PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):
Manufacturing Engineering Graduates are expected, after graduation, to meet the following Program Educational Objectives (PEOs):

1. Be employed in jobs related to designing, modeling, analyzing and managing modern complex systems, implementing and improving systems in manufacturing sectors at local, regional, national and global levels.
2. Have engaged in life-long learning, such as graduate studies and research, certification from professional organizations, fundamentals of engineering certification, or active participation in professional societies/activities.
3. Demonstrate professional success as evidenced by, among others, increased job responsibilities and leadership role at the place of employment and in greater society.

PROGRAMME OUTCOMES (POs):

a. Engineering/Foundational Knowledge in mathematics, engineering sciences, applied probability, computer science, humanities, and social science.
b. Professional Skills to communicate in both oral and written forms and to be proficient in working in diverse teams of individuals.
c. Manufacturing Engineering Knowledge/Skills in materials and manufacturing processes, process, assembly, and product engineering, manufacturing competitiveness, and manufacturing systems design,
d. Confidence in Engineering and professional skills.
e. Understanding of Professional and Ethical Behavior to be prepared for ethical decision making, service to the engineering profession, and have the means to continue in the acquisition of knowledge.

<table>
<thead>
<tr>
<th>PEO/ PO</th>
<th>a.</th>
<th>b.</th>
<th>c.</th>
<th>d.</th>
<th>e.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SEMESTER</td>
<td>Course Title</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>d</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>I</td>
<td>Communicative English</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Mathematics I</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Physics</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Chemistry</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem Solving and Python Programming</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Engineering Graphics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Problem Solving and Python Programming Laboratory</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics and Chemistry Laboratory</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Technical English</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Engineering Mathematics II</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Materials Science</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basic Electrical, Electronics and Instrumentation Engineering</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Environmental Science and Engineering</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Mechanics</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Practices Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basic Electrical, Electronics and Instrumentation Engineering Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>Transforms and Partial Differential Equations</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Metallurgy</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical Drives and Controls</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strength of Materials for Mechanical Engineers</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing Processes – I</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer Aided Machine Drawing</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical Engineering and Measurements Laboratory</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing Technology Laboratory - I</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Interpersonal Skills/Listening &amp; Speaking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>Probability and Statistics</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing Processes – II</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fluid Mechanics and Machinery</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thermodynamics</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanics of Machines</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEMESTER</td>
<td>COURSES</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>YEAR III</td>
<td>Manufacturing Technology Laboratory - II ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strength of Materials and Fluid Mechanics &amp; Machinery Laboratory ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dynamics Laboratory ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Advanced Reading and Writing ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEMESTER V</td>
<td>Casting and Welding Technology ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAD/CAM ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydraulics and Pneumatics ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Machine Design ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Metrology ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Open Elective - I ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metrology Laboratory ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAD/CAM Laboratory ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI</td>
<td>Industrial Management ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design of Jigs, Fixtures and Press Tools ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flexible Manufacturing Systems ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechatronics ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Finite Element Analysis ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Elective I ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechatronics Laboratory ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Communication ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEMESTER VI</td>
<td>Operations Research ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer Integrated Production Management System ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Metal Forming Technology ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Open Elective - II ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Elective II ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Elective III ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer Aided Simulation and Analysis Laboratory ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design and Fabrication Project ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEMESTER VII</td>
<td>Professional Elective IV ✓ ✓ ¡</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Professional Elective V ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Project Work ✓ ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Process Planning and Cost Estimation ✓ ✓ ✓ ✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEM VIII</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### SEMESTER I

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS8151</td>
<td>Communicative English</td>
<td>HS</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MA8151</td>
<td>Engineering Mathematics - I</td>
<td>BS</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>PH8151</td>
<td>Engineering Physics</td>
<td>BS</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>CY8151</td>
<td>Engineering Chemistry</td>
<td>BS</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE8151</td>
<td>Problem Solving and Python Programming</td>
<td>ES</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>GE8152</td>
<td>Engineering Graphics</td>
<td>ES</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE8161</td>
<td>Problem Solving and Python Programming</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>BS8161</td>
<td>Physics and Chemistry Laboratory</td>
<td>BS</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>31</td>
<td>19</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

### SEMESTER II

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS8251</td>
<td>Technical English</td>
<td>HS</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MA8251</td>
<td>Engineering Mathematics - II</td>
<td>BS</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>PH8251</td>
<td>Materials Science</td>
<td>BS</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>BE8253</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering</td>
<td>ES</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE8291</td>
<td>Environmental Science and Engineering</td>
<td>HS</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>GE8292</td>
<td>Engineering Mechanics</td>
<td>ES</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE8261</td>
<td>Engineering Practices Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>BE8261</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>30</td>
<td>20</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>
### SEMESTER III

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MA8353</td>
<td>Transforms and Partial Differential Equations</td>
<td>BS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>ME8491</td>
<td>Engineering Metallurgy</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>EE8353</td>
<td>Electrical Drives and Controls</td>
<td>ES</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>CE8395</td>
<td>Strength of Materials for Mechanical Engineers</td>
<td>ES</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>MF8301</td>
<td>Manufacturing Processes – I</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>ME8381</td>
<td>Computer Aided Machine Drawing</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>EE8312</td>
<td>Electrical Engineering and Measurements Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>ME8361</td>
<td>Manufacturing Technology Laboratory - I</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>HS8381</td>
<td>Interpersonal Skills/Listening &amp; Speaking</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>16</td>
<td>0</td>
<td>14</td>
<td>23</td>
</tr>
</tbody>
</table>

### SEMESTER IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MA8391</td>
<td>Probability and Statistics</td>
<td>BS</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MF8401</td>
<td>Manufacturing Processes – II</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>CE8394</td>
<td>Fluid Mechanics and Machinery</td>
<td>ES</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>MF8491</td>
<td>Thermodynamics</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>PR8451</td>
<td>Mechanics of Machines</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>MF8411</td>
<td>Manufacturing Technology Laboratory - II</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>CE8381</td>
<td>Strength of Materials and Fluid Mechanics &amp; Machinery Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>ME8481</td>
<td>Dynamics Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>HS8461</td>
<td>Advanced Reading and Writing</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>33</td>
<td>17</td>
<td>2</td>
<td>14</td>
<td>25</td>
</tr>
</tbody>
</table>
### SEMESTER V

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MF8501</td>
<td>Casting and Welding Technology</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>ME8592</td>
<td>CAD/CAM</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>ME8694</td>
<td>Hydraulics and Pneumatics</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MF8502</td>
<td>Machine Design</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>MF8503</td>
<td>Engineering Metrology</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Open Elective - I</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**PRACTICAL**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>MF8511</td>
<td>Metrology Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>ME8681</td>
<td>CAD / CAM Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

**TOTAL** 26 18 0 8 22

### SEMESTER VI

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MG8691</td>
<td>Industrial Management</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>ME8095</td>
<td>Design of Jigs, Fixtures and Press Tools</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MF8691</td>
<td>Flexible Manufacturing Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>ME8791</td>
<td>Mechatronics</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>ME8692</td>
<td>Finite Element Analysis</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Professional Elective I</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

**PRACTICAL**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.</td>
<td>ME8781</td>
<td>Mechatronics Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>HS8581</td>
<td>Professional Communication</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

**TOTAL** 24 18 0 6 21
**SEMESTER VII**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MG8491</td>
<td>Operations Research</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MF8701</td>
<td>Computer Integrated Production Management System</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MF8791</td>
<td>Metal Forming Technology</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Open Elective - II</td>
<td>OE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective II</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Professional Elective III</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>MF8761</td>
<td>Computer Aided Simulation and Analysis Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>ME8682</td>
<td>Design and Fabrication Project</td>
<td>EEC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>26</td>
<td>18</td>
<td>8</td>
<td>22</td>
</tr>
</tbody>
</table>

**SEMESTER VIII**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>ME8793</td>
<td>Process Planning and Cost Estimation</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Professional Elective IV</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Professional Elective V</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>MF8811</td>
<td>Project Work</td>
<td>EEC</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>29</td>
<td>9</td>
<td>20</td>
<td>19</td>
</tr>
</tbody>
</table>

**TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 182**
### HUMANITIES AND SOCIAL SCIENCES (HS)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HS8151</td>
<td>Communicative English</td>
<td>HS</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>HS8251</td>
<td>Technical English</td>
<td>HS</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>GE8291</td>
<td>Environmental Science and Engineering</td>
<td>HS</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### BASIC SCIENCE (BS)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MA8151</td>
<td>Engineering Mathematics I</td>
<td>BS</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>PH8151</td>
<td>Engineering Physics</td>
<td>BS</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>CY8151</td>
<td>Engineering Chemistry</td>
<td>BS</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>BS8161</td>
<td>Physics and Chemistry Laboratory</td>
<td>BS</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>MA8251</td>
<td>Engineering Mathematics II</td>
<td>BS</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>PH8251</td>
<td>Materials Science</td>
<td>BS</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>MA8353</td>
<td>Transforms and Partial Differential Equations</td>
<td>BS</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>MA8391</td>
<td>Probability and Statistics</td>
<td>BS</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

### ENGINEERING SCIENCES (ES)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GE8151</td>
<td>Problem Solving and Python Programming</td>
<td>ES</td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>GE8152</td>
<td>Engineering Graphics</td>
<td>ES</td>
<td></td>
<td>6</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>GE8161</td>
<td>Problem Solving and Python Programming Laboratory</td>
<td>ES</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>BE8253</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering Laboratory</td>
<td>ES</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>GE8292</td>
<td>Engineering Mechanics</td>
<td>ES</td>
<td></td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td>GE8261</td>
<td>Engineering Practices Laboratory</td>
<td>ES</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>BE8261</td>
<td>Basic Electrical, Electronics and Instrumentation Engineering Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>EE8353</td>
<td>Electrical Drives and Controls</td>
<td>ES</td>
<td></td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>CE8395</td>
<td>Strength of Materials for Mechanical Engineers</td>
<td>ES</td>
<td></td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>EE8312</td>
<td>Electrical Engineering and Measurements Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CE8394</td>
<td>Fluid Mechanics and Machinery</td>
<td>ES</td>
<td></td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>12</td>
<td>CE8381</td>
<td>Strength of Materials and Fluid Mechanics &amp; Machinery Laboratory</td>
<td>ES</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>SL. NO.</td>
<td>COURSE CODE</td>
<td>COURSE TITLE</td>
<td>CATEGORY</td>
<td>CONTACT PERIODS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>-------------------------------------</td>
<td>----------</td>
<td>-----------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>ME8491</td>
<td>Engineering Metallurgy</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>MF8301</td>
<td>Manufacturing Processes – I</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>ME8381</td>
<td>Computer Aided Machine Drawing</td>
<td>PC</td>
<td>4 0 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>ME8361</td>
<td>Manufacturing Technology Laboratory - I</td>
<td>PC</td>
<td>4 0 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>MF8401</td>
<td>Manufacturing Processes – II</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>MF8491</td>
<td>Thermodynamics</td>
<td>PC</td>
<td>5 2 0 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>PR8451</td>
<td>Mechanics of Machines</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>MF8411</td>
<td>Manufacturing Technology Laboratory - II</td>
<td>PC</td>
<td>4 0 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>ME8481</td>
<td>Dynamics Laboratory</td>
<td>PC</td>
<td>4 0 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>MF8501</td>
<td>Casting and Welding Technology</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>ME8592</td>
<td>CAD/CAM</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>ME8694</td>
<td>Hydraulics and Pneumatics</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>MF8502</td>
<td>Machine Design</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>MF8503</td>
<td>Engineering Metrology</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>MF8511</td>
<td>Metrology Laboratory</td>
<td>PC</td>
<td>4 0 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>ME8681</td>
<td>CAD / CAM Laboratory</td>
<td>PC</td>
<td>4 0 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>MG8691</td>
<td>Industrial Management</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>ME8095</td>
<td>Design of Jigs, Fixtures and Press Tools</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>MF8691</td>
<td>Flexible Manufacturing Systems</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>ME8791</td>
<td>Mechatronics</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>ME8692</td>
<td>Finite Element Analysis</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>ME8781</td>
<td>Mechatronics Laboratory</td>
<td>PC</td>
<td>4 0 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>MF8791</td>
<td>Metal Forming Technology</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>MG8491</td>
<td>Operations Research</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>MF8701</td>
<td>Computer Integrated Production Management System</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>ME8793</td>
<td>Process Planning and Cost Estimation</td>
<td>PC</td>
<td>3 0 0 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>MF8761</td>
<td>Computer Aided Simulation and Analysis Laboratory</td>
<td>PC</td>
<td>4 0 4 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### PROFESSIONAL ELECTIVES FOR MANUFACTURING ENGINEERING

#### SEMESTER VI, ELECTIVE I

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MF8001</td>
<td>Precision Engineering</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MA8491</td>
<td>Numerical Methods</td>
<td>PE</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>MF8002</td>
<td>Introduction to Artificial Intelligence</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>GE8075</td>
<td>Intellectual Property Rights</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE8073</td>
<td>Fundamentals of Nanoscience</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

#### SEMESTER VII, ELECTIVE II

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MF8091</td>
<td>Packaging Materials and Technology</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>ML8491</td>
<td>Powder Metallurgy</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>ME8073</td>
<td>Unconventional Machining Processes</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>ME8098</td>
<td>Quality Control and Reliability Engineering</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>MF8071</td>
<td>Additive Manufacturing</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>GE8071</td>
<td>Disaster Management</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>GE8077</td>
<td>Total Quality Management</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

#### SEMESTER VII, ELECTIVE III

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MF8072</td>
<td>Total Productive Maintenance</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MF8003</td>
<td>Design for Manufacturing</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>ME8097</td>
<td>Non Destructive Testing and Evaluation</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>ME8093</td>
<td>Computational Fluid Dynamics</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>ME8099</td>
<td>Robotics</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>GE8072</td>
<td>Foundation Skills in Integrated Product Development</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>GE8074</td>
<td>Human Rights</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
### SEMESTER VIII, ELECTIVE IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MF8004</td>
<td>Value Engineering and Reengineering</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>MF8005</td>
<td>New and Renewable Sources of Energy</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MF8006</td>
<td>Green and Sustainable Manufacturing</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MF8008</td>
<td>Processing of Plastics and Composite Materials</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VIII, ELECTIVE V

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MF8007</td>
<td>Computer Simulation</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>ME8074</td>
<td>Vibration and Noise Control</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>MG8791</td>
<td>Supply Chain Management</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>GE8076</td>
<td>Professional Ethics in Engineering</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
### EMPLOYABILITY ENHANCEMENT COURSES (EEC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>HS8381</td>
<td>Interpersonal Skills/Listening &amp; Speaking</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>HS8461</td>
<td>Advanced Reading and Writing</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>HS8581</td>
<td>Professional Communication</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>ME8682</td>
<td>Design and Fabrication Project</td>
<td>EEC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>MF8811</td>
<td>Project Work</td>
<td>EEC</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>20</td>
<td>10</td>
</tr>
</tbody>
</table>

### SUMMARY

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>SUBJECT AREA</th>
<th>CREDITS PER SEMESTER</th>
<th>CREDITS TOTAL</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
<td>V</td>
</tr>
<tr>
<td>1.</td>
<td>HS</td>
<td>4</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>BS</td>
<td>12</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>ES</td>
<td>9</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>4.</td>
<td>PC</td>
<td>-</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>5.</td>
<td>PE</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6.</td>
<td>OE</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>7.</td>
<td>EEC</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>25</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>8.</td>
<td>Non Credit / Mandatory</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I  SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS  12

UNIT II GENERAL READING AND FREE WRITING  12
Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and/or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –Listening- telephonic conversations. Speaking – sharing information of a personal kind—greeting – taking leave-Language development – prepositions, conjunctions Vocabulary development- guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT
Reading- short texts and longer passages (close reading) Writing- understanding text structure-use of reference words and discourse markers-coherence-jumbled sentences Listening – listening to longer texts and filling up the table- product description- narratives from different sources. Speaking- asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- direct vs indirect questions- Vocabulary development – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT  12
Reading- comprehension-reading longer texts- reading different types of texts- magazines Writing- letter writing, informal or personal letters-e-mails-conventions of personal email- Listening-listening to dialogues or conversations and completing exercises based on them. Speaking-speaking about oneself- speaking about one’s friend- Language development- Tenses- simple present-simple past- present continuous and past continuous- Vocabulary development-synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING  12
Reading- longer texts- close reading –Writing- brainstorming -writing short essays – developing an outline- identifying main and subordinate ideas- dialogue writing-Listening – listening to talks-conversations- Speaking – participating in conversations- short group conversations-Language development-modal verbs- present/ past perfect tense - Vocabulary development-collocations-fixed and semi-fixed expressions

TOTAL : 60 PERIODS
OUTCOMES: At the end of the course, learners will be able to:
- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:

REFERENCES
3. Redston, Chris & Gillies Cunningham Face2Face (Pre-intermediate Student’s Book& Workbook) Cambridge University Press, New Delhi: 2005

MA8151 ENGINEERING MATHEMATICS – I

OBJECTIVES:
The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

UNIT I DIFFERENTIAL CALCULUS
12
Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maxima and Minima of functions of one variable.

UNIT II FUNCTIONS OF SEVERAL VARIABLES
12

UNIT III INTEGRAL CALCULUS
12
Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.
UNIT IV
MULTIPLE INTEGRALS


UNIT V
DIFFERENTIAL EQUATIONS


TOTAL : 60 PERIODS

OUTCOMES:
After completing this course, students should demonstrate competency in the following skills:

- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

TEXT BOOKS:
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:

PH8151
ENGINEERING PHYSICS

| L | T | P | C |
| 3 | 0 | 0 | 3 |

OBJECTIVES:
- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I
PROPERTIES OF MATTER

UNIT II WAVES AND FIBER OPTICS


UNIT III THERMAL PHYSICS


UNIT IV QUANTUM PHYSICS


UNIT V CRYSTAL PHYSICS

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course,

- the students will gain knowledge on the basics of properties of matter and its applications,
- the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I  WATER AND ITS TREATMENT  9

UNIT II  SURFACE CHEMISTRY AND CATALYSIS  9

UNIT III  ALLOYS AND PHASE RULE  9

UNIT IV  FUELS AND COMBUSTION  9

UNIT V  ENERGY SOURCES AND STORAGE DEVICES  9
Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H₂-O₂ fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:
- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.
TEXT BOOKS:

REFERENCES:

GE8151 PROBLEM SOLVING AND PYTHON PROGRAMMING

OBJECTIVES:
- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures — lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I ALGORITHMIC PROBLEM SOLVING
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards, guess an integer number in a range, Towers of Hanoi.

UNIT II DATA, EXPRESSIONS, STATEMENTS
Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.

UNIT IV LISTS, TUPLES, DICTIONARIES
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file.
OUTCOMES:
Upon completion of the course, students will be able to

- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TOTAL : 45 PERIODS

TEXT BOOKS:

REFERENCES:

GE8152 ENGINEERING GRAPHICS L T P C
2 0 4 4

OBJECTIVES:
- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination) 1
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACE 6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.
UNIT III PROJECTION OF SOLIDS 5+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the
axis is inclined to one of the principal planes by rotating object method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF
SURFACES 5+12
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one
of the principal planes and perpendicular to the other – obtaining true shape of section.
Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and
cones.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12
Principles of isometric projection – isometric scale –Isometric projections of simple solids and
truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple
vertical positions - Perspective projection of simple solids-Prisms, pyramids and cylinders by
visual ray method .

TOTAL: 90 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to

- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of
  objects.
- project orthographic projections of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:
   2009.

REFERENCES:
   Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore,
   2007.
   introduction to Interactive Computer Graphics for Design and Production, Eastern Economy
   Delhi, 2015.

Publication of Bureau of Indian Standards:
   sheets.
Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

GE8161 PROBLEM SOLVING AND PYTHON PROGRAMMING
LABORATORY

OBJECTIVES:
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS
1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton’s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame
13. Simulate bouncing ball using Pygame

PLATFORM NEEDED
Python 3 interpreter for Windows/Linux

OUTCOMES:
Upon completion of the course, students will be able to
- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

TOTAL : 60 PERIODS
OBJECTIVES:
- To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)
1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young’s modulus by non-uniform bending method
3. (a) Determination of wavelength, and particle size using Laser
   (b) Determination of acceptance angle in an optical fiber.
5. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
6. Determination of wavelength of mercury spectrum – spectrometer grating
7. Determination of band gap of a semiconductor
8. Determination of thickness of a thin wire – Air wedge method

TOTAL: 30 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)
OBJECTIVES:
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometry.
1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-
   Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:
- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30 PERIODS

TEXTBOOKS:
OBJECTIVES:
The Course prepares second semester Engineering and Technology students to:
• Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
• Foster their ability to write convincing job applications and effective reports.
• Develop their speaking skills to make technical presentations, participate in group discussions.
• Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialisation.

UNIT I
INTRODUCTION TECHNICAL ENGLISH

UNIT II
READING AND STUDY SKILLS
Listening- Listening to longer technical talks and completing exercises based on them-Speaking – describing a process-Reading – reading longer technical texts- identifying the various transitions in a text- paragraphing- Writing- interpreting charts, graphs- Vocabulary Development-vocabulary used in formal letters/emails and reports Language Development- impersonal passive voice, numerical adjectives.

UNIT III
TECHNICAL WRITING AND GRAMMAR
Listening- Listening to classroom lectures/ talksls on engineering/technology -Speaking – introduction to technical presentations- Reading – longer texts both general and technical, practice in speed reading; Writing-Describing a process, use of sequence words- Vocabulary Development- sequence words- Misspelled words. Language Development- embedded sentences

UNIT IV
REPORT WRITING

UNIT V
GROUP DISCUSSION AND JOB APPLICATIONS
Listening- TED/Ink talks; Speaking –participating in a group discussion -Reading– reading and understanding technical articles Writing– Writing reports- minutes of a meeting- accident and survey-Vocabulary Development- verbal analogies Language Development- reported speech

OUTCOMES: At the end of the course learners will be able to:
• Read technical texts and write area- specific texts effortlessly.
• Listen and comprehend lectures and talks in their area of specialisation successfully.
• Speak appropriately and effectively in varied formal and informal contexts.
• Write reports and winning job applications.

TEXT BOOKS:
REFERENCES

Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

MA8251 ENGINEERING MATHEMATICS – II

OBJECTIVES:
This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modeling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES

UNIT II VECTOR CALCULUS
Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w = z + c$, $cz$, $\frac{1}{z}$, $z^2$ - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION

UNIT V LAPLACE TRANSFORMS

TOTAL: 60 PERIODS
OUTCOMES:
After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigen values and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green’s theorems and their verification.
- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS:

REFERENCES:

MATERIALS SCIENCE

PH8251
(Common to courses offered in Faculty of Mechanical Engineering Except B.E. Materials Science and Engineering )

OBJECTIVES:
- To introduce the essential principles of materials science for mechanical and related engineering applications.

UNIT I PHASE DIAGRAMS
Solid solutions - Hume Rothery's rules – the phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

UNIT II FERROUS ALLOYS
UNIT III MECHANICAL PROPERTIES

UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS

UNIT V NEW MATERIALS

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course,
- the students will have knowledge on the various phase diagrams and their applications
- the students will acquire knowledge on Fe-Fe₃C phase diagram, various microstructures and alloys
- the students will get knowledge on mechanical properties of materials and their measurement
- the students will gain knowledge on magnetic, dielectric and superconducting properties of materials
- the students will understand the basics of ceramics, composites and nanomaterials.

TEXT BOOKS:

REFERENCES
OBJECTIVES:
To impart knowledge on
• Electric circuit laws, single and three phase circuits and wiring
• Working principles of Electrical Machines
• Working principle of Various electronic devices and measuring instruments

UNIT I ELECTRICAL CIRCUITS

UNIT II AC CIRCUITS
Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits – Three phase loads - housing wiring, industrial wiring, materials of wiring

UNIT III ELECTRICAL MACHINES
Principles of operation and characteristics of ; DC machines, Transformers (single and three phase ), Synchronous machines , three phase and single phase induction motors.

UNIT IV ELECTRONIC DEVICES & CIRCUITS

UNIT V MEASUREMENTS & INSTRUMENTATION
Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect and Mechanical - ,Classification of instruments - Types of indicating Instruments - multimeters –Oscilloscopes- – three-phase power measurements– instrument transformers (CT and PT )

OUTCOMES:
Ability to
• Understand electric circuits and working principles of electrical machines
• Understand the concepts of various electronic devices
• Choose appropriate instruments for electrical measurement for a specific application

TEXT BOOKS

REFERENCES
OBJECTIVES:

• To study the nature and facts about environment.
• To finding and implementing scientific, technological, economic and political solutions to environmental problems.
• To study the interrelationship between living organism and environment.
• To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
• To study the dynamic processes and understand the features of the earth’s interior and surface.
• To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY  
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II  ENVIRONMENTAL POLLUTION  
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III  NATURAL RESOURCES  
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.
UNIT IV  SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT

OUTCOMES:
- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXT BOOKS:

REFERENCES:

GE8292  ENGINEERING MECHANICS

OBJECTIVES:
- To develop capacity to predict the effect of force and motion in the course of carrying out the design functions of engineering.

UNIT I  STATICS OF PARTICLES
UNIT II  EQUILIBRIUM OF RIGID BODIES  
Free body diagrams – Types of supports – Action and reaction forces – Stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  
Centroids and centre of mass – Centroids of lines and areas – Rectangular, circular, triangular areas by integration – T section, I section – Angle section, Hollow section by using standard formula – Theorems of Pappus – Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia for prismatic, cylindrical and spherical solids from first principle – Relation to area moments of inertia.

UNIT IV  DYNAMICS OF PARTICLES  

UNIT V  FRICTION AND RIGID BODY DYNAMICS  
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – Wedge friction – Rolling resistance – Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL: 45+30=75 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to
• illustrate the vectorial and scalar representation of forces and moments
• analyse the rigid body in equilibrium
• evaluate the properties of surfaces and solids
• calculate dynamic forces exerted in rigid body
• determine the friction and the effects by the laws of friction

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I  CIVIL ENGINEERING PRACTICE  13
Buildings:
(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.

(e) Demonstration of plumbing requirements of high-rise buildings.

Carpentry using Power Tools only:
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II  MECHANICAL ENGINEERING PRACTICE  18
Welding:
(a) Preparation of butt joints, lap joints and T-joints by Shielded metal arc welding.
(b) Gas welding practice

Basic Machining:
(a) Simple Turning and Taper turning
(b) Drilling Practice

Sheet Metal Work:
(a) Forming & Bending:
(b) Model making – Trays and funnels.
(c) Different type of joints.

Machine assembly practice:
(a) Study of centrifugal pump
(b) Study of air conditioner

Demonstration on:
(a) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.
(b) Foundry operations like mould preparation for gear and step cone pulley.
(c) Fitting – Exercises – Preparation of square fitting and V-fitting models.
GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
5. Measurement of energy using single phase energy meter.

IV ELECTRONICS ENGINEERING PRACTICE
1. Study of Electronic components and equipments – Resistor, colour coding
   measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to
- fabricate carpentry components and pipe connections including plumbing works.
- use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
- CIVIL
  1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
  2. Carpentry vice (fitted to work bench) 15 Nos.
  4. Models of industrial trusses, door joints, furniture joints 5 each
  5. Power Tools: (a) Rotary Hammer 2 Nos
    (b) Demolition Hammer 2 Nos
    (c) Circular Saw 2 Nos
    (d) Planer 2 Nos
    (e) Hand Drilling Machine 2 Nos
    (f) Jigsaw 2 Nos

- MECHANICAL
  1. Arc welding transformer with cables and holders 5 Nos.
  2. Welding booth with exhaust facility 5 Nos.
  3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
  4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
  5. Centre lathe 2 Nos.
  6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

**ELECTRICAL**
1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No.
5. Power Tools: (a) Range Finder 2 Nos
    (b) Digital Live-wire detector 2 Nos

**ELECTRONICS**
1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

---

**BE8261 BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY**

**OBJECTIVE:**
- To train the students in performing various tests on electrical drives, sensors and circuits.

**LIST OF EXPERIMENTS:**
1. Load test on separately excited DC generator
2. Load test on Single phase Transformer
3. Load test on Induction motor
4. Verification of Circuit Laws
5. Verification of Circuit Theorems
6. Measurement of three phase power
7. Load test on DC shunt motor.
8. Diode based application circuits
9. Transistor based application circuits
10. Study of CRO and measurement of AC signals
11. Characteristics of LVDT
12. Calibration of Rotometer
13. RTD and Thermistor

Minimum of 10 Experiments to be carried out :-

**OUTCOMES:**
- Ability to determine the speed characteristic of different electrical machines
- Ability to design simple circuits involving diodes and transistors
- Ability to use operational amplifiers

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>D. C. Motor Generator Set</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>D.C. Shunt Motor</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Single Phase Transformer</td>
<td>2</td>
</tr>
</tbody>
</table>
4 Single Phase Induction Motor 2
5 Ammeter A.C and D.C 20
6 Voltmeters A.C and D.C 20
7 Watt meters LPF and UPF 4
8 Resistors & Breadboards -
9 Cathode Ray Oscilloscopes 4
10 Dual Regulated power supplies 6
11 A.C. Signal Generators 4
12 Transistors (BJT, JFET) -

MA8353 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS 4 0 0 4

OBJECTIVES:
- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12
Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 12

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12
Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.

UNIT IV FOURIER TRANSFORMS 12

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12

TOTAL: 60 PERIODS
OUTCOMES:
Upon successful completion of the course, students should be able to:

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS:

REFERENCES:

ME8491 ENGINEERING METALLURGY

OBJECTIVE:
- To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

UNIT I ALLOYS AND PHASE DIAGRAMS

UNIT II HEAT TREATMENT
UNIT III  FERROUS AND NON-FERROUS METALS

UNIT IV  NON-METALLIC MATERIALS
Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET,PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al2O3, SiC, Si3N4, PSZ and SIALON –Composites- Classifications- Metal Matrix and FRP - Applications of Composites.

UNIT V  MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Explain alloys and phase diagram, Iron-Iron carbide diagram and steel classification.
CO2 Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.
CO3 Summarize the mechanism of plastic deformation and testing mechanical properties.
CO4 Clarify the effect of alloying elements on ferrous and non-ferrous metals.
CO5 Differentiate different non-metallic materials.

TEXT BOOKS:

REFERENCES:

EE8353  ELECTRICAL DRIVES AND CONTROLS

OBJECTIVES:
• To understand the basic concepts of different types of electrical machines and their performance.
• To study the different methods of starting D.C motors and induction motors.
• To study the conventional and solid-state drives

UNIT I  INTRODUCTION
Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors
UNIT II     DRIVE MOTOR CHARACTERISTICS  9
Mechanical characteristics – Speed-Torque characteristics of various types of load and drive
motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single
phase and three phase induction motors.

UNIT III    STARTING METHODS          8
Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase
squirrel cage and slip ring induction motors.

UNIT IV     CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES 10
Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control
system - Using controlled rectifiers and DC choppers – applications.

UNIT V      CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES 10
Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip
power recovery scheme – Using inverters and AC voltage regulators – applications.

TOTAL: 45 PERIODS

OUTCOME:
• Upon Completion of this subject, the students can able to explain different types of
electrical machines and their performance

TEXT BOOKS:

REFERENCES:

STRENGTH OF MATERIALS FOR
MECHANICAL ENGINEERS

CE8395

L  T  P  C
3  0  0  3

OBJECTIVES:
• To understand the concepts of stress, strain, principal stresses and principal planes.
• To study the concept of shearing force and bending moment due to external loads in
determinate beams and their effect on stresses.
• To determine stresses and deformation in circular shafts and helical spring due to torsion.
• To compute slopes and deflections in determinate beams by various methods.
• To study the stresses and deformations induced in thin and thick shells.

UNIT I      STRESS, STRAIN AND DEFORMATION OF SOLIDS  9
Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of
simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains –Stresses
on inclined planes – principal stresses and principal planes – Mohr’s circle of stress.

UNIT II     TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM  9
Beams – types transverse loading on beams – Shear force and bending moment in beams –
Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending–
bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams –
Shear stress distribution.
UNIT III  TORSION  9
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts –
Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical
springs, carriage springs.

UNIT IV  DEFLECTION OF BEAMS  9
Double Integration method – Macaulay’s method – Area moment method for computation of
slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal
theorems.

UNIT V  THIN CYLINDERS, SPHERES AND THICK CYLINDERS  9
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses
and deformation in thin and thick cylinders – spherical shells subjected to internal pressure –
Deformation in spherical shells – Lame’s theorem.

OUTCOMES:
Students will be able to
- Understand the concepts of stress and strain in simple and compound bars, the importance
  of principal stresses and principal planes.
- Understand the load transferring mechanism in beams and stress distribution due to
  shearing force and bending moment.
- Apply basic equation of simple torsion in designing of shafts and helical spring
- Calculate the slope and deflection in beams using different methods.
- Analyze and design thin and thick shells for the applied internal and external pressures.

TEXT BOOKS:

REFERENCES:
   Series, 2010.

MF8301  MANUFACTURING PROCESSES - I  L T P C  3 0 0 3

OBJECTIVES:
At the end of this course the student should be able to understand
- Methods to solve problems on cutting forces, tool life and analytical methods of estimating
cutting temperature.
- Constructional features of lathe, drilling, shaper, planer, boring, broaching, and grinding
  machines, accessories and common operations performed on these machines.
- Machine tool structures, erection and testing of machine tools Concept of automation of
  machine tools.

UNIT I  FUNDAMENTALS OF METAL CUTTING  9
Tool geometry- Mechanics of orthogonal and oblique cutting - mechanism of chip formation- Types
of chips produced in cutting -Cutting forces - Merchant’s circle diagram – simple problems -Cutting
temperature-causes, effects, measurement, estimation and control-Tool failure modes-wear
mechanisms – tool life - simple problems- Machinability -Surface finish and integrity of machined
surfaces- Machining economics- cutting tool materials- Cutting tool reconditioning-Cutting fluids.
UNIT II BASIC MACHINING PROCESSES

UNIT III GRINDING AND FINISHING OPERATIONS

UNIT IV GEAR CUTTING
Gear cutting methods-Kinematics of gear shaping and gear hobbing – template gear cutting methods-Gear generation principles specifications - Bevel gear generator - Gear finishing methods-gear grinding -lapping

UNIT V MACHINE TOOL STRUCTURE AND AUTOMATION
Classification Machine tool structures-Vibration and chatters in machining-erecting and testing of machine tools-Automation: Cam controlled automats, single spindle and multi spindle automats - Swiss type, automatic screw mechanism - Feeding mechanism - Transfer mechanism, Tracer controller mechanism.

OUTCOME:
- Upon completion of this course, the students can able to use different manufacturing process and use this in industry for component production

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To make the students understand and interpret drawings of machine components
• To prepare assembly drawings both manually and using standard CAD packages
• To familiarize the students with Indian Standards on drawing practices and standard components
• To gain practical experience in handling 2D drafting and 3D modeling software systems.

UNIT I  DRAWING STANDARDS & FITS AND TOLERANCES  12

UNIT II  INTRODUCTION TO 2D DRAFTING  16
• Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed drawing.
• Bearings - Bush bearing, Plummer block
• Valves – Safety and non-return valves.

UNIT III  3D GEOMETRIC MODELING AND ASSEMBLY  32
• Couplings – Flange, Universal, Oldham’s, Muff, Gear couplings
• Joints – Knuckle, Gib & cotter, strap, sleeve & cotter joints
• Engine parts – Piston, connecting rod, cross-head (vertical and horizontal), stuffing box, multi-plate clutch
• Miscellaneous machine components – Screw jack, machine vice, tail stock, chuck, vane and gear pump

TOTAL:60 PERIODS

Note: 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D / 3D CAD software

OUTCOMES:
Upon the completion of this course the students will be able to
CO1  Follow the drawing standards, Fits and Tolerances
CO2  Re-create part drawings, sectional views and assembly drawings as per standards

TEXT BOOK:

REFERENCES:

37
OBJECTIVES:
To impart practical knowledge on
- Characteristic of different machines
- Method of speed control of machines
- Measurement of various electrical parameters

LIST OF EXPERIMENTS
1. Study of DC & AC Starters
2. Study of Transducers
3. Wheatstone Bridge and Schering Bridge
4. ADC and DAC Converters
5. Speed Control of DC Shunt Motor
6. Load Test on DC Shunt Motor
7. OCC & Load Characteristics of DC Shunt Generator
8. Load Test on Single-Phase Transformer
9. Load Test on Three-Phase Induction Motor
10. Load Test on Single-Phase Induction Motor.

OUTCOMES
- Ability to perform speed characteristic of different electrical machine.
- Ability to measure various electrical parameter.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
1. DC & AC Starters
2. Transducers
3. Wheatstone Bridge & Schering Bridge
4. ADC & DAC Converters
5. DC Shunt Motor
6. Single-Phase Transformer
7. Three-Phase Induction Motor

ME8361 MANUFACTURING TECHNOLOGY LABORATORY – I

OBJECTIVE:
- To Study and practice the various operations that can be performed in lathe, shaper, drilling, milling machines etc. and to equip with the practical knowledge required in the core industries.

LIST OF EXPERIMENTS
Machining and Machining time estimations for:
1. Taper Turning
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping
8. Fabrication of simple structural shapes using Gas Metal Arc Welding
9. Joining of plates and pipes using Gas Metal Arc Welding/ Arc Welding /Submerged arc welding
10. Preparation of green sand moulds
11. Manufacturing of simple sheet metal components using shearing and bending operations.
12. Manufacturing of sheet metal components using metal spinning on a lathe

TOTAL: 60 PERIODS
OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Demonstrate the safety precautions exercised in the mechanical workshop.
CO2 Make the work piece as per given shape and size using Lathe.
CO3 Join two metals using arc welding.
CO4 Use sheet metal fabrication tools and make simple tray and funnel.
CO5 Use different moulding tools, patterns and prepare sand moulds.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Centre Lathes</td>
<td>7 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>4</td>
<td>Shaper</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Arc welding transformer with cables and holders</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>6</td>
<td>Oxygen and acetylene gas cylinders, blow pipe and other welding outfit</td>
<td>1 No</td>
</tr>
<tr>
<td>7</td>
<td>Moulding table, Moulding equipments</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>8</td>
<td>Sheet metal forming tools and equipments</td>
<td>2 Nos.</td>
</tr>
</tbody>
</table>

HS8381 INTERPERSONAL SKILLS/LISTENING & SPEAKING

OBJECTIVES: The Course will enable learners to:
• Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
• Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
• improve general and academic listening skills
• Make effective presentations.

UNIT I
Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II
Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III
Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail.
UNIT IV
Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V
Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL: 30 PERIODS

OUTCOMES: At the end of the course Learners will be able to:
- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS:

REFERENCES

MA8391
PROBABILITY AND STATISTICS
L T P C
4 0 0 4

OBJECTIVES:
- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I
PROBABILITY AND RANDOM VARIABLES
12
UNIT II  TWO - DIMENSIONAL RANDOM VARIABLES  12
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III  TESTING OF HYPOTHESIS  12
Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV  DESIGN OF EXPERIMENTS  12
One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT V  STATISTICAL QUALITY CONTROL  12
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL : 60 PERIODS

OUTCOMES :
Upon successful completion of the course, students will be able to:
- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS :

REFERENCES :
OBJECTIVES:
At the end of this course the student should be able to understand
- The tools, equipment and principle of operation of primary and secondary manufacturing processes.
- Defects, causes and their remedies of welding, casting and metal forming operations.
- Processing of plastics and fabrication of various types composite material.
- Equipment, principle of operation of nontraditional machining and forming processes.

UNIT I  CASTING PROCESSES  9

UNIT II  METAL FORMING PROCESSES  9
Hot working & Cold working of metals – Forging Machines - Forging operations– Rolling- Types of Rolling mills – Rolling operations – Extrusion – Extrusion processes– Rod, wire and tube drawing - Bending – Principle & types- Deep drawing – Principle & Types Sheet metal forming operations such as squeezing, spinning, peen ,stretch forming and super plastic forming.

UNIT III  FABRICATION PROCESSES  9

UNIT IV  PROCESSING OF PLASTICS AND COMPOSITES  9

UNIT V  UNCONVENTIONAL METHODS OF MANUFACTURING  9

TOTAL : 45 PERIODS

OUTCOME:
- Upon completion of this course, the students can able to use different manufacturing process and use this in industry for component production

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- The properties of fluids and concept of control volume are studied.
- The applications of the conservation laws to flow through pipes are studied.
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps.
- To understand the importance of various types of flow in turbines.

UNIT I  FLUID PROPERTIES AND FLOW CHARACTERISTICS  12
Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II  FLOW THROUGH CIRCULAR CONDUITS  12

UNIT III  DIMENSIONAL ANALYSIS  12
Need for dimensional analysis – methods of dimensional analysis – Similitude – types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

UNIT IV  PUMPS  12

UNIT V  TURBINES  12

TOTAL: 75 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to
- Apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can analyse and calculate major and minor losses associated with pipe flow in piping networks.
- Can mathematically predict the nature of physical quantities.
- Can critically analyse the performance of pumps.
- Can critically analyse the performance of turbines.

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To understand the basic laws of thermodynamics and heat transfer.
- To understand the principle of operation of thermal equipments like IC engine, boilers, turbine and refrigerator etc.

UNIT I  BASIC CONCEPTS OF THERMODYNAMICS 9+6

UNIT II  FIRST AND SECOND LAW OF THERMODYNAMICS 9+6

UNIT III  HEAT ENGINES 9+6

UNIT IV  GASES AND VAPOUR MIXTURES 9+6

UNIT V  HEAT TRANSFER 9+6

OUTCOME:
- Upon completion of this course, the students can able to understand different gas power cycles and use of them in IC and R&AC applications.

TEXT BOOKS

REFERENCES:
OBJECTIVES:
- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To understand the importance of balancing and vibration.

UNIT I  KINEMATICS OF MACHINES  9

UNIT II  GEARS and GEAR TRAINS  9

UNIT III  FRICTION  9
Types of friction – Friction Drives -friction in screw threads – bearings – Friction clutches – Belt drives

UNIT IV  BALANCING AND MECHANISM FOR CONTROL  9
Static and Dynamic balancing – Balancing of revolving and reciprocating masses – Balancing machines -Balancing a single cylinder engine – Balancing of Multi-cylinder inline, V-engines – Partial balancing in engines- Governors and Gyroscopic effects.

UNIT V  VIBRATION  9

OUTCOMES:
Student will be able to
- Understand the principles in the formation of mechanisms and their kinematics.
- Understand the construction features of Gears and Gear Trains.
- Understand the effect of friction in different machine elements.
- Understand the importance of balancing.
- Understand the importance of Governors and Gyroscopic effects.
- Understand the importance of vibration.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
- To Study and acquire knowledge on various basic machining operations in special purpose machines and its applications in real life manufacture of components in the industry

LIST OF EXPERIMENTS:
1. Contour milling using vertical milling machine
2. Spur gear cutting in milling machine
3. Helical Gear Cutting in milling machine
4. Gear generation in hobbing machine
5. Gear generation in gear shaping machine
6. Plain Surface grinding
7. Cylindrical grinding
8. Tool angle grinding with tool and Cutter Grinder
9. Measurement of cutting forces in Milling / Turning Process
10. CNC Part Programming

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Use different machine tools to manufacturing gears
CO2 Ability to use different machine tools to manufacturing gears.
CO3 Ability to use different machine tools for finishing operations
CO4 Ability to manufacture tools using cutter grinder
CO5 Develop CNC part programming

TOTAL: 60 PERIODS

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turret and Capstan Lathes</td>
<td>1 No each</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal Milling Machine</td>
<td>2 No</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>4</td>
<td>Surface Grinding Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Cylindrical Grinding Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Radial Drilling Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Lathe Tool Dynamometer</td>
<td>1 No</td>
</tr>
<tr>
<td>8</td>
<td>Milling Tool Dynamometer</td>
<td>1 No</td>
</tr>
<tr>
<td>9</td>
<td>Gear Hobbing Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>10</td>
<td>Tool Makers Microscope</td>
<td>1 No</td>
</tr>
<tr>
<td>11</td>
<td>CNC Lathe</td>
<td>1 No</td>
</tr>
<tr>
<td>12</td>
<td>CNC Milling machine</td>
<td>1 No</td>
</tr>
<tr>
<td>13</td>
<td>Gear Shaping machine</td>
<td>1 No</td>
</tr>
<tr>
<td>14</td>
<td>Centerless grinding machine</td>
<td>1 No</td>
</tr>
<tr>
<td>15</td>
<td>Tool and cutter grinder</td>
<td>1 No</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To study the mechanical properties of materials when subjected to different types of loading.
- To verify the principles studied in Fluid Mechanics theory by performing experiments in lab.

STRENGTH OF MATERIALS

LIST OF EXPERIMENTS
1. Tension test on a mild steel rod
2. Double shear test on Mild steel and Aluminium rods
3. Torsion test on mild steel rod
4. Impact test on metal specimen
5. Hardness test on metals - Brinnell and Rockwell Hardness Number
6. Deflection test on beams
7. Compression test on helical springs
8. Strain Measurement using Rosette strain gauge
10. Tempering- Improvement Mechanical properties Comparison
   (i) Unhardened specimen
   (ii) Quenched Specimen and
   (iii) Quenched and tempered specimen.
11. Microscopic Examination of
   (i) Hardened samples and
   (ii) Hardened and tempered samples.

OUTCOME:
- Ability to perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Torsion Testing Machine (60 NM Capacity)</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Impact Testing Machine (300 J Capacity)</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Brinell Hardness Testing Machine</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Rockwell Hardness Testing Machine</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Spring Testing Machine for tensile and compressive loads (2500 N)</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Metallurgical Microscopes</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>Muffle Furnace (800 C)</td>
<td>1</td>
</tr>
</tbody>
</table>

FLUID MECHANICS AND MACHINES LABORATORY

LIST OF EXPERIMENTS
1. Determination of the Coefficient of discharge of given Orifice meter.
2. Determination of the Coefficient of discharge of given Venturi meter.
3. Calculation of the rate of flow using Rota meter.
4. Determination of friction factor for a given set of pipes.
5. Conducting experiments and drawing the characteristic curves of centrifugal pump/ submergible pump
6. Conducting experiments and drawing the characteristic curves of reciprocating pump.
7. Conducting experiments and drawing the characteristic curves of Gear pump.
8. Conducting experiments and drawing the characteristic curves of Pelton wheel.
9. Conducting experiments and drawing the characteristics curves of Francis turbine.
10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of this course, the students will be able to:
- Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
- Use the measurement equipments for flow measurement.
- Perform test on different fluid machinery.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Orifice meter setup</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Venturi meter setup</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Rotameter setup</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Pipe Flow analysis setup</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Centrifugal pump/submergible pump setup</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Reciprocating pump setup</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Gear pump setup</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Pelton wheel setup</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Francis turbine setup</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>Kaplan turbine setup</td>
<td>1</td>
</tr>
</tbody>
</table>

ME8481 DYNAMICS LABORATORY

OBJECTIVES:
- To supplement the principles learnt in kinematics and Dynamics of Machinery.
- To understand how certain measuring devices are used for dynamic testing.

LIST OF EXPERIMENTS
1. a) Study of gear parameters.
   b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
   b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system.
   b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus.
   c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
   b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.- Undamped and Damped Natural frequencies. b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
11. a) Balancing of rotating masses. (b) Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses.
    b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.
    c) Determination of transmissibility ratio using vibrating table.

TOTAL : 60 PERIODS

OUTCOMES:
- Ability to demonstrate the principles of kinematics and dynamics of machinery
- Ability to use the measuring devices for dynamic testing.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cam follower setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Motorised gyroscope.</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Governor apparatus - Watt, Porter, Proell and Hartnell governors.</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Whirling of shaft apparatus.</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Dynamic balancing machine.</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Two rotor vibration setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Spring mass vibration system.</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Torsional Vibration of single rotor system setup.</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Gear Models</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Kinematic Models to study various mechanisms.</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Turn table apparatus.</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Transverse vibration setup of</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>a) cantilever</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) Free-Free beam</td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) Simply supported beam.</td>
<td></td>
</tr>
</tbody>
</table>

HS8461 ADVANCED READING AND WRITING

OBJECTIVES:
- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students’ critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I
Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title Writing-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph
UNIT II
Reading-Read for details-Use of graphic organizers to review and aid comprehension Writing-State reasons and examples to support ideas in writing- Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT III
Reading- Understanding pronoun reference and use of connectors in a passage- speed reading techniques-Writing- Elements of a good essay-Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT IV
Reading- Genre and Organization of Ideas- Writing- Email writing- resumes – Job application-project writing-writing convincing proposals.

UNIT V
Reading- Critical reading and thinking- understanding how the text positions the reader- identify Writing- Statement of Purpose- letter of recommendation- Vision statement

OUTCOMES: At the end of the course Learners will be able to:
• Write different types of essays.
• Write winning job applications.
• Read and evaluate texts critically.
• Display critical thinking in various professional contexts.

TEXT BOOKS:

REFERENCES

MF8501 CASTING AND WELDING TECHNOLOGY

OBJECTIVES:
At the end of this course the student should be able to understand
• Melting procedure of various materials
• Design principles of welding and casting
• Principles of advanced welding and casting processes
• Automation of welding and casting plant
UNIT I  MELTING AND POURING  

UNIT II  CASTING DESIGN  
Solidification of pure metals and alloys-shrinkage in cast metals-design of sprue, runner ,gate and risers-problems in design and manufacture of thin and unequal sections-designing for directional solidification, minimum distortion and for overall economy-design problems of L,T,V,X and Y junctions.

UNIT III  WELD DESIGN AND WELDING METALLURGY  
Design of welded components-symbolic representation of welds on drawings- welding classes-residual stresses in welds-weld distortions-design consideration-strength consideration of welded joints-analysis of statistically loaded welded joints-welded structures subjected to fatigue loads.

UNIT IV  SPECIAL CASTING AND WELDING PROCESSES  

UNIT V  QUALITY CONTROL AND AUTOMATION  

OUTCOMES
• Ability to design welding and casting component
• Ability to perform quality control and inspection.

TEXT BOOKS

REFERENCES
OBJECTIVE:
- To provide an overview of how computers are being used in mechanical component design

UNIT I  FUNDAMENTALS OF COMPUTER GRAPHICS  9
Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture- Computer graphics – co-ordinate systems- 2D and 3D transformations homogeneous coordinates - Line drawing -Clipping- viewing transformation

UNIT II  GEOMETRIC MODELING AND VISUAL REALISM  9

UNIT III  ASSEMBLY OF PARTS AND CAD STANDARDS  9
Assembly modelling – interferences of positions and orientation – tolerance analysis-mass property calculations – mechanism simulation and interference checking.
Standards for computer graphics- Graphical Kernel System (GKS) - standards for exchange images- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, CALS etc. - communication standards.

UNIT IV  FUNDAMENTALS OF CAM  9

UNIT V  PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING  9

TOTAL : 45 PERIODS

OUTCOME:
- Upon completion of this course, the students can able to use computer and CAD software’s for modeling of mechanical components

TEXT BOOK:

REFERENCES:
OBJECTIVES:
- To provide student with knowledge on the application of fluid power in process, construction and manufacturing Industries.
- To provide students with an understanding of the fluids and components utilized in modern industrial fluid power system.
- To develop a measurable degree of competence in the design, construction and operation of fluid power circuits.

UNIT I FLUID POWER PRINCIPLES AND HYDRAULIC PUMPS

UNIT II HYDRAULIC ACTUATORS AND CONTROL COMPONENTS

UNIT III HYDRAULIC CIRCUITS AND SYSTEMS
Accumulators, Intensifiers, Industrial hydraulic circuits – Regenerative, Pump Unloading, Double- Pump, Pressure Intensifier, Air-over oil, Sequence, Reciprocation, Synchronization, Fail-Safe, Speed Control, Hydrostatic transmission, Electro hydraulic circuits, Mechanical hydraulic servo systems.

UNIT IV PNEUMATIC AND ELECTRO PNEUMATIC SYSTEMS

UNIT V TROUBLE SHOOTING AND APPLICATIONS

TOTAL:45 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Explain the Fluid power and operation of different types of pumps.
CO2 Summarize the features and functions of Hydraulic motors, actuators and Flow control valves
CO3 Explain the different types of Hydraulic circuits and systems
CO4 Explain the working of different pneumatic circuits and systems
CO5 Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.
TEXT BOOKS:

REFERENCES:

MF8502 MACHINE DESIGN L T P C
3 0 0 3

OBJECTIVES:
• To familiarise the various steps involved in the Design Process
• To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
• To learn to use standard practices and standard data.
• To learn to use catalogues and standard machine components (Use of P S G Design Data Book is permitted)

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS

UNIT II DESIGN OF SHAFTS AND COUPLINGS

UNIT III DESIGN OF TEMPORARY AND PERMANENT JOINTS

UNIT IV DESIGN OF ENERGY STORING ELEMENTS
Design of various types of springs, optimization of helical spings – rubber springs – Design of flywheels considering stresses in rings and arms, for engines and punching machines.

UNIT V DESIGN OF BEARINGS AND MISCELLANEOUS ELEMENTS
Sliding contact and rolling contact bearings – Design of hydrodynamic journal bearings, McKee’s Eqn., Sommerfield Number, Raimondi & Boyd – Selection of Rolling Contact bearings – Design of Seals and Gaskets – Design of Connecting Rod.

TOTAL: 45 PERIODS

OUTCOME:
• Upon completion of this course, the students can able to successfully design engine components and successfully design transmission components used in Engine and machines

54
TEXT BOOKS:

REFERENCES:

MF8503 ENGINEERING METROLOGY
L T P C
3 0 0 3

OBJECTIVE:
• To teach the students basic concepts in various methods of engineering measurement techniques and applications, understand the importance of measurement and inspection in manufacturing industries. Expose the students to various modern metrological instruments and the procedure used to operate these instruments.

UNIT I BASIC CONCEPTS OF MEASUREMENTS

UNIT II LINEAR AND ANGULAR MEASUREMENTS

UNIT III FORM MEASUREMENTS

UNIT IV OPTICAL MEASUREMENTS

UNIT V ADVANCES IN METROLOGY

TOTAL: 45 PERIODS

OUTCOME:
• Upon completion of this course, the students can able to demonstrate different measurement technologies and use of them in Industrial Components
TEXT BOOKS:

REFERENCES:

MF8511 METROLOGY LABORATORY

OBJECTIVE:
- To make the students understand the fundamental principles of measuring techniques by practicing exercises on various measuring instruments.

LIST OF EXPERIMENTS:
Contact methods:
1) Linear and Angular measurement using Autocollimator.
2) Measurement of composite error using gear tester.
3) Calibration of optical comparator and measurement of dimension
4) Determining the accuracy of electrical and optical comparator.
5) Measurement of taper angle using sine bar.
6) Measurement of various angles using Bevel Protractor.
7) Surface assessment using contact roughness tester.
Non-contact measurement techniques:
10) Experiments in CMM.

TOTAL: 60 PERIODS

OUTCOMES:
- Ability to use different metrological equipments and measure different parameters for quality impertion
- Use of the metrological equipments for quality control

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
Autocollimator, Gear Tester, Optical Comparator, Sine Bar, Bevel Protractor, Tool Makers Microscope, CMM, Contact roughness tester, Computers with necessary accessories.

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Autocollimator &amp; Reflector and a straight edge or straight component</td>
<td>1 each</td>
</tr>
<tr>
<td>2.</td>
<td>Gear Tester, Master gear &amp; test gear (s)</td>
<td>1 each</td>
</tr>
<tr>
<td>3.</td>
<td>Optical Comparator, samples &amp; slip gauge set</td>
<td>1 each</td>
</tr>
<tr>
<td>4.</td>
<td>Electrical Comparator, samples &amp; slip gauge set</td>
<td>1 each</td>
</tr>
<tr>
<td>5.</td>
<td>Sine bar, tapered component, dial indicator</td>
<td>1 each</td>
</tr>
</tbody>
</table>
6. Bevel protractor & samples 1 each
7. Roughness tester (Contact & Non contact), machined samples 1 each
8. Tool Makers Microscope & samples, suitable screw threads 1 each
9. Coordinate Measuring Machine & accessories 1 each
10. Gear tooth Vernier Caliper & a suitable master gear 1 each

<table>
<thead>
<tr>
<th>ME8681</th>
<th>CAD/CAM LABORATORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

OBJECTIVES:
- To gain practical experience in handling 2D drafting and 3D modelling software systems.
- To study the features of CNC Machine Tool.
- To expose students to modern control systems (Fanuc, Siemens etc.,)
- To know the application of various CNC machines like CNC lathe, CNC Vertical Machining centre, CNC EDM and CNC wire-cut and studying of Rapid prototyping.

LIST OF EXPERIMENTS
1. 3D GEOMETRIC MODELLING

List of Experiments
1. Introduction of 3D Modeling software

Creation of 3D assembly model of following machine elements using 3D Modelling software
2. Flange Coupling
3. Plummer Block
4. Screw Jack
5. Lathe Tailstock
6. Universal Joint
7. Machine Vice
8. Stuffing box
9. Crosshead
10. Safety Valves
11. Non-return valves
12. Connecting rod
13. Piston
14. Crankshaft
* Students may also be trained in manual drawing of some of the above components


(i) Part Programming - CNC Machining Centre a) Linear Cutting.
   b) Circular cutting.
(ii) Part Programming - CNC Turning Centre a) Straight, Taper and Radius Turning.

30 PERIODS

57
b) Thread Cutting.
c) Rough and Finish Turning
Cycle. d) Drilling and Tapping
Cycle.
3. Computer Aided Part Programming
e) CL Data and Post process generation using CAM packages.
f) Application of CAPP in Machining and Turning Centre.

TOTAL: 60 PERIODS

OUTCOMES
CO1 Draw 3D and Assembly drawing using CAD software
CO2 Demonstrate manual part programming with G and M codes using CAM

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARDWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Computer Server</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Computer nodes or systems (High end CPU with atleast 1 GB main memory) networked to the server</td>
<td>30</td>
</tr>
<tr>
<td>3.</td>
<td>A3 size plotter</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Laser Printer</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>CNC Lathe</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>CNC milling machine</td>
<td>1</td>
</tr>
<tr>
<td>SOFTWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Any High end integrated modeling and manufacturing CAD / CAM software</td>
<td>15 licenses</td>
</tr>
<tr>
<td>8.</td>
<td>CAM Software for machining centre and turning centre (CNC Programming and tool path simulation for FANUC / Sinumeric and Heidenhain controller)</td>
<td>15 licenses</td>
</tr>
<tr>
<td>9.</td>
<td>Licensed operating system</td>
<td>Adequate</td>
</tr>
<tr>
<td>10.</td>
<td>Support for CAPP</td>
<td>Adequate</td>
</tr>
</tbody>
</table>

MG8691 Ind ustrial Management

OBJECTIVE:
• To provide an opportunity to learn basic management concepts essential for business.

UNIT I  INTRODUCTION

UNIT II  FUNCTIONS OF MANAGEMENT
UNIT III ORGANIZATIONAL BEHAVIOUR


UNIT IV GROUP DYNAMICS


UNIT V MODERN CONCEPTS


TOTAL : 45 PERIODS

OUTCOME:

- Students gain knowledge on the basic management principles to become management (s) professional.

TEXT BOOKS


REFERENCES:


ME8095 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

OBJECTIVES:

- To understand the functions and design principles of Jigs, fixtures and press tools
- To gain proficiency in the development of required views of the final design.

UNIT I LOCATING AND CLAMPING PRINCIPLES:


UNIT II JIGS AND FIXTURES

Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.
UNIT III  PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES

UNIT IV  BENDING AND DRAWING DIES

UNIT V  FORMING TECHNIQUES AND EVALUATION
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine Blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke.

TOTAL: 45 PERIODS
Note: (Use of P S G Design Data Book is permitted in the University examination)

OUTCOMES:

Upon the completion of this course the students will be able to
CO1 Summarize the different methods of Locating Jigs and Fixtures and Clamping principles
CO2 Design and develop jigs and fixtures for given component
CO3 Discuss the press working terminologies and elements of cutting dies
CO4 Distinguish between Bending and Drawing dies.
CO5 Discuss the different types of forming techniques

TEXT BOOKS:

REFERENCES:
1. ASTM Fundamentals of Tool Design Prentice Hall of India.

MF8691  FLEXIBLE MANUFACTURING SYSTEMS

OBJECTIVES:
At the end of this course the student should be able to understand
- Modern manufacturing systems
- To understand the concepts and applications of flexible manufacturing systems

UNIT I  PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE MANUFACTURING SYSTEMS
Introduction to FMS—development of manufacturing systems—benefits—major elements—types of flexibility—FMS application and flexibility—single product, single batch, n-batch scheduling problem—knowledge based scheduling system.

UNIT II COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS 9
Introduction—composition of FMS—hierarchy of computer control—computer control of work center and assembly lines—FMS supervisory computer control—types of software specification and selection—trends.

UNIT III FMS SIMULATION AND DATA BASE 9

UNIT IV GROUP TECHNOLOGY AND JUSTIFICATION OF FMS 9
Introduction—matrix formulation—mathematical programming formulation—graph formulation—knowledge based system for group technology—economic justification of FMS—application of possibility distributions in FMS systems justification.

UNIT V APPLICATIONS OF FMS AND FACTORY OF THE FUTURE 9
FMS application in machining, sheet metal fabrication, prismatic component production—aerospace application—FMS development towards factories of the future—artificial intelligence and expert systems in FMS—design philosophy and characteristics for future.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to perform Planning, Scheduling and control of Flexible Manufacturing systems
- Perform simulation on software’s use of group technology to product classification

REFERENCES:

UNIT II  MICROPROCESSOR AND MICROCONTROLLER  9

UNIT III  PROGRAMMABLE PERIPHERAL INTERFACE  9

UNIT IV  PROGRAMMABLE LOGIC CONTROLLER  9
Introduction – Basic structure – Input and output processing – Programming – Mnemonics – Timers, counters and internal relays – Data handling – Selection of PLC.

UNIT V  ACTUATORS AND MECHATRONIC SYSTEM DESIGN  9

TOTAL : 45 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical, Electronic Systems and sensor technology.
CO2 Discuss the architecture of Microprocessor and Microcontroller, Pin Diagram, Addressing Modes of Microprocessor and Microcontroller.
CO3 Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various device interfacing
CO4 Explain the architecture, programming and application of programmable logic controllers to problems and challenges in the areas of Mechatronic engineering.
CO5 Discuss various Actuators and Mechatronics system using the knowledge and skills acquired through the course and also from the given case studies

TEXT BOOKS:

REFERENCES:

ME8692  FINITE ELEMENT ANALYSIS  L  T  P  C
3  0  0  3

OBJECTIVES:
• To introduce the concepts of Mathematical Modeling of Engineering Problems.
• To appreciate the use of FEM to a range of Engineering Problems.

UNIT I
INTRODUCTION
9
Historical Background – Mathematical Modeling of field problems in Engineering – Governing
Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems–
Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz
Technique – Basic concepts of the Finite Element Method.

UNIT II
ONE-DIMENSIONAL PROBLEMS
9
One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher
order Elements – Derivation of Shape functions and Stiffness matrices and force vectors-
Assembly of Matrices - Solution of problems from solid mechanics and heat transfer.
Longitudinal vibration frequencies and mode shapes. Fourth Order Beam Equation –Transverse
deflections and Natural frequencies of beams.

UNIT III
TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS
9
Second Order 2D Equations involving Scalar Variable Functions – Variational formulation –Finite
Element formulation – Triangular elements – Shape functions and element matrices and vectors.
Application to Field Problems - Thermal problems – Torsion of Non circular shafts –Quadrilateral
elements – Higher Order Elements.

UNIT IV
TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS
9
Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Body forces
and temperature effects – Stress calculations - Plate and shell elements.

UNIT V
ISOPARAMETRIC FORMULATION
9
Natural co-ordinate systems – Isoparametric elements – Shape functions for iso parametric
elements – One and two dimensions – Serendipity elements – Numerical integration and
application to plane stress problems - Matrix solution techniques – Solutions Techniques to
Dynamic problems – Introduction to Analysis Software.

TOTAL : 45 PERIODS

OUTCOMES
CO1 Summarize the basics of finite element formulation.
CO2 Apply finite element formulations to solve one dimensional Problems.
CO3 Apply finite element formulations to solve two dimensional Problems.
CO4 Apply finite element method to solve heat transfer and fluid mechanics problems.
CO5 Apply finite element method to solve problems on dynamic analysis.

TEXT BOOKS:
   Hill, 2005
   Delhi, 2007.

REFERENCES:
   Sons, 2005 (Indian Reprint 2013)*
2. Chandrupatla & Belagundu, “Introduction to Finite Elements in Engineering”, 3rd
   Heinemann, 2004
5. Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, “Concepts
ME8781  MECHATRONICS LABORATORY  L  T  P  C
0  0  4  2

OBJECTIVES:
- To know the method of programming the microprocessor and also the design, modeling & analysis of basic electrical, hydraulic & pneumatic Systems which enable the students to understand the concept of mechatronics.

LIST OF EXPERIMENTS:
2. Stepper motor interface.
4. Speed control of DC motor.
5. Study of various types of transducers.
7. Modelling and analysis of basic hydraulic, pneumatic and electrical circuits using Software.
8. Study of PLC and its applications.
9. Study of image processing technique.

TOTAL: 60 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Demonstrate the functioning of mechatronics system with various pneumatic, hydraulic and electrical systems.
CO2 Demonstrate the functioning of control systems with the help of PLC and microcontrollers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Basic Pneumatic Trainer Kit with manual and electrical controls/ PLC Control each</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Basic Hydraulic Trainer Kit</td>
<td>1 No</td>
</tr>
<tr>
<td>3</td>
<td>Hydraulics and Pneumatics Systems Simulation Software</td>
<td>10 No</td>
</tr>
<tr>
<td>4</td>
<td>8051 Microcontroller kit with stepper motor and drive circuit sets</td>
<td>2 No</td>
</tr>
<tr>
<td>5</td>
<td>Image processing system with hardware &amp; software</td>
<td>1 No</td>
</tr>
</tbody>
</table>

HS8581  PROFESSIONAL COMMUNICATION  L  T  P  C
0  0  2  1

OBJECTIVES: The course aims to:
- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I
Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II
Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III
Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV
Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V
Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL : 30 PERIODS

OUTCOMES: At the end of the course Learners will be able to:
• Make effective presentations
• Participate confidently in Group Discussions.
• Attend job interviews and be successful in them.
• Develop adequate Soft Skills required for the workplace

Recommended Software
1. Open Source Software
2. Win English

REFERENCES:

MG8491 OPERATIONS RESEARCH L T P C
3 0 0 3

OBJECTIVE:
• To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems.

UNIT I LINEAR MODELS

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS
UNIT III INVENTORY MODELS
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV QUEUEING MODELS
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V DECISION MODELS

OUTCOME:
- Upon completion of this course, the students can able to use the optimization techniques for use engineering and Business problems

TEXT BOOKS:

REFERENCES:

MF8701 COMPUTER INTEGRATED PRODUCTION MANAGEMENT SYSTEM

OBJECTIVE:
- The course provides basic concepts of production planning and control, its bottlenecks, material requirement planning, shop floor control and different approaches to computer aided process planning in manufacturing sector.

UNIT I MANUFACTURING PLANNING AND CONTROL
Basic concepts - Types of production System - Functions of production planning and control – problems with Production Planning and Control – Computer Integrated Production Management System - Evolution of the MPC system-Demand management in MPC system and the MPC Environment: Make-to-stock, Assembly - to - order, Make - to –order, Engineer-to-order.

UNIT II FORECASTING
UNIT III MATERIAL REQUIREMENT PLANNING


UNIT IV COMPUTER AIDED PROCESS PLANNING


UNIT V SHOP FLOOR CONTROL


OUTCOMES:

At the end of this course the students are expected

- To familiarize the students with computer application in various activities of manufacturing, production and control system.
- To apply appropriate principles and strategies of planning and control, forecasting, material requirement planning, process planning concepts and shop floor control into computer integrated manufacturing system.

TOTAL: 45 PERIODS

TEXT BOOKS:


REFERENCES:


MF8791 METAL FORMING TECHNOLOGY

L T P C
3 0 0 3
OBJECTIVE:
- To understand the principle, procedure and applications of Bulk Metal Forming and Sheet Metal Forming.

UNIT I  FUNDAMENTALS OF METAL FORMING  9

UNIT II  FORGING AND ROLLING  9

UNIT III  EXTRUSION AND DRAWING PROCESSES  9

UNIT IV  SHEET METAL FORMING PROCESSES  9

UNIT V  RECENT ADVANCES  9

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able to
- To understand the fundamental mechanics of metal forming processes
- To learn the principle, classification, equipments used and applications of Rolling and Forging Processes
- To learn the principle, classification, equipment’s used and applications of Extrusion and Drawing Processes
- To understand the principle, procedure of various sheet metal forming processes
- To study about the recent advances in technology for metal forming

TEXT BOOKS:
2. Nagpal G.R. “Metal forming processes”, Khanna publishers, New Delhi, 2004

REFERENCES:
OBJECTIVES:
- To give exposure to software tools needed to analyze engineering problems.
- To expose the students to different applications of simulation and analysis tools.

LIST OF EXPERIMENTS:
A. SIMULATION
1. MATLAB basics, Dealing with matrices, Graphing- Functions of one variable and two variables
2. Use of Matlab to solve simple problems in vibration
3. Mechanism Simulation using software

B. ANALYSIS
1. Force and Stress analysis using link elements in Trusses, cables etc.
2. Stress and deflection analysis in beams with different support conditions.
3. Stress analysis of flat plates and simple shells.
5. Thermal stress and heat transfer analysis of plates.
7. Vibration analysis of spring-mass systems.
8. Model analysis of Beams.
9. Harmonic, transient and spectrum analysis of simple systems.

OUTCOME:
- To train the students to make use of software for simulation and analysis for various applications in the field of manufacturing engineering.

TEXT BOOKS:

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Description of Equipment</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>HARDWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Computers with necessary accessories</td>
<td>30 nos.</td>
</tr>
<tr>
<td>2.</td>
<td>Printer</td>
<td>1 no.</td>
</tr>
<tr>
<td>SOFTWARE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Any Commercially available Finite element analysis software with preprocessor, solver &amp; post processor</td>
<td>30 licenses</td>
</tr>
<tr>
<td>2.</td>
<td>MATLAB Software (Basic modules) or other equivalent software</td>
<td>Min 5 license</td>
</tr>
</tbody>
</table>
• The main objective is to give an opportunity to the student to get hands on training in the fabrication of one or more components of a complete working model, which is designed by them.

GUIDELINE FOR REVIEW AND EVALUATION
The students may be grouped into 2 to 4 and work under a project supervisor. The device/system/component(s) to be fabricated may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group and the fabricated model, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

TOTAL : 60 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 design and Fabricate the machine element or the mechanical product.
CO2 demonstrate the working model of the machine element or the mechanical product.

ME8793 PROCESS PLANNING AND COST ESTIMATION  L T P C
                                        3 0 0 3

OBJECTIVE:
• To introduce the process planning concepts to make cost estimation for various products after process planning

UNIT I    INTRODUCTION TO PROCESS PLANNING  9
Introduction- methods of process planning-Drawing interpretation-Material evaluation – steps in process selection-.Production equipment and tooling selection

UNIT II   PROCESS PLANNING ACTIVITIES  9
Process parameters calculation for various production processes-Selection jigs and fixtures election of quality assurance methods - Set of documents for process planning-Economics of process planning- case studies

UNIT III  INTRODUCTION TO COST ESTIMATION  9
Importance of costing and estimation –methods of costing-elements of cost estimation –Types of estimates – Estimating procedure- Estimation labor cost, material cost- allocation of over head charges- Calculation of depreciation cost

UNIT IV  PRODUCTION COST ESTIMATION  9
Estimation of Different Types of Jobs - Estimation of Forging Shop, Estimation of Welding Shop, Estimation of Foundry Shop

UNIT V  MACHINING TIME CALCULATION  9
Upon the completion of this course the students will be able to
CO1 select the process, equipment and tools for various industrial products.
CO2 prepare process planning activity chart.
CO3 explain the concept of cost estimation.
CO4 compute the job order cost for different type of shop floor.
CO5 calculate the machining time for various machining operations.

TEXT BOOKS:

REFERENCES:

MF8811 PROJECT WORK

OBJECTIVE:
- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

OUTCOME:
- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

MF8001 PRECISION ENGINEERING

OBJECTIVE:
- To impart knowledge in the increasing quality concepts of parts, accuracy requirement of machine tools and also to introduce latest topics in Manufacturing like micro machining and smart materials so as to equip them to join core electronic manufacturing industries.
UNIT I CONCEPTS OF ACCURACY AND MACHINE TOOLS

UNIT II STIFFNESS, THERMAL EFFECTS AND FINISH MACHINING

UNIT III DIMENSIONING
Definition of terms – Key dimension – Superfluous dimension – dimensional stepped shaft – assigning tolerances in the constituent dimensions – dimensional chains.

UNIT IV MICRO-MACHINING MICRO FABRICATION

UNIT V SMART STRUCTURES, MATERIALS AND MICRO ACTUATORS

TOTAL: 45 PERIODS

OUTCOME:
- Upon completion of this course the student can able to use of quality concepts parts, accuracy requirements of machine tools and use of latest machining process such as micro machining and micro fabrication.

TEXT BOOKS:

REFERENCES:
1. MEMS Hand Book, CRC Press, 2001

MA8491 NUMERICAL METHODS

OBJECTIVES:
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals in real life situations.
- To acquaint the student with understanding of numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.
- To understand the knowledge of various techniques and methods of solving various types of partial differential equations.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

UNIT II
INTERPOLATION AND APPROXIMATION
Interpolation with unequal intervals - Lagrange’s interpolation – Newton’s divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton’s forward and backward difference formulae.

UNIT III
NUMERICAL DIFFERENTIATION AND INTEGRATION

UNIT IV
INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS

UNIT V
BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS
Finite difference methods for solving second order two-point linear boundary value problems - Finite difference techniques for the solution of two dimensional Laplace’s and Poisson’s equations on rectangular domain – One dimensional heat flow equation by explicit and implicit (Crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL : 60 PERIODS

OUTCOMES:
Upon successful completion of the course, students should be able to:
• Understand the basic concepts and techniques of solving algebraic and transcendental equations.
• Appreciate the numerical techniques of interpolation and error approximations in various intervals in real life situations.
• Apply the numerical techniques of differentiation and integration for engineering problems.
• Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.
• Solve the partial and ordinary differential equations with initial and boundary conditions by using certain techniques with engineering applications.

TEXT BOOKS:

REFERENCES:
OBJECTIVE:
• The objective of this course is to familiarize the students in the basic principles of Artificial Intelligence and important topics such as Heuristics, game playing, knowledge representation

UNIT I INTRODUCTION

UNIT II GAME PLAYING
Overview – Minimax search procedure – Adding Alpha – Beta cutoffs – Waiting for Quiescence – Secondary search

UNIT III KNOWLEDGE REPRESENTATION

UNIT IV KNOWLEDGE REPRESENTATION USING OTHER LOGIC

UNIT V STRUCTURAL REPRESENTATIONS OF KNOWLEDGE

TOTAL: 45 PERIODS

OUTCOME:
• Use of Artificial Intelligence and tools solve engineering problems.

TEXT BOOK:

REFERENCES:
OBJECTIVE:
- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION
Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad.

UNIT III AGREEMENTS AND LEGISLATIONS

UNIT IV DIGITAL PRODUCTS AND LAW

UNIT V ENFORCEMENT OF IPRs
Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL : 45 PERIODS

OUTCOME:
- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS

REFERENCES
UNIT I INTRODUCTION
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II GENERAL METHODS OF PREPARATION
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III NANOMATERIALS

UNIT IV CHARACTERIZATION TECHNIQUES

UNIT V APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES:
• Will familiarize about the science of nanomaterials
• Will demonstrate the preparation of nanomaterials
• Will develop knowledge in characteristic nanomaterial

TEXT BOOKS :

REFERENCES:
OBJECTIVE:

- To study the fundamentals of packaging, manufacturing process, packaging materials and package testing.

UNIT I  FUNDAMENTALS OF PACKAGING  9
Definition, functions of packaging, types and selection of package, Packaging hazards, interaction of package and contents, materials and machine interface, Environmental and recycling considerations - life cycle assessment Package Design - Fundamentals, factors influencing design, stages in package development, graphic design, Structural design – simulation softwares

UNIT II  PACKAGING MATERIALS  9
Major Plastic packaging materials viz. Polyolefins, Polystyrene, Polyvinylchloride, Polymes, Polyamides (Nylons), Polycarbonate and newer materials such as High Nitrile Polymers, Polyethylene Napthalate (PEN), Nanomaterials, biodegradable materials – properties and applications, recycling; Wood, Paper, Textile, Glass, Metals - Tin, Steel, aluminum, Labelling materials, Cushioning Materials – properties and areas of application.

UNIT III  CONVERSION TECHNOLOGY  9

Surface treatment for printing, Printing processes – offset, flexo, gravure and pad printing.

UNIT IV  SPECIALITY PACKAGING  9
Aerosol packaging, Shrink and Stretch wrapping, Blister packaging, Anti-static packaging, Aseptic packaging, Active packaging, Modified Atmospheric Packaging, Ovenable package; Cosmetic packaging, Hardware packaging, Textile packaging, Food packaging; Child resistant and Health care packaging, Export packaging, Lidding, RFID in packaging.

UNIT V  TESTING  9

TOTAL :45 PERIODS

OUTCOMES

- Ability to effectively use diffuse packing materials.
- Ability to test packaging materials.

TEXT BOOKS

REFERENCES:

ML8491 POWDER METALLURGY

OBJECTIVE:
- This course teaches powder preparation, characterization, compaction and sintering. This knowledge is essential to understand powder metallurgy applications in aerospace, automobile and machining materials.

UNIT I POWDER MANUFACTURE AND CONDITIONING

UNIT II CHARACTERISTICS AND TESTING OF METAL POWDERS
Sampling, chemical composition purity, surface contamination etc. Particle size, and its measurement, Principle and procedure of sieve analysis, microscopic analysis: sedimentation, elutriation, permeability. Adsorption methods and resistivity methods: particle shape, classifications, microstructure, specific surface area, apparent and tap density, green density, green strength, sintered compact density, porosity, shrinkage.

UNIT III POWDER COMPACTION
Pressure less compaction: slip casting and slurry casting, pressure compaction - lubrication, single ended and double ended compaction, isostatic pressing, powder rolling, forging and extrusion, explosive compaction.

UNIT IV SINTERING
Stage of sintering, property changes, mechanisms of sintering, liquid phase sintering and infiltration, activated sintering, hot pressing and Hot Isostatic Pressing (HIP), vacuum sintering, sintering furnaces-batch and continuous-sintering atmosphere, Finishing operations – sizing, coining, repressing and heat treatment, special sintering processes - microwave sintering, Spark plasma sintering, Field assisted sintering, Reactive sintering, sintering of nanostructured materials.
UNIT V APPLICATIONS


TOTAL: 45 PERIODS

OUTCOMES:

- Ability to understand and describe about various ways of producing metal powders.
- Have the knowledge of metal powder characterization.
- Ability to describe the various powder compaction process
- Ability to select appropriate sintering techniques based on the requirement.
- Ability to appreciate the role of powder metallurgy component in various fields.

TEXT BOOKS:


REFERENCES:


ME8073 UNCONVENTIONAL MACHINING PROCESSES L T P C

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

OBJECTIVE:

- To learn about various unconventional machining processes, the various process parameters and their influence on performance and their applications

UNIT I INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES


UNIT II THERMAL AND ELECTRICAL ENERGY BASED PROCESSES

UNIT III CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES


UNIT IV ADVANCED NANO FINISHING PROCESSES

Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magneto rheological abrasive flow finishing their working principles, equipments, effect of process parameters, applications, advantages and limitations.

UNIT V RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES

Recent developments in non-traditional machining processes, their working principles, equipments, effect of process parameters, applications, advantages and limitations. Comparison of non-traditional machining processes.

OUTCOMES:

Upon the completion of this course the students will be able to

CO1 Explain the need for unconventional machining processes and its classification
CO2 Compare various thermal energy and electrical energy based unconventional machining processes.
CO3 Summarize various chemical and electro-chemical energy based unconventional machining processes.
CO4 Explain various nano abrasives based unconventional machining processes.
CO5 Distinguish various recent trends based unconventional machining processes.

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:

ME8098 QUALITY CONTROL AND RELIABILITY ENGINEERING

OBJECTIVES:

- To introduce the concept of SQC
- To understand process control and acceptance sampling procedure and their application.
- To learn the concept of reliability.

UNIT I INTRODUCTION AND PROCESS CONTROL FOR VARIABLES

Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality control: Quality cost-Variation in process causes of variation –Theory of control chart- uses of control chart –X chart, R chart and chart - process capability – process capability studies and simple problems. Six sigma concepts
UNIT II PROCESS CONTROL FOR ATTRIBUTES
Control chart for attributes –control chart for non conformings– p chart and np chart – control chart for nonconformities– C and U charts, State of control and process out of control identification in charts, pattern study.

UNIT III ACCEPTANCE SAMPLING

UNIT IV LIFE TESTING – RELIABILITY

UNIT V QUALITY AND RELIABILITY
Note: Use of approved statistical table permitted in the examination.
TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Summarize the concept of Quality and Process control for variables
CO2 Apply the process control for attributes
CO3 Explain the concept of sampling and to solve problems
CO4 Explain the concept of Life testing
CO5 Explain the concept Reliability and techniques involved

TEXT BOOKS:

REFERENCES:

MF8071 ADDITIVE MANUFACTURING L T P C
3 0 0 3

OBJECTIVES:
• To know the principle, methods, possibilities and limitations as well as environmental effects of Additive Manufacturing technologies.
• To be familiar with the characteristics of the different materials those are used in Additive Manufacturing technologies.

UNIT I INTRODUCTION
UNIT II  DESIGN FOR ADDITIVE MANUFACTURING  9

UNIT III  PHOTOPOLYMERIZATION AND POWDER BED FUSION PROCESSES  9

UNIT IV  EXTRUSION BASED AND SHEET LAMINATION PROCESSES  9

UNIT V  PRINTING PROCESSES AND BEAM DEPOSITION PROCESSES  9

TOTAL: 45 PERIODS

OUTCOME:
• On completion of this course, students will learn about a working principle and construction of Additive Manufacturing technologies, their potential to support design and manufacturing, modern development in additive manufacturing process and case studies relevant to mass customized manufacturing.

TEXT BOOKS:

REFERENCES:

GE8071  DISASTER MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
• To provide students an exposure to disasters, their significance and types.
• To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction
• To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR)
• To enhance awareness of institutional processes in the country and
• To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity
UNIT I INTRODUCTION TO DISASTERS
Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts - in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don’ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)
Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation – Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster – Disaster Damage Assessment.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

OUTCOMES:
The students will be able to
- Differentiate the types of disasters, causes and their impact on environment and society
- Assess vulnerability and various methods of risk reduction measures as well as mitigation.
- Draw the hazard and vulnerability profile of India, Scenarios in the Indian context, Disaster damage assessment and management.

TEXT BOOKS:

REFERENCES
1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
OBJECTIVE:

- To facilitate the understanding of Quality Management principles and process.

UNIT I INTRODUCTION


UNIT II TQM PRINCIPLES

Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I

The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.

UNIT IV TQM TOOLS AND TECHNIQUES II

Quality Circles - Cost of Quality - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY MANAGEMENT SYSTEM


TOTAL: 45 PERIODS

OUTCOME:

- The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.

TEXT BOOK:


REFERENCES:

4. ISO 9001-2015 standards
OBJECTIVES:
At the end of this course the student should be able to understand
• To understand maintenance concepts
• To understand the modern practices in maintenance

UNIT I MAINTENANCE CONCEPTS
Objectives and functions – Tero technology – Reliability Centered Maintenance (RCM) – maintainability prediction – availability and system effectiveness- maintenance costs – maintenance organization

UNIT II MAINTENANCE MODELS
Minimal repair – maintenance types – balancing PM and breakdown maintenance- PM schedules: deviations on both sides of target values – PM schedules: functional characteristics – replacement models

UNIT III TOTAL PRODUCTIVE MAINTENANCE

UNIT IV MAINTENANCE LOGISTICS

UNIT V ONLINE MONITORING

TOTAL: 45 PERIODS

OUTCOMES
• Implementation the concept of total productive maintenance to the industries
• Effectively use the total productive maintenance for online monitoring of processes
TEXT BOOKS

REFERENCES:

MF8003 DESIGN FOR MANUFACTURING

OBJECTIVES:
- To understand the principles of design such the manufacturing of the product is possible.
- Various design aspects to be considered for manufacturing the products using different processes.

UNIT I DESIGN FOR MANUFACTURING APPROACH AND PROCESS 9
Methodologies and tools, design axioms, design for assembly and evaluation, minimum part assessment. Taguchi method, robustness assessment, manufacturing process rules, designer’s tool kit, Computer Aided group Technology, failure mode effective analysis, Value Analysis. Design for minimum number of parts, development of modular design, minimizing part variations, design of parts to be multi-functional, multi-use, ease of fabrication, Poka Yoke principles.

UNIT II GEOMETRIC ANALYSIS 9
Surface finish, review of relationship between attainable tolerance grades and difference machining processes. Analysis of tapers, screw threads, applying probability to tolerances.

UNIT III FORM DESIGN OF CASTINGS AND WELDMENTS 9
Redesign of castings based on parting line considerations, minimising core requirements, redesigning cast members using weldments, use of welding symbols.

UNIT IV MECHANICAL ASSEMBLY 9
Selective assembly, deciding the number of groups, control of axial play, examples, grouped datum systems -different types, geometric analysis and applications - design features to facilitate automated assembly.

UNIT V TRUE POSITION THEORY 9
Virtual size concept, floating and fixed fasteners, projected tolerance zone, assembly with gasket, zero true position tolerance, functional gauges, paper layout gauging, examples. Operation sequence for typical shaft type of components. Preparation of process drawings for different operations, tolerance worksheets and centrality analysis, examples.

TOTAL: 45 PERIODS
OUTCOMES
- Perform designing of components considering manufacture ability
- Ability to design casting and weld structures.
- Ability to use principles of design for assembly

TEXT BOOKS:

REFERENCES:

ME8097 NON DESTRUCTIVE TESTING AND EVALUATION L T P C 3 0 0 3

OBJECTIVE:
- To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

UNIT I OVERVIEW OF NDT 9
NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection – Unaided and aided.

UNIT II SURFACE NDE METHODS 9

UNIT III THERMOGRAPHY AND EDDY CURRENT TESTING (ET) 9
UNIT IV ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE)
9

UNIT V RADIOGRAPHY (RT)
9
Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square law, characteristics of films - graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

TOTAL : 45 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Explain the fundamental concepts of NDT
CO2 Discuss the different methods of NDE
CO3 Explain the concept of Thermography and Eddy current testing
CO4 Explain the concept of Ultrasonic Testing and Acoustic Emission
CO5 Explain the concept of Radiography

TEXT BOOKS:

REFERENCES:

ME8093 COMPUTATIONAL FLUID DYNAMICS L T P C
3 0 0 3

OBJECTIVES:
• To introduce Governing Equations of viscous fluid flows
• To introduce numerical modeling and its role in the field of fluid flow and heat transfer
• To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
• To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers.
UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS

UNIT II FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION

UNIT III FINITE VOLUME METHOD FOR CONVECTION DIFFUSION
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes properties of discretization schemes – Conservativeness, Boundedness, Transportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT IV FLOW FIELD ANALYSIS

UNIT V TURBULENCE MODELS AND MESH GENERATION

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Derive the governing equations and boundary conditions for Fluid dynamics
CO2 Analyze Finite difference and Finite volume method for Diffusion
CO3 Analyze Finite volume method for Convective diffusion
CO4 Analyze Flow field problems
CO5 Explain the Turbulence models and Mesh generation techniques

TOTAL: 45 PERIODS

TEXT BOOKS:

REFERENCES:
OBJECTIVES
- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming
- To learn Robot safety issues and economics.

UNIT I  FUNDAMENTALS OF ROBOT  9
Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II  ROBOT DRIVE SYSTEMS AND END EFFECTORS  9
Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III  SENSORS AND MACHINE VISION  9

UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  9
Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V  IMPLEMENTATION AND ROBOT ECONOMICS  9
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Explain the concepts of industrial robots, classification, specifications and coordinate systems.
Also summarize the need and application of robots in different sectors.
CO2 Illustrate the different types of robot drive systems as well as robot end effectors.
CO3 Apply the different sensors and image processing techniques in robotics to improve the ability of robots.
CO4 Develop robotic programs for different tasks and familiarize with the kinematics of robot.
CO5 Examine the implementation of robots in various industrial sectors and interpolate the economic analysis of robots.
TEXT BOOKS:

REFERENCES:

GE8072 FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT


UNIT II REQUIREMENTS AND SYSTEM DESIGN


UNIT III DESIGN AND TESTING

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines - Concept Screening & Evaluation - Detailed Design - Component Design and Verification –

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:
1. Book specially prepared by NASSCOM as per the MoU.

REFERENCES:
OBJECTIVE:
- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I

UNIT II

UNIT III
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V

TOTAL: 45 PERIODS

OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

MF8004
VALUE ENGINEERING AND REENGINEERING

OBJECTIVES:
- To understand and analyse the theory and methodology of Value Engineering with the Guidelines, Performa and Checklist for a systematic, step by step application of the technique to the current industrial problems.
- To provide the knowledge about Reengineering Principles, the various models and implementation method, which are adopted in the industries.

UNIT I
FUNDAMENTALS OF VALUE ENGINEERING
Value Types – How to add value job plan – Technique employed – who will do value engineering – Organizing the value engineering study – Benefits.
UNIT II  STEP BY STEP APPLICATION OF JOB PLAN  9

UNIT III  WORK SHEETS AND GUIDE LINES  9

UNIT IV  REENGINEERING PRINCIPLES  9

UNIT V  IMPLEMENTATION OF REENGINEERING  8

TOTAL : 45 PERIODS

OUTCOMES
- Use of value engineering and reengineering to the current industrial problem
- Ability to use various models and methods to solve the industrial problem

TEXT BOOKS:
1. Del L. Younker, “Value Engineering” Marcel Dekker, Inc. 2003

REFERENCES:

MF8005  NEW AND RENEWABLE SOURCES OF ENERGY  L T P C
3 0 0 3

OBJECTIVE:
- The student expected to understand and analyze the pattern of renewable energy resources
  Suggest methodologies / technologies for its utilization. Economics of the utilization and environmental merits

UNIT I  SOLAR ENERGY  9

UNIT II  WIND ENERGY  9
UNIT III BIO - ENERGY

UNIT IV OTEC, TIDAL, GEOTHERMAL AND HYDEL ENERGY

UNIT V NEW ENERGY SOURCES
Hydrogen, generation, storage, transport and utilisation, Applications: power generation, transport – Fuel cells – technologies, types – economics and the power generation.

TOTAL:45 PERIODS

OUTCOME
• Use of renewable source for energy conversion

TEXT BOOKS:

REFERENCES:

MF8006 GREEN AND SUSTAINABLE MANUFACTURING

OBJECTIVE
• To impart knowledge on green sustainable manufacturing, polices, best practices for green sustainable manufacturing, lean manufacturing, green energy, sustainable manufacturing for best practices.

UNIT I INTRODUCTION TO GREEN MANUFACTURING
Introduction to Green Manufacturing – need for green manufacturing - Environmental effects and damages - green manufacturing strategies – application and limitations of green manufacturing.
UNIT II SUSTAINABLE MANUFACTURING


UNIT III SUSTAINABLE MANUFACTURING AND POLICIES


UNIT IV SUSTAINABILITY MANUFACTURING BEST PRACTICES

Introduction to best practices of sustainability manufacturing – Manufacturability issues in sustainable product design - Environmentally conscious design/manufacturing processes - Societal impact - Product functionality, serviceability, maintainability, upgradability - Innovative product/process designs for sustainability - Preservation of sustainable development.

UNIT V LEAN MANUFACTURING AND GREEN ENERGY

Introduction to lean Manufacturing - Lean manufacturing tools - Comparison of conventional manufacturing and lean Manufacturing - Advantages and Limitations of lean Manufacturing. Introduction to green energy concepts – Green house effect - Global warming - Climate change - Environmental degradation– Environmental pollution – Pollution due to manufacturing industries - Remedies.

TOTAL: 45PERIODS

OUTCOMES:
At the end of this course the student will be able

- To impart best practices for sustainable green manufacturing in industries, understand polices for sustainable manufacturing.
- Understand concepts in green sustainable manufacturing, polices, best practices for green sustainable manufacturing, lean manufacturing, green energy, sustainable manufacturing for best practices.

TEXT BOOKS:

REFERENCES:

MF8008 PROCESSING OF PLASTICS AND COMPOSITE MATERIALS

OBJECTIVES:
To impart sound knowledge in
- Types of plastics, their structure, properties and applications
- Processing, machinery and joining of plastics
- Processing of Polymer Matrix and Metal Matrix Composites and their applications.

UNIT I INTRODUCTION TO PLASTICS AND COMPOSITES

UNIT II PROCESSING OF PLASTICS

UNIT III MACHINING AND JOINING OF PLASTICS
General Machining properties of plastics – Machining Parameters and their effect – Joining of Plastics – Mechanical Fasteners – Thermal bonding – Press Fitting.

UNIT IV PROCESSING OF POLYMER MATRIX COMPOSITES

UNIT V PROCESSING OF METAL MATRIX COMPOSITES

TOTAL: 45 PERIODS

OUTCOMES
- Ability to identify suitable matrix and reinforcement materials to fabricate composite materials.
- Ability to fabricate PMC, MMC and CMC.
TEXT BOOKS

REFERENCES

MF8007 COMPUTER SIMULATION

OBJECTIVES:
- To understand the importance and advantages of applying simulation techniques for solving various problems on discrete event systems.
- To teach various random number generation techniques, its use in simulation, tests and validity of random numbers etc. Development of simulation models, verification, validation and analysis. Introduction to various simulation languages and comparison

UNIT I INTRODUCTION
Concept of simulation – simulation as a decision making tool-Monte Carlo simulation.

UNIT II RANDOM NUMBERS/VARIATES
Pseudo random numbers – methods of generating random variates – random variates for uniform, normal, binominal, passion, exponential distributions.

UNIT III DESIGN OF SIMULATION EXPERIMENTS
Problem formulation – data collection and reduction – logic developments – initial conditions – run length, tabular method of simulation – development of models using higher level languages for systems like queuing, production, inventory and maintenance – output analysis and interpretation, validation.

UNIT IV DISCRETE SYSTEM SIMULATION LANGUAGES
Need for simulation language – Comparison of simulation languages: SIMSCRIPT, GASP, SIMULA, GPSS, PROMODEL, etc...
UNIT V CASE STUDIES USING SIMULATION LANGUAGES

Development of simulation models using the simulation language studies for systems for systems like, queuing systems, production systems, inventory systems, maintenance and replacement systems, investment analysis and network.

TOTAL: 45 PERIODS

OUTCOMES
- Ability to mathematical skills in simulation.
- Use of simulation languages such as SIMSCRIPT, GASP, SIMULA, GPSS, PROMODEL
- Perform simulation of system like queuing system, production systems, inventory system etc.,

TEXT BOOK

REFERENCES

UNIT I BASICS OF VIBRATION
Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, determination of natural frequencies.

UNIT II BASICS OF NOISE
Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis, tracking analysis, sound quality analysis.

UNIT III AUTOMOTIVE NOISE SOURCES

UNIT IV CONTROL TECHNIQUES
Vibration isolation, tuned absorbers, un-tuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.
UNIT V  SOURCE OF NOISE AND CONTROL
Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption, sound transmission through barriers

OUTCOMES:
Upon the completion of this course the students will be able to
CO1 Summarize the Basics of Vibration
CO2 Summarize the Basics of Noise
CO3 Explain the Sources of Automotive Noise
CO4 Discuss the Control techniques for vibration
CO5 Describe the sources and control of Noise

TEXT BOOK:

REFERENCES:
UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY
The role IT in supply chain - The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

TOTAL: 45 PERIODS

OUTCOME:
• The student would understand the framework and scope of supply chain networks and functions.

TEXT BOOK :

REFERENCES:

GE8076 PROFESSIONAL ETHICS IN ENGINEERING

OBJECTIVE:
• To enable the students to create an awareness on Engineering Ethics and Human Values to instill Moral and Social Values and Loyalty and to appreciate the rights of others.

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS
UNIT V  GLOBAL ISSUES

TOTAL: 45 PERIODS

OUTCOME:
• Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXT BOOKS:

REFERENCES:

Web sources:
1. www.onlineethics.org
2. www.nspe.org
3. www.globaletics.org
4. www.ethics.org