-20 Class Test II |
| **Number of Academic Days = 22** | 17, 18 & 19 Aug-20 End Term Student Feedback |

| **Sep-20**                       |                             |
| S M T W T F S                     |                             |
| 1 2 3 4 5 6                       | 1-Sep-20 Anant Chaturthi |
| 6 7 8 9 10 11 12                 | 5-Sep-20 Teacher Day |
| 13 14 15 16 17 18 19             | 15-Sep-20 Engineer’s Day |
| 20 21 22 23 24 25 26             | 24, 25 & 26 Sept-20 Additional Improvement Class Test |
| 27 28 29 30                      |                             |
| **Number of Academic Days = 25** |                             |

| **Oct-20**                       |                             |
| S M T W T F S                     |                             |
| 1 2 3 4 5 6                       | 2-Oct-20 Swachata Din & Mahatma Gandhi Jayanti |
| 4 5 6 7 8 9 10                    | 25-Oct-20 Dasara |
| 11 12 13 14 15 16 17             | second Week Oct - 2020 Submission & Internal Oral |
| 18 19 20 21 22 23 24              | Third Week Oct - 2020 Tentative date for Shivaji University POE. |
| 25 26 27 28 29 30 31             | 30-Oct-20 Eid A Milad |
| **Number of Academic Days = 26** |                             |

| **Nov-20**                       |                             |
| S M T W T F S                     |                             |
| 1 2 3 4 5 6 7                     | Third week Nov 2020 Tentative Start of SUK Theory Examination |
| 8 9 10 11 12 13 14                | 13 Nov. to 17 Nov. 2020 Diwali Holiday (17 Nov. adjusted against 30 Nov. Guru Nanak Jayanti) |
| 15 16 17 18 19 20 21              | 28-Nov-20 End of Semester |
| 22 23 24 25 26 27 28              | 30-Nov-20 Meeting of HODs with Principal regarding planning of even semester 2020-21 |
| 29 30                             |                             |
| **Number of Academic Days = 19**  |                             |

**Total number of academic days = 127**

Note:
* Academic Monitoring and Evaluation Committee meeting in every month.
* Guest Lecture & Industrial Visit should be arranged as per Shivaji University Kolhapur norms.
* Professional Communication, General Aptitude, Interview Techniques and other T&P related activities as per T&P schedule.
* There will be no Vehicle Day on every Fourth Saturday.

Dr. Sandyesh Sawant
Principal
### Academic Calendar Odd Semester 2020-21

#### Term Commencement on 22 June 2020

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**Second week of June 2020**
- **Jun-20**
  - Academic Monitoring (Academic Diary, Course File etc)
  - 20-Jun-20 Staff Meeting Regarding Academic with Principal
  - 22-Jun-20 Term Commencement on 22 June 2020

**Number of Academic Days = 08**

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#### Jul-20

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**Second week of July 2020**
- Result Analysis of SUK April/May 2020 examination
- 11-Jul-20 Meeting of Internal Quality Assurance Committee
- 13,14 & 15 July-20 Mid Term Student Feedback
- 18-Jul-20 Meeting of Anti-Ragging Committee

**Number of Academic Days = 27**

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#### Aug-20

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**1-Aug-20 Bakari Eid**
- 8-Aug-20 Freshers - Welcome Function
- 15-Aug-20 Independence Day (Flag hoisting at 07:30 AM in SGM campus)
- 28,29 & 31 Aug-20 Class Test II
- 22-Aug-20 Ganesh Chaturthi
- 27-Aug-20 Gauri Ganapati Visarjan
- 17,18 & 19 Aug-20 End Term Student Feedback
- 30-Aug-20 Moharram

**Number of Academic Days = 22**

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#### Sep-20

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**1-Sep-20 Anant Chaturthi**
- 5-Sep-20 Teacher Day
- 15-Sep-20 Engineer's Day
- 24, 25 & 26 Sept-20 Additional Improvement Class Test

**Number of Academic Days = 25**

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#### Oct-20

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**2-Oct-20 Swachata Din & Mahatma Gandhi Jayanti**
- 25-Oct-20 Dasara
- second Week Oct.- 2020 Submission & Internal Oral
- Third Week Oct.-2020 Tentative date for Shivaji University POE.
- 30-Oct-20 Eid A Milad

**Number of Academic Days = 26**

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#### Nov-20

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**Third week Nov 2020**
- Tentative Start of SUK Theory Examination
- 13 Nov. to 17 Nov 20 Diwali Holiday (17 Nov. adjusted against 30 Nov. Guru Nanak Jayanti )
- 28-Nov-20 End of Semester
- 30-Nov-20 Meeting of HODs with Principal regarding planning of even semester 2020-21

**Number of Academic Days = 19**

**Total number of academic days = 127**

---

**Note:**
- *Academic Monitoring and Evaluation Committee meeting in every month.
- *Guest Lecture & Industrial Visit should be arranged as per Shivaji University Kolhapur norms
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- *There will be No Vehicle Day on every Fourth Saturday.

---

**Prof. S. T. Matale**
Academic Co-Ordinator

**Dr. S. H. Sawant**
Principal
<table>
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<td>Note:</td>
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<td>* Academic Monitoring and Evaluation Committee meeting in every month.</td>
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<td>* There will be 'No Vehicle Day' on every fourth Saturday.</td>
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<td>* Professional Communication, General Aptitude, Interview Techniques and other T&amp;P related activities as per T&amp;P schedule.</td>
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**Prof. S. T. Matale**
Academic Co-Ordinator

**Principal**
Tentative Term End 24th July 2021

### Tentative Academic Calendar Even Semester 2020-21

<table>
<thead>
<tr>
<th>Month</th>
<th>Academic Days</th>
<th>Key Events</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>6-Feb-21 TPO &amp; Co-ordinators Meeting with Principal</td>
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<td></td>
<td></td>
<td>7-Feb-21 Second Week Preliminary Academic Monitoring (Academic Diary, Course File etc)</td>
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<td>8-Feb-21 Staff Meeting Regarding Academic with Principal</td>
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<td>14-Feb-21 Term Commencement on 15 Feb. 2021</td>
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<td>21-Feb-21 Chhatrapati Shivaji Maharaj Jayanti</td>
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<td>27-Feb-21 Meeting of Internal Quality Assurance Committee</td>
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<td>Mar-21</td>
<td>25</td>
<td>22-Mar-21 Mahashivratri</td>
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<td>20-Mar-21 Letter to Parents regarding attendance</td>
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<td>7-Mar-21 Second Week NSS Camp</td>
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<td>14-Mar-21 Kalbhairav Yatra Gadginglaj</td>
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<td>21-Mar-21 Class Test- I</td>
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<td>29-Mar-21 Dhulivandan (Holi)</td>
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<td>Apr-21</td>
<td>20</td>
<td>30-Apr-21 Parents Meet</td>
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<td>20-Apr-21 Annual Cultural Function</td>
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<td>3-Apr-21 Dr. B.R. Ambedkar Jayanti</td>
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<td>4-Apr-21 Technical Event</td>
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<td>10-Apr-21 Good Friday</td>
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<td>11-Apr-21 Gudhi Padava</td>
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<td>21-Apr-21 Ram Navami</td>
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<td>May-21</td>
<td>23</td>
<td>30-May-21 Buddha Purnima</td>
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<td>29-May-21 FareWell Party</td>
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<td>1-May-21 Maharashtra Day</td>
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<td>15-May-21 End of Teaching</td>
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<td>13-May-21 Ramzan Eid</td>
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<td></td>
<td>17, 18 &amp; 19 May-21 Additional Improvement Class Test</td>
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<td>21-May-21 End Term Student Feedback</td>
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<td>26-May-21 Buddha Purnima</td>
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<td>Jun-21</td>
<td>26</td>
<td>First Week Submission &amp; Internal Oral</td>
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<td>6-Jun-21 07 to 19 June 2021 Tentative Date for SUK POE Exam</td>
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<td>13-Jun-21 21-Jun-21 Tentative date for start of SUK Theory exam</td>
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<td>20-Jun-21 Academic &amp; Administrative Audit</td>
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<td>Jul-21</td>
<td>20</td>
<td>Third Week Academic &amp; Administrative Audit</td>
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<td>4-Jul-21 Summer Vacation</td>
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<td>11-Jul-21 End of Semester and End of SUK exam</td>
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<td>18-Jul-21 Bakari Eid</td>
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</table>

**Total Teaching Days = 60**

**Total Academic Days=120**

**Note:**

* Academic Monitoring and Evaluation Committee meeting in every month.
* There will be ‘No Vehicle Day’ on every fourth Saturday.
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* Faculty Development Program should be arranged by each department according to availability of expert.
* Professional Communication, General Aptitude, Interview Techniques and other T&P related activities as per T&P schedule.

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Prof. S. T. Matale  
Academic Co-Ordinator  

Dr. S. H. Sawant  
Principal