VISION :
To emerge as a Centre of excellence in the field of Industrial Engineering where the world class practices of teaching, learning and research synergize.

MISSION :
- Development of state of the art curriculum to meet the dynamic industry needs.
- Knowledge dissemination through student centric teaching learning process.
- Enriching laboratories with modern facilities
- Research contribution in the field of Industrial Engineering
- Maintaining continuous interaction with industry
- Cultivate the spirit of Entrepreneurship.
PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):
I. Find gainful employment in manufacturing and service sector.
II. Get elevated to managerial position and lead the organization competitively.
III. Enter into higher studies leading to post-graduate and research degrees.
IV. Become consultant and provide solutions to the practical problems of any organization.
V. Become an entrepreneur and be part of a supply chain or make and sell products in the open market.

PROGRAMME OUTCOMES (POs):
After going through the four years of study, our Industrial Engineering Graduates will exhibit ability to:

<table>
<thead>
<tr>
<th>PO#</th>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engineering knowledge</td>
<td>Apply knowledge of mathematics, basic science and engineering science.</td>
</tr>
<tr>
<td>2</td>
<td>Problem analysis</td>
<td>Identify, formulate and solve engineering problems.</td>
</tr>
<tr>
<td>3</td>
<td>Design/development of solutions</td>
<td>Design a system or process to improve its performance, satisfying its constraints.</td>
</tr>
<tr>
<td>4</td>
<td>Conduct investigations of complex problems</td>
<td>Conduct experiments &amp; collect, analyze and interpret the data.</td>
</tr>
<tr>
<td>5</td>
<td>Modern tool usage</td>
<td>Apply various tools and techniques to improve the efficiency of the system.</td>
</tr>
<tr>
<td>6</td>
<td>The Engineer and society</td>
<td>Conduct themselves to uphold the professional and social obligations.</td>
</tr>
<tr>
<td>7</td>
<td>Environment and sustainability</td>
<td>Design the system with environment consciousness and sustainable development.</td>
</tr>
<tr>
<td>8</td>
<td>Ethics</td>
<td>Interacting industry, business and society in a professional and ethical manner.</td>
</tr>
<tr>
<td>9</td>
<td>Individual and team work</td>
<td>Function in a multidisciplinary team.</td>
</tr>
<tr>
<td>10</td>
<td>Communication</td>
<td>Proficiency in oral and written Communication.</td>
</tr>
<tr>
<td>11</td>
<td>Project management and finance</td>
<td>Implement cost effective and improved system.</td>
</tr>
<tr>
<td>12</td>
<td>Life-long learning</td>
<td>Continue professional development and learning as a life-long activity.</td>
</tr>
</tbody>
</table>

PROGRAM SPECIFIC OUTCOMES (PSOs):

By the completion of Industrial Engineering program the student will have following Program specific outcomes:
1. Foundation: Graduates will have a strong foundation in engineering, science and current industrial engineering practices and will have experience in solving structured and unstructured problems using conventional and innovative solutions.
2. Communication: Graduates will have developed their communication and inter personal skills through a variety of individual and team - related activities, both multi - functional and intra - disciplinary.
3. Responsibility: Graduates will have an understanding of ethical and professional responsibilities of an engineer and the impact of engineering solutions on society and the global environment.
4. Design: Graduates will be able to effectively describe the problem, analyze the data, develop potential solutions, evaluate these solutions, and present the results using their oral, written and electronic media skills.

Attested

[Signature]
### PEO / PO Mapping:

<table>
<thead>
<tr>
<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
<th>PROGRAMME OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>PO1    PO2    PO3    PO4    PO5    PO6    PO7    PO8    PO9    PO10    PO11    PO12</td>
</tr>
<tr>
<td>II</td>
<td>✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓</td>
</tr>
<tr>
<td>III</td>
<td>✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓</td>
</tr>
<tr>
<td>IV</td>
<td>✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓</td>
</tr>
<tr>
<td>V</td>
<td>✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓       ✓</td>
</tr>
</tbody>
</table>

### Mapping of Course Outcome and Programme Outcome

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th>Course Name</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sem 1</td>
<td>Technical English</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></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>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basic Sciences Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Workshop Practices Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Physics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mathematics - II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 2</td>
<td>Engineering Mathematics - II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Basics of Electrical and Electronics Engineering</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</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>
<td></td>
<td></td>
<td></td>
<td></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>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</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>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical and Electronics Engineering</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Semester</td>
<td>Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 3</td>
<td>Probability and Statistics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Mechanics of Materials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Economics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing Processes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Facilities Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing Technology Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 4</td>
<td>Environmental Sciences</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work System Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Thermodynamics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Strength of Materials and Fluid Machinery</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work System Design Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Employability Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 5</td>
<td>Total Quality Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operations Research</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Engineering Quality Control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Optimization Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer Aided Drawing Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Year 3</td>
<td>Production and Operations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Design of Experiments</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reliability Engineering</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing Automation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></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>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Analytics Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automation Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sem 6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<td></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>
<td></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>
<td></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>
<td></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>
<td>-----------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>--------------------------</td>
<td>------------</td>
</tr>
<tr>
<td><strong>Sem 7</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sem 8</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS5151</td>
<td>Technical English</td>
<td>HSMC</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>MA5158</td>
<td>Engineering Mathematics - I</td>
<td>BSC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>PH5151</td>
<td>Engineering Physics</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>CY5151</td>
<td>Engineering Chemistry</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>GE5151</td>
<td>Engineering Graphics</td>
<td>ESC</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>BS5161</td>
<td>Basic Sciences Laboratory</td>
<td>BSC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>GE5162</td>
<td>Workshop Practices Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td>1</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>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MA5252</td>
<td>Engineering Mathematics- II</td>
<td>BSC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>GE5153</td>
<td>Problem Solving and Python Programming</td>
<td>ESC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>EE5251</td>
<td>Basics of Electrical and Electronics Engineering</td>
<td>ESC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>GE5152</td>
<td>Engineering Mechanics</td>
<td>ESC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>PH5251</td>
<td>Materials Science</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>GE5161</td>
<td>Problem Solving and Python programming Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>EE5261</td>
<td>Electrical and Electronics Engineering Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>15</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>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L     T   P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MA5354</td>
<td>Probability and Statistics</td>
<td>BSC</td>
<td>3     1   0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>ML5352</td>
<td>Mechanics of Materials</td>
<td>ESC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE5301</td>
<td>Engineering Economics</td>
<td>PCC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>ME5251</td>
<td>Manufacturing Processes</td>
<td>PCC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>IE5302</td>
<td>Facilities Design</td>
<td>PCC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>ME5461</td>
<td>Manufacturing Technology Laboratory</td>
<td>PCC</td>
<td>0     0   4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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>
</tr>
<tr>
<td></td>
<td></td>
<td></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>
</tr>
<tr>
<td></td>
<td></td>
<td></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>
</tr>
<tr>
<td></td>
<td></td>
<td></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>
</tr>
</tbody>
</table>

**TOTAL** 18 1 4 23 21

## SEMESTER IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L     T   P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>GE5251</td>
<td>Environmental Sciences</td>
<td>BSC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>CE5251</td>
<td>Fluid Mechanics and Machinery</td>
<td>ESC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE5401</td>
<td>Work System Design</td>
<td>PCC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MF5351</td>
<td>Thermodynamics</td>
<td>PCC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>ME5452</td>
<td>Mechanics of Machines</td>
<td>PCC</td>
<td>3     0   0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>Audit Course – 1*</td>
<td></td>
<td>AC</td>
<td>3     0   0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>CE5361</td>
<td>Strength of Materials and Fluid Machinery Laboratory</td>
<td>ESC</td>
<td>0     0   4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>IE5411</td>
<td>Work System Design Laboratory</td>
<td>PCC</td>
<td>0     0   2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>HS5461</td>
<td>Employability Skills</td>
<td>EEC</td>
<td>0     0   4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></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>
</tr>
<tr>
<td></td>
<td></td>
<td></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>
</tr>
<tr>
<td></td>
<td></td>
<td></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>
</tr>
<tr>
<td></td>
<td></td>
<td></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>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL** 21 0 10 31 23

*Audit Course is optional.*
<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L    T    P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>GE5451</td>
<td>Total Quality Management</td>
<td>HSMC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE5552</td>
<td>Operations Research</td>
<td>PCC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>ME5553</td>
<td>Machine Design</td>
<td>PCC</td>
<td>3    1    0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>IE5551</td>
<td>Engineering Quality Control</td>
<td>PCC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective-I</td>
<td>PEC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Audit Course – II*</td>
<td>AC</td>
<td>3    0    0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>IE5511</td>
<td>Optimization Laboratory</td>
<td>PCC</td>
<td>0    0    2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>ME5361</td>
<td>Computer Aided Machine Drawing</td>
<td>PCC</td>
<td>0    0    4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>1    6</td>
<td>25</td>
</tr>
</tbody>
</table>

*Audit Course is optional.

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L    T    P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>IE5652</td>
<td>Production and Operations Management</td>
<td>PCC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE5601</td>
<td>Design of Experiments</td>
<td>PCC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE5653</td>
<td>Reliability Engineering</td>
<td>PCC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>IE5651</td>
<td>Manufacturing Automation</td>
<td>PCC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective-II</td>
<td>PEC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Open Elective-I</td>
<td>OEC</td>
<td>3    0    0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>IE5611</td>
<td>Data Analytics Laboratory</td>
<td>PCC</td>
<td>0    0    4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>IE5612</td>
<td>Automation Laboratory</td>
<td>PCC</td>
<td>0    0    2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>0    6</td>
<td>24</td>
</tr>
</tbody>
</table>
## SEMESTER VII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1.</td>
<td>IE5701</td>
<td>Applied Ergonomics</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>IE5702</td>
<td>Simulation Modeling and Analysis</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>IE5751</td>
<td>Supply Chain Management</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Professional Elective-III</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective-IV</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Open Elective-II</td>
<td>OEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>IE5711</td>
<td>Discrete Simulation Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>IE5712</td>
<td>Ergonomics Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>IE5713</td>
<td>Project I</td>
<td>EEC</td>
<td>0</td>
<td>0</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>0</td>
<td>10</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>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td>Professional Elective-V</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Professional Elective-VI</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Professional Elective-VII</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>4.</td>
<td>IE5811</td>
<td>Project II</td>
<td>EEC</td>
<td>0</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>0</td>
<td>16</td>
</tr>
</tbody>
</table>

Total Number of Credits: 166
### HUMANITIES AND SOCIAL SCIENCES (HSMC) – MANAGEMENT AND OTHERS

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Periods per week</th>
<th>Credits</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Practical</td>
</tr>
<tr>
<td>1.</td>
<td>HS5151</td>
<td>Technical English</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>GE5451</td>
<td>Total Quality Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

### HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Periods per week</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
</tr>
<tr>
<td>1.</td>
<td>HU5171</td>
<td>Language and Communication</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>HU5172</td>
<td>Values and Ethics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>HU5173</td>
<td>Human Relations at Work</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>HU5174</td>
<td>Psychological Processes</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>HU5175</td>
<td>Education, Technology and Society</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>HU5176</td>
<td>Philosophy</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>7.</td>
<td>HU5177</td>
<td>Applications of Psychology in Everyday Life</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>

### HSMC– ELECTIVES – HUMANITIES II (EVEN SEMESTER)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Periods per week</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
</tr>
<tr>
<td>1.</td>
<td>HU5271</td>
<td>Gender Culture and Development</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>HU5272</td>
<td>Ethics and Holistic Life</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>HU5273</td>
<td>Law and Engineering</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>HU5274</td>
<td>Film Appreciation</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>HU5275</td>
<td>Fundamentals of Language and Linguistics</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>HU5276</td>
<td>Understanding Society and Culture through Literature</td>
<td>3</td>
<td>0</td>
</tr>
</tbody>
</table>
# BASIC SCIENCE COURSE [BSC]

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Periods per week</th>
<th>Credits</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Practical</td>
</tr>
<tr>
<td>1.</td>
<td>MA5158</td>
<td>Engineering Mathematics - I</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>PH5151</td>
<td>Engineering Physics</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>CY5151</td>
<td>Engineering Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>BS5161</td>
<td>Basic Sciences Laboratory</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>MA5252</td>
<td>Engineering Mathematics-II</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>PH5251</td>
<td>Materials Science</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7.</td>
<td>MA5354</td>
<td>Probability and Statistics</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>8.</td>
<td>GE5251</td>
<td>Environmental Sciences</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

# ENGINEERING SCIENCE COURSE [ESC]

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Periods per week</th>
<th>Credits</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
<td>Practical</td>
</tr>
<tr>
<td>1.</td>
<td>GE5151</td>
<td>Engineering Graphics</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>GE5162</td>
<td>Workshop Practices Laboratory</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>GE5153</td>
<td>Problem Solving and Python programming</td>
<td>3 0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>EE5251</td>
<td>Basics of Electrical and Electronics Engineering</td>
<td>3 0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>GE5152</td>
<td>Engineering Mechanics</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>EE5261</td>
<td>Electrical and Electronics Engineering Laboratory</td>
<td>0 0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>GE5161</td>
<td>Problem Solving and Python programming Laboratory</td>
<td>0 0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>ML5352</td>
<td>Mechanics of Materials</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>9.</td>
<td>CE5361</td>
<td>Strength of Materials and Fluid Machinery Laboratory</td>
<td>0 0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>10.</td>
<td>CE5251</td>
<td>Fluid Mechanics and Machinery</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
AUDIT COURSES (AC)
Registration for any of these courses is optional to students

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Periods per week</th>
<th>Total Contact Periods</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AD5091</td>
<td>Constitution of India</td>
<td>3 0 0</td>
<td>3 0</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>AD5092</td>
<td>Value Education</td>
<td>3 0 0</td>
<td>3 0</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>AD5093</td>
<td>Pedagogy Studies</td>
<td>3 0 0</td>
<td>3 0</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>AD5094</td>
<td>Stress Management by Yoga</td>
<td>3 0 0</td>
<td>3 0</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>AD5095</td>
<td>Personality Development Through Life Enlightenment Skills</td>
<td>3 0 0</td>
<td>3 0</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>AD5096</td>
<td>Unnat Bharat Abhiyan</td>
<td>3 0 0</td>
<td>3 0</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>AD5097</td>
<td>Essence of Indian Knowledge Tradition</td>
<td>3 0 0</td>
<td>3 0</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>AD5098</td>
<td>Sanga Tamil Literature Appreciation</td>
<td>3 0 0</td>
<td>3 0</td>
<td></td>
</tr>
</tbody>
</table>

PROFESSIONAL CORE COURSES [PCC]

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Periods per week</th>
<th>Credits</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IE5301</td>
<td>Engineering Economics</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE5302</td>
<td>Facilities Design</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>ME5251</td>
<td>Manufacturing Processes</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>ME5461</td>
<td>Manufacturing Technology Laboratory</td>
<td>0 0 4</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>IE5401</td>
<td>Work System Design</td>
<td>3 0 0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>MF5351</td>
<td>Thermodynamics</td>
<td>3 0 0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>ME5452</td>
<td>Mechanics of Machines</td>
<td>3 0 0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>CE5391</td>
<td>Strength of Materials and Fluid Machinery Laboratory</td>
<td>0 0 4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>IE5411</td>
<td>Work System Design Laboratory</td>
<td>0 0 2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>10.</td>
<td>IE5552</td>
<td>Operations Research</td>
<td>3 0 0</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>ME5553</td>
<td>Machine Design</td>
<td>3 1 0</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>IE5551</td>
<td>Engineering Quality Control</td>
<td>3 0 0</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>IE5511</td>
<td>Optimization Laboratory</td>
<td>0 0 2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>ME5361</td>
<td>Computer Aided Drawing Laboratory</td>
<td>0 0 4</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>15.</td>
<td>IE5652</td>
<td>Production and Operations Management</td>
<td>3 0 0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>16.</td>
<td>IE5601</td>
<td>Design of Experiments</td>
<td>3 0 0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>17.</td>
<td>IE5653</td>
<td>Reliability Engineering</td>
<td>3 0 0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>18.</td>
<td>IE5651</td>
<td>Manufacturing Automation</td>
<td>3 0 0</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>19.</td>
<td>IE5611</td>
<td>Data Analytics Laboratory</td>
<td>0 0 2</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>20.</td>
<td>IE5612</td>
<td>Automation Laboratory</td>
<td>0 0 2</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>SL. NO.</td>
<td>COURSE CODE</td>
<td>COURSE TITLE</td>
<td>CATEGORY</td>
<td>PERIODS PER WEEK</td>
<td>TOTAL CONTACT PERIODS</td>
</tr>
<tr>
<td>---------</td>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>----------</td>
<td>------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>22</td>
<td>IE5701</td>
<td>Applied Ergonomics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>IE5702</td>
<td>Simulation Modeling and Analysis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>IE5751</td>
<td>Supply Chain Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>IE5711</td>
<td>Discrete Simulation Laboratory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>IE5712</td>
<td>Ergonomics Laboratory</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PROFESSIONAL ELECTIVE COURSES**

**SEMESTER V, ELECTIVE I**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IE5001</td>
<td>Applied Multi-Variate Statistical Analysis</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>IE5002</td>
<td>Computational Methods and Algorithms</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>IE5073</td>
<td>Lean Six Sigma</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

**SEMESTER VI, ELECTIVE II**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IE5074</td>
<td>Machine Learning Algorithms</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>IE5003</td>
<td>Accounting and Finance for Management</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>IE5004</td>
<td>Advanced Optimization Techniques</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</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>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IE5005</td>
<td>Maintenance Engineering and Management</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>IE5006</td>
<td>Robotics Engineering</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>IE5007</td>
<td>Productivity Management and Re-engineering</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
### SEMESTER VII, ELECTIVE IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IE5008</td>
<td>Manufacturing Systems and Models</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE5009</td>
<td>Operations Scheduling</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>ME5075</td>
<td>Entrepreneurship Development</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MG5451</td>
<td>Principles of Management</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</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>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IE5010</td>
<td>Product Design and Value Engineering</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE5077</td>
<td>Systems Engineering</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE5011</td>
<td>Metrology and Inspection</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>IE5012</td>
<td>Project Management</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VIII, ELECTIVE VI

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IE5072</td>
<td>Enterprise Resource Planning</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE5013</td>
<td>Software Engineering and Methodologies</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE5076</td>
<td>Safety Engineering and Management</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>IE5075</td>
<td>Principles of Computer Integrated Manufacturing Systems</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VIII, ELECTIVE VII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IE5014</td>
<td>Introduction to Automotive Systems</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE5015</td>
<td>Cost Estimation and Cost Control</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE5016</td>
<td>Applied Soft Computing</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>IE5071</td>
<td>Decision Support and Intelligent Systems</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</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>PERIODS PER WEEK</th>
<th>CREDITS</th>
<th>SEM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>HS5461</td>
<td>Employability Skills</td>
<td>0 0 4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>IE5713</td>
<td>Project I</td>
<td>0 0 6</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td>IE5811</td>
<td>Project II</td>
<td>0 0 16</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

## SUMMARY

Name of the Programme

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Credits per Semester</th>
<th>Credits Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>II</td>
<td>III</td>
</tr>
<tr>
<td>1.</td>
<td>HSMC</td>
<td>04 00</td>
</tr>
<tr>
<td>2.</td>
<td>BSC</td>
<td>12 07</td>
</tr>
<tr>
<td>3.</td>
<td>ESC</td>
<td>05 14</td>
</tr>
<tr>
<td>4.</td>
<td>PCC</td>
<td>00 00</td>
</tr>
<tr>
<td>5.</td>
<td>PEC</td>
<td>00 00</td>
</tr>
<tr>
<td>6.</td>
<td>OEC</td>
<td>00 00</td>
</tr>
<tr>
<td>7.</td>
<td>EEC</td>
<td>00 00</td>
</tr>
<tr>
<td>Non Credit/AC</td>
<td>0 0</td>
<td>0 0</td>
</tr>
<tr>
<td><strong>Total Credit</strong></td>
<td>21 21</td>
<td>21 23</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
The first semester English course entitled ‘Technical English’ aims to,

- Familiarise first year students of engineering and technology with the fundamental aspects of technical English.
- Develop all the four language skills by giving sufficient practice in the use of the skills in real life contexts.
- Enhance the linguistic and communicative competence of first year engineering and technology students.

UNIT I  INTRODUCING ONESELF  12
Listening: Listening and filling a form, listening to speeches by specialists from various branches of engineering and completing activities such as answering questions, identifying the main ideas of the listening text, style of the speaker (tone and tenor) – Speaking: Introducing oneself – introducing friend/ family - Reading: Descriptive passages (from newspapers / magazines)- Writing: Writing a paragraph (native place, school life)- Grammar: Simple present, present continuous – Vocabulary Development: One word substitution

UNIT II  DIALOGUE WRITING  12
Listening: Listening to conversations (asking for and giving directions) – Speaking: making conversation using (asking for directions, making an enquiry), Role plays-dialogues- Reading: Reading a print interview and answering comprehension questions-Writing: Writing a checklist, Dialogue writing- Grammar: Simple past – question formation (Wh- questions, Yes or No questions, Tag questions)- Vocabulary Development: Stress shift, lexical items related to the theme of the given unit.

UNIT III  FORMAL LETTER WRITING  12
Listening: Listening to speeches by famous people and identifying the central message of the speech – answering multiple-choice questions)-Speaking: Giving short talks on a given topic-Reading: Reading motivational essays on famous engineers and technologists (answering open-ended and closed questions)- Writing: Writing formal letters/ emails (Complaint letters)-Grammar: Future Tense forms of verbs, subject and verb agreement-Vocabulary Development: Collocations – Fixed expressions

UNIT IV  WRITING COMPLAINT LETTERS  12

UNIT V  WRITING DEFINITIONS AND PRODUCT DESCRIPTION  12
Listening: Listening to a product description (labeling and gap filling) exercises- Speaking: Describing a product and comparing and contrasting it with other products- Reading: Reading graphical material for comparison (advertisements)-Writing: Writing Definitions (short and long) – compare and contrast paragraphs- Grammar: Adjectives – Degrees of comparison - compound nouns- Vocabulary Development: Use of discourse markers – suffixes (adjectival endings).

TOTAL: 60 PERIODS

LEARNING OUTCOMES:
At the end of the course the students will have gained,

- Exposure to basic aspects of technical English.
- The confidence to communicate effectively in various academic situations.
- Learnt the use of basic features of Technical English.
TEXT BOOK:

ASSESSMENT PATTERN:
- Assessments will assess all the four skills through both pen and paper and computer based tests.
- Assessments can be pen and paper based, quizzes.

MA5158 ENGINEERING MATHEMATICS – I
(Common to all branches of B.E. / B.Tech. Programmes in I Semester)

L 3 T 1 P 0 C 4

COURSE OBJECTIVES:
- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications.

UNIT I MATRICES
12

UNIT II DIFFERENTIAL CALCULUS
12

UNIT III FUNCTIONS OF SEVERAL VARIABLES
12

UNIT IV 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 V MULTIPLE INTEGRALS
12

TOTAL: 60 PERIODS
COURSE OUTCOMES:

At the end of the course the students will be able to

- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEXT BOOKS:


REFERENCES:


PH5151 ENGINEERING PHYSICS (Common to all branches of B.E / B.Tech programmes) 3 0 0 3

COURSE OBJECTIVES

- To make the students in understanding the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.
- To enable the students in understanding the importance of quantum physics.
- To elucidate the application of quantum mechanics towards the formation of energy bands in crystalline materials.

UNIT I MECHANICS

UNIT II  ELECTROMAGNETIC WAVES

UNIT III  OSCILLATIONS, OPTICS AND LASERS

UNIT IV  BASIC QUANTUM MECHANICS
Photons and light waves - Electrons and matter waves - The Schrödinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization - Particle in a infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V  APPLIED QUANTUM MECHANICS
The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope - Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch’s theorem for particles in a periodic potential. Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

COURSE OUTCOMES
After completion of this course, the students should able to
• Understanding the importance of mechanics.
• Express the knowledge of electromagnetic waves.
• Know the basics of oscillations, optics and lasers.
• Understanding the importance of quantum physics.
• Apply quantum mechanical principles towards the formation of energy bands in crystalline materials.

TEXT BOOKS

REFERENCES
COURSE OBJECTIVES:
- To introduce the basic concepts of polymers, their properties and some of the important applications.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To facilitate the understanding of the laws of photochemistry, photoprocesses and instrumentation & applications of spectroscopic techniques.
- To familiarize the operating principles and applications of energy conversion, its processes and storage devices.
- To inculcate sound understanding of water quality parameters and water treatment techniques.

UNIT I POLYMER CHEMISTRY

UNIT II NANO CHEMISTRY

UNIT III PHOTO CHEMISTRY AND SPECTROSCOPY

UNIT IV ENERGY CONVERSION AND STORAGE
Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant – fast breeder reactor. Solar energy conversion - solar cells. Wind energy. Batteries - types of batteries – primary battery (dry cell), secondary battery (lead acid, nickel-cadmium and lithium-ion-battery). Fuel cells – H₂-O₂ and microbial fuel cell. Explosives – classification, examples: TNT, RDX, Dynamite; Rocket fuels and propellants – definition and uses.

UNIT V WATER TECHNOLOGY

TOTAL: 45 PERIODS
COURSE OUTCOMES:
- To recognize and apply basic knowledge on different types of polymeric materials, their general preparation methods and applications to futuristic material fabrication needs.
- To identify and apply basic concepts of nanoscience and nanotechnology in designing the synthesis of nanomaterials for engineering and technology applications.
- To identify and apply suitable spectroscopic technique for material analysis and study different forms of photochemical reactions.
- To recognize different forms of energy resources and apply them for suitable applications in energy sectors.
- To demonstrate the knowledge of water and their quality in using at different industries.

TEXT BOOKS:

REFERENCES:

GE5151 ENGINEERING GRAPHICS

COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Drawing free hand sketches of basic geometrical shapes and multiple views of objects.
2. Drawing orthographic projections of lines and planes.
3. Drawing orthographic projections of solids.
4. Drawing development of the surfaces of objects.
5. Drawing isometric and perspective views of simple solids.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)
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 FREE HANDSKETCHING
Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by different methods – 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- Free hand sketching of multiple views from pictorial views of objects

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES
Orthographic projection- principles-Principle 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 trapezoidal 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 15
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 15
Sectioning of 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. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 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 and miscellaneous problems. Perspective projection of simple solids-Prisms pyramids and cylinders by visual ray method and vanishing point method.

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY) 3
Introduction to drafting packages and demonstration of their use

TOTAL (L: 15 + P: 60)=75 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Draw free hand sketching of basic geometrical shapes and multiple views of objects.
2. Draw orthographic projections of lines and planes
3. Draw orthographic projections of solids
4. Draw development of the surfaces of objects
5. Draw isometric and perspective views of simple solids.

TEXT BOOKS:

REFERENCES:

Publication of Bureau of Indian Standards:

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.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. The examination will be conducted in appropriate sessions on the same day.
BS5161 BASIC SCIENCES LABORATORY
(Common to all branches of B.E. / B.Tech Programmes)

PHYSICS LABORATORY: (Any Seven Experiments)

COURSE OBJECTIVES:
- To inculcate experimental skills to test basic understanding of physics of materials including properties of matter, thermal and optical properties.
- To induce the students to familiarize with experimental determination of velocity of ultrasonic waves and band gap determination.

LIST OF EXPERIMENTS
1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of Young’s modulus
3. Uniform bending – Determination of Young’s modulus
4. Lee’s disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. a) Optical fibre - Determination of Numerical Aperture and acceptance angle
   b) Compact disc- Determination of width of the groove using laser.
10. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
11. Post office box - Determination of Band gap of a semiconductor.
13. Photoelectric effect
14. Michelson Interferometer.
16. Melde’s string experiment

TOTAL: 30 PERIODS

COURSE OUTCOMES:
Upon completion of the course, the students will be able
- To determine various moduli of elasticity and also various thermal and optical properties of materials.
- To determine the velocity of ultrasonic waves, band gap determination and viscosity of liquids

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>3</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>4</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>5</td>
<td>0.6</td>
<td>0.6</td>
</tr>
</tbody>
</table>
CHEMISTRY LABORATORY: (Minimum of 8 experiments to be conducted)

COURSE OBJECTIVES:
- To inculcate experimental skills to test basic understanding of water quality parameters, such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry, potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and polymers by spectroscopy and viscometry methods.

LIST OF EXPERIMENTS:

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. Phase change in a solid.

TOTAL: 30 PERIODS

COURSE OUTCOMES:
- To analyse the quality of water samples with respect to their acidity, alkalinity, hardness and DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques.
- To determine the molecular weight of polymers by viscometric method.
- To quantitatively analyse the impurities in solution by electroanalytical techniques.
- To design and analyse the kinetics of reactions and corrosion of metals.

TEXT BOOKS:
COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in common household wood work.
2. Wiring various electrical joints in common household electrical wire work.
3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.
4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES

PLUMBING WORK:
   a) Connecting various basic pipe fittings like valves, taps, coupling, unions, reducers, elbows and other components which are commonly used in household.
   b) Preparing plumbing line sketches.
   c) Laying pipe connection to the suction side of a pump
   d) Laying pipe connection to the delivery side of a pump.
   e) Connecting pipes of different materials: Metal, plastic and flexible pipes used in household appliances.

WOOD WORK:
   a) Sawing,
   b) Planing and
   c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:
   a) Studying joints in door panels and wooden furniture
   b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES

WIRING WORK:
   a) Wiring Switches, Fuse, Indicator and Lamp etc. such as in basic household,
   b) Wiring Stair case light.
   c) Wiring tube – light.
   d) Preparing wiring diagrams for a given situation.

Wiring Study:
   a) Studying an Iron-Box wiring.
   b) Studying a Fan Regulator wiring.
   c) Studying an Emergency Lamp wiring.
GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES

WELDING WORK:
  a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.
  b) Practicing gas welding.

BASIC MACHINING WORK:
  a) (simple) Turning.
  b) (simple) Drilling.
  c) (simple) Tapping.

ASSEMBLY WORK:
  a) Assembling a centrifugal pump.
  b) Assembling a household mixer.
  c) Assembling an air conditioner.

SHEET METAL WORK:
  a) Making of a square tray

FOUNDRY WORK:
  a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES

SOLDERING WORK:
  a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:
  a) Assembling and testing electronic components on a small PCB.

ELECTRONIC EQUIPMENT STUDY:
  a) Studying a FM radio.
  b) Studying an electronic telephone.

TOTAL = 60 PERIODS

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

1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.
4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
<th>PO 13</th>
<th>PSO 1</th>
<th>PSO 2</th>
<th>PSO 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.6</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.6</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.6</td>
<td>0.6</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MA5252 ENGINEERING MATHEMATICS – II
(Common to all branches of B.E. / B.Tech. Programmes in II Semester)

L T P C
3 1 0 4

COURSE OBJECTIVES:

- To acquaint the students with the concepts of vector calculus which naturally arises in many engineering problems.
- To develop an understanding of the standard techniques of complex variable theory in particular analytic function and its mapping property.
- To familiarize the students with complex integration techniques and contour integration techniques which can be used in real integrals.
- To acquaint the students with Differential Equations which are significantly used in Engineering problems.
- To make the students appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I VECTOR CALCULUS

UNIT II ANALYTIC FUNCTION
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions - Bilinear transformation \( w = c + z, \ a z, \ 1/z, \ z^2 \).

UNIT III COMPLEX INTEGRATION

UNIT IV DIFFERENTIAL EQUATIONS
Method of variation of parameters – Method of undetermined coefficients – Homogenous equations of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

UNIT V LAPLACE TRANSFORMS

TOTAL : 60 PERIODS

COURSE OUTCOMES:

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

- Calculate grad, div and curl and use Gauss, Stokes and Greens theorems to simplify calculations of integrals.
- Construct analytic functions and use their conformal mapping property in application problems.
- Evaluate real and complex integrals using the Cauchy’s integral formula and residue theorem.
- Apply various methods of solving differential equation which arise in many application problems.
- Apply Laplace transform methods for solving linear differential equations.
TEXT BOOKS:

REFERENCES:

GE5153 PROBLEM SOLVING AND PYTHON PROGRAMMING

COURSE OBJECTIVES:
- To know the basics of algorithmic problem solving.
- To develop Python programs with conditionals and loops.
- To define Python functions and use function calls.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

UNIT I INTRODUCTION TO COMPUTING AND PROBLEM SOLVING

SUGGESTED ACTIVITIES:
- Developing Pseudocodes and flowcharts for real life activities such as railway ticket booking using IRCTC, admission process to undergraduate course, academic schedules during a semester etc.
- Developing algorithms for basic mathematical expressions using arithmetic operations.
- Installing Python.
- Simple programs on print statements, arithmetic operations.

SUGGESTED EVALUATION METHODS:
- Assignments on pseudocodes and flowcharts.
- Tutorials on Python programs.

UNIT II CONDITIONALS AND FUNCTIONS
SUGGESTED ACTIVITIES:
- Simple Python program implementation using Operators, Conditionals, Iterative Constructs and Functions.
- Implementation of a simple calculator.
- Developing simple applications like calendar, phone directory, to-do lists etc.
- Flow charts for GCD, Exponent Functions, Fibonacci Series using conditionals and iterative statements.
- External learning - Recursion vs. Iteration.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.
- Group discussion on external learning.

UNIT III   SIMPLE DATA STRUCTURES IN PYTHON


SUGGESTED ACTIVITIES:
- Implementing python program using lists, tuples, sets for the following scenario:
  Simple sorting techniques
  Student Examination Report
  Billing Scheme during shopping.
- External learning - List vs. Tuple vs. Set – Implementing any application using all the three data structures.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.
- Group Discussion on external learning component.

UNIT IV   STRINGS, DICTIONARIES, MODULES


SUGGESTED ACTIVITIES:
- Implementing Python program by importing Time module, Math package etc.
- Creation of any package (student’s choice) and importing into the application.

SUGGESTED EVALUATION METHODS:
- Tutorials on the above activities.

UNIT V   FILE HANDLING AND EXCEPTION HANDLING

Introduction to Files – File Path – Opening and Closing Files – Reading and Writing Files – File Position – Exception: Errors and Exceptions, Exception Handling, Multiple Exceptions.

SUGGESTED ACTIVITIES:
- Developing modules using Python to handle files and apply various operations on files.
- Usage of exceptions, multiple except blocks - for applications that use delimiters like age, range of numerals etc.
- Implementing Python program to open a non-existent file using exceptions.
SUGGESTED EVALUATION METHODS:

- Tutorials on the above activities.
- Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

On completion of the course, students will be able to:

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.
CO6: Read and write data from/to files in Python programs.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO6</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOKS:


REFERENCES:


EE5251 BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE OBJECTIVES:

- To understand the basic concepts of electric circuits, magnetic circuits and wiring.
- To understand the operation of AC and DC machines.
- To understand the working principle of electronic devices and circuits.

UNIT I BASIC CIRCUITS AND DOMESTIC WIRING

UNIT II    THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS  9
Three phase supply – Star connection – Delta connection –Balanced and Unbalanced Loads-
Power in three-phase systems – Comparison of star and delta connections – Advantages-
Magnetic circuits-Definitions-MMF, Flux, Reluctance, Magnetic field intensity, Flux density, 
Fringing, self and mutual inductances-simple problems.

UNIT III    ELECTRICAL MACHINES  9
Working principle of DC generator, motor-EMF and Torque equation-Types –Shunt, Series and 
Compound-Applications. Working principle of transformer-EMF equation-Operating principles of 
three phase and single phase induction motor-Applications. Working principles of alternator-EMF 
equation-Operating principles of Synchronous motor, stepper motor-Applications.

UNIT IV    BASICS OF ELECTRONICS  9
Intrinsic semiconductors, Extrinsic semiconductors – P-type and N-type, P-N junction, VI 
Characteristics of PN junction diode, Zener effect, Zener diode, Zener diode Characteristics-
Rectifier circuits-Wave shaping.

UNIT V    CURRENT CONTROLLED AND VOLTAGE CONTROLLED DEVICES  9
Working principle and characteristics - BJT, SCR, JFET, MOSFET.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1  To be able to understand the concepts related with electrical circuits and wiring.
CO2  To be able to study the different three phase connections and the concepts of magnetic 
circuits.
CO3  Capable of understanding the operating principle of AC and DC machines.
CO4  To be able to understand the working principle of electronic devices such as diode and 
zener diode.
CO 5  To be able to understand the characteristics and working of current controlled and 
voltage controlled devices.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:
   Education, 2014
   New Delhi, 1989.

REFERENCES:
   2017
COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:

1. Applying the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Applying the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force - couple system acting on rigid bodies in 2D and 3D.
3. Applying the concepts of locating centroids/center of gravity of various sections / volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Applying the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Applying the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

UNIT I
STATICS OF PARTICLES

UNIT II
EQUILIBRIUM OF RIGID BODIES

UNIT III
DISTRIBUTED FORCES
Centroids of lines and areas – symmetrical and unsymmetrical shapes, Determination of Centroids by Integration, Theorems of Pappus-Guldinus, Distributed Loads on Beams, Centre of Gravity of a Three-Dimensional Body, Centroid of a Volume, Composite Bodies, Determination of Centroids of Volumes by Integration.
Moments of Inertia of Areas and Mass - Determination of the Moment of Inertia of an Area by Integration, Polar Moment of Inertia, Radius of Gyration of an Area, Parallel-Axis Theorem, Moments of Inertia of Composite Areas, Moments of Inertia of a Mass - Moments of Inertia of Thin Plates, Determination of the Moment of Inertia of a Three-Dimensional Body by Integration.

UNIT IV
FRICTION

UNIT V
DYNAMICS OF PARTICLES

TOTAL (L: 45 + T: 15) = 60 PERIODS
COURSE OUTCOMES:
Upon completion of this course, the students will be able to:

1. Apply the various methods to determine the resultant forces and its equilibrium acting on a particle in 2D and 3D.
2. Apply the concept of reaction forces (non-concurrent coplanar and noncoplanar forces) and moment of various support systems with rigid bodies in 2D and 3D in equilibrium. Reducing the force, moment, and couple to an equivalent force-couple system acting on rigid bodies in 2D and 3D.
3. Apply the concepts of locating centroids/center of gravity of various sections/volumes and to find out area moments of inertia for the sections and mass moment of inertia of solids.
4. Apply the concepts of frictional forces at the contact surfaces of various engineering systems.
5. Apply the various methods of evaluating kinetic and kinematic parameters of the rigid bodies subjected to concurrent coplanar forces.

TEXT BOOKS:

REFERENCES:
PH5251 MATERIALS SCIENCE
(Common to Mechanical, Manufacturing, Industrial, Mining, Aeronautical, Automobile and Production Engineering & Rubber and Plastics Technology)

COURSE OBJECTIVES:
- To make the students to understand the basics of crystallography and crystal imperfections.
- To introduce various strengthening methods of materials, and also various mechanical properties and their measurement.
- To impart knowledge on the basics of phase diagrams and their applications.
- To learn about iron-carbon system, and about various ferrous and non-ferrous alloys.
- To introduce the preparation, properties and applications of ceramics, composites and nanomaterials.

UNIT I CRYSTALLOGRAPHY

UNIT II MECHANICAL PROPERTIES

UNIT III PHASE DIAGRAMS
Basic concepts - Gibbs phase rule – Unary phase diagram (iron) - Binary phase diagrams: isomorphous systems (Cu-Ni) – determination of phase composition and phase amounts – tie line and lever rule - binary eutectic diagram with no solid solution and limited solid solution (Pb-Sn) – eutectoid and peritectic reactions - other invariant reactions – micro structural development during the slow cooling: eutectic, hypereutectic and hypoeutectic compositions.

UNIT IV FERROUS AND NONFERROUS ALLOYS

UNIT V CERAMICS, COMPOSITES AND NANO MATERIALS

COURSE OUTCOMES:
Upon completion of this course, the students will
- understand the basics of crystallography and its importance in materials properties
- understand the significance of dislocations, strengthening mechanisms, and tensile, creep, hardness and fracture behavior of materials
• gain knowledge on binary phase diagrams, and also will be able to determine the phase composition and phase amount.
• understand about the Fe-C system and various microstructures in it, and also about various ferrous and non-ferrous alloys.
• get adequate understanding on the preparation, properties and applications of ceramics, composites and nanomaterials.

REFERENCES

GE5161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

COURSE OBJECTIVES:
• To understand the problem solving approaches.
• To learn the basic programming constructs in Python.
• To articulate where computing strategies support in providing Python-based solutions to real world problems.
• To use Python data structures - lists, tuples, dictionaries.
• To do input/output with files in Python.

EXPERIMENTS:
1. Identification and solving of simple real life or scientific or technical problems, and developing flow charts for the same.
2. Python programming using simple statements and expressions.
3. Scientific problems using Conditionals and Iterative loops.
4. Implementing real-time/technical applications using Lists, Tuples.
5. Implementing real-time/technical applications using Sets, Dictionaries.
6. Implementing programs using Functions.
7. Implementing programs using Strings.
9. Implementing real-time/technical applications using File handling.
10. Implementing real-time/technical applications using Exception handling.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python data structures.
CO6: Apply Python features in developing software applications.
EE5261  ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY  L  T  P  C
0 0 4 2

COURSE OBJECTIVES:
1. To impart hands on experience in verification of circuit laws and measurement of circuit parameters
2. To train the students in performing various tests on electrical motors.
3. It also gives practical exposure to the usage of CRO, power sources & function generators

LIST OF EXPERIMENTS
1. Verification of Kirchhoff’s Law.
2. Steady state response of AC and DC circuits (Mesh, Node Analysis)
3. Frequency response of RLC circuits.
5. Regulation of single phase transformer.
6. Performance characteristics of DC shunt generator.
7. Performance characteristics of single phase induction motor.
8. Characteristics of PN diode and Zener diode
9. Characteristics of Zener diode
10. Half wave and full wave Rectifiers
11. Application of Zener diode as shunt regulator.
12. Characteristics of BJT and JFET

TOTAL: 60 PERIODS

COURSE OUTCOMES:
1. To become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
2. Ability to perform speed characteristic of different electrical machines
3. Ability to use logic gates and Flip flops

MA5354  PROBABILITY AND STATISTICS  L  T  P  C
3 1 0 4

COURSE OBJECTIVES:
• To understand the basics of random variables with emphasis on the standard discrete and continuous distributions.
• To understand the basic probability concepts with respect to two dimensional random variables along with the relationship between the random variables and the significance of the Central Limit theorem.
• To apply the small/ large sample tests through Tests of hypothesis.
• To understand the concept of analysis of variance and use it to investigate factorial dependence.
• To monitor a process and detect a situation when the process is out of control.
UNIT I RANDOM VARIABLES
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions – Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES
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 TESTS OF SIGNIFICANCE
Type I and Type II errors – Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – Chi-square test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank – Sum test (Wilcoxon test).

UNIT IV DESIGN OF EXPERIMENTS
Completely Randomized Design – Randomized Block Design – Latin Square Design – Factorial design – Taguchi’s robust parameter design.

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:

- To analyze the performance in terms of probabilities and distributions achieved by the determined solutions
- To be familiar with some of the commonly encountered two dimensional random variables and be equipped for a possible extension to multivariate analysis
- To apply the basic principles underlying statistical inference (estimation and hypothesis testing)
- To demonstrate the knowledge of applicable large sample theory of estimators and tests
- To obtain a better understanding of the importance of the methods in modern industrial processes.

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
The main learning objective of this course is to prepare students for:

1. Applying the principle concepts behind stress, strain and deformation of solids for various engineering applications.
2. Analyzing the transverse loading on beams and stresses in beam for various engineering applications.
3. Analyzing the torsion principles on shafts and springs for various engineering applications.
4. Analyzing the deflection of beams for various engineering applications.
5. Analyzing the thin and thick shells and principal stresses in beam for various engineering applications.

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

UNIT II  TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM  9

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 Theorems for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

UNIT V  THICK & THIN SHELLS & PRINCIPAL STRESSES  9
Stresses in thin cylindrical shell due to internal pressure, circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame’s theory – Application of theories of failure – Stresses on inclined planes – principal stresses and principal planes – Mohr’s circle of stress.

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

1. Apply the principle concepts behind stress, strain and deformation of solids for various engineering applications.
2. Analyze the transverse loading on beams and stresses in beam for various engineering applications.
3. Analyze the torsion principles on shafts and springs for various engineering applications.
4. Analyze the deflection of beams for various engineering applications.
5. Analyze the thin and thick shells and principal stresses in beam for various engineering applications.

TEXT BOOKS:

REFERENCES:
IE5301  ENGINEERING ECONOMICS                  L T P C  
                                                 3 0 0 3

COURSE OBJECTIVES:
- Understanding the concept of Engineering Economics.
- Implement various micro economics concept in real life.
- Gaining knowledge in the field of macro economics to enable the students to have better understanding of various components of macro economics.
- Understanding the different procedures of pricing.
- Learn the various cost related concepts in micro economics.

UNIT I  INTRODUCTION TO MANAGERIAL ECONOMICS AND DEMAND ANALYSIS  9

UNIT II  PRODUCTION AND COST ANALYSIS  9
Production Analysis – Production function, Returns to a factor, Returns to scale, ISO quants and least cost combination of inputs. Cost Analysis – Cost concepts, Determinants of cost, Short-run cost-output Relationship, Long-run cost output relationship, Economies and Diseconomies of scale and Estimating cost-Output Relationship.

UNIT III  PRICING  9

UNIT IV  MACRO ECONOMICS – I  9

UNIT V  MACRO ECONOMICS - II  9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Students will become familiar with principles of micro economics and demand forecasting.
CO2: Good understanding and knowledge in production and detailed cost analysis.
CO3: The principles of pricing methodologies are familiarized.
CO4: Macro Economics of various parameters of Gross National Product.
CO5: Awareness in business dynamics in macro economics.
TEXT BOOKS:

REFERENCES:

**ME5251 MANUFACTURING PROCESSES**  

**COURSE OBJECTIVES:**
The main learning objective of this course is to prepare the students for:
1. Applying the working principles of various metal casting processes.
2. Applying the working principles of various metal joining processes.
3. Analyzing the working principles of bulk deformation of metals.
4. Applying the working principles of sheet metal forming process.
5. Applying the working principles of plastics molding.

**UNIT I METAL CASTING PROCESSES**

**UNIT II METAL JOINING PROCESSES**

**UNIT III BULK DEFORMATION PROCESSES**
UNIT IV  SHEET METAL PROCESSES


UNIT V  MANUFACTURE OF PLASTIC COMPONENTS


TOTAL  = 45 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Apply the working principles of various metal casting processes.
2. Apply the working principles of various metal joining processes.
3. Analyze the working principles of bulk deformation of metals.
4. Apply the working principles of sheet metal forming process.
5. Apply the working principles of plastics molding.

TEXT BOOKS:

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>3</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>4</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>5</td>
<td>0.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- Explain the basic principles in facilities planning and plant location.
- Interpret the basic principles in facility layout design decisions through proper analysis.
- Illustrate and explain various modern trends while designing a layout.
- Develop knowledge in line balancing concepts to implement improved system.
- Summarize basic principles in designing, measuring and analyzing material flow to improve the efficiency of the system.

UNIT I  PLANT LOCATION  9
Introduction, Factors affecting location decisions, Qualitative models, Quantitative models, Break-Even analysis model, Brown & Gibbs model, Single facility location models, Gravity location models, Mini-Sum model, Mini-Max model, Multi facility location models, Covering model, Warehouse location model.

UNIT II  FACILITIES LAYOUT DESIGN  9
Need for layout study, Objectives of a good facility layout, Classification of layout, Layout procedure – Nadler's ideal system approach – Immer's basic steps – Apple's layout procedure – Reed's layout procedure, Layout planning – Systematic layout planning(SLP) – Information gathering, Flow analysis & Activity analysis, Relationship diagram, Space requirement and availability, Designing the layout.

UNIT III  COMPUTERIZED LAYOUT PLANNING  9
Designing the process layout – CRAFT, ALDEP, CORELAP – Trends in computerized layout, Group technology models – Production flow analysis (PFA) – Rank order clustering (ROC).

UNIT IV  DESIGNING PRODUCT LAYOUT  9

UNIT V  MATERIALS HANDLING AND PACKAGING  9
Scope and definitions of material handling – Objectives, Principles of material handling, Unit load concept, Material handling system design, Classification of material handling equipments, Equipment selection & specification, JIT impact on facilities design, Packaging.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Students should be able to
CO1: apply and evaluate appropriate location models for various facility types.
CO2: effectively design and analyze various facility layouts.
CO3: apply and analyze various computerized techniques while designing a layout.
CO4: effectively implement a strategy to level the workload across all the workstations.
CO5: implement smooth and cost effective system in the material handling process.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:
REFERENCES:

ME5461 MANUFACTURING TECHNOLOGY LABORATORY

COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:
1. Selecting appropriate tools, equipments and machines to complete a given job.
2. Performing various welding process using GMAW.
3. Performing various machining process such as rolling, drawing, turning, shaping, drilling, milling.
5. Analyzing the defects in the cast and machined components.

LIST OF EXPERIMENTS
1. Fabricating simple structural shapes using Gas Metal Arc Welding machine.
2. Preparing green sand moulds with cast patterns.
3. Casting aluminum parts using stir casting machine.
4. Reducing the thickness of the plates using rolling machine.
5. Reducing the diameter of on circular parts using wire drawing process machine.
6. Taper Turning and Eccentric Turning on circular parts using lathe machine.
7. Knurling, external and internal thread cutting on circular parts using lathe machine.
8. Shaping – Square and Hexagonal Heads on circular parts using shaper machine.
11. Cutting spur and helical gear using milling machine.
15. Broaching components using broaching machine.

TOTAL = 60 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Select appropriate tools, equipments and machines to complete a given job.
2. Perform various welding process using GMAW.
3. Perform various machining process such as rolling, drawing, turning, shaping, drilling, milling.
5. Analyze the defects in the cast and machined components.

<table>
<thead>
<tr>
<th>CO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.9</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td></td>
<td>0.3</td>
<td>0.3</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td></td>
<td>0.3</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.9</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.3</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.9</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.3</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.9</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td>0.3</td>
<td>0.3</td>
<td>0.6</td>
<td>0.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

- To introduce the basic concepts of environment, ecosystems and biodiversity and emphasize on the biodiversity of India and its conservation.
- To impart knowledge on the causes, effects and control or prevention measures of environmental pollution and natural disasters.
- To facilitate the understanding of global and Indian scenario of renewable and non-renewable resources, causes of their degradation and measures to preserve them.
- To familiarize the influence of societal use of resources on the environment and introduce the legal provisions, National and International laws and conventions for environmental protection.
- To inculcate the effect of population dynamics on human and environmental health and inform about human right, value education and role of technology in monitoring human and environmental issues.

UNIT I  ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY  14
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 – bio geographical 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  8
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 – soil 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  10
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 47 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
From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of
people; its problems and concerns, case studies – role of non-governmental organization-
environmental ethics: Issues and possible solutions – climate change, global warming, acid rain,
ozone layer depletion, nuclear accidents and holocaust, case studies – wasteland reclamation –
consumerism and waste products – environment protection act – Air (Prevention and Control of
Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest
conservation act – enforcement machinery involved in environmental legislation- central and state
pollution control boards- Public awareness.

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT  6
Population growth, variation among nations – population explosion – family welfare programme –
welfare – role of information technology in environment and human health – Case studies.

COURSE OUTCOMES:

• To recognize and understand the functions of environment, ecosystems and biodiversity and
  their conservation.
• To identify the causes, effects and environmental pollution and natural disasters and
  contribute to the preventive measures in the immediate society.
• To identify and apply the understanding of renewable and non-renewable resources and
  contribute to the sustainable measures to preserve them for future generations.
• To recognize different forms of energy and apply them for suitable applications in for
  technological advancement and societal development.
• To demonstrate the knowledge of societal activity on the long and short term environmental
  issues and abide by the legal provisions, National and International laws and conventions in
  professional and personal activities and to identify and analyse effect of population dynamics
  on human value education, consumerism and role of technology in environmental issues.

TEXT BOOKS:
   (2016).

REFERENCES:
1. R.K. Trivedi, ‘Handbook of Environmental Laws, Rules, Guidelines, Compliances and
3. Dharmendra S. Sengar, ‘Environmental law’, Prentice hall of India PVT. LTD, New Delhi,
   2007.
   (2005).
5. Erach Bharucha “Textbook of Environmental Studies for Undergraduate Courses” Orient

CE5251  FLUID MECHANICS AND MACHINERY  L T P C  3 0 0 3

COURSE OBJECTIVE:
To introduce the students about properties of the fluids, behaviour of fluids under static
conditions and to impart basic knowledge of the dynamics of fluids and to expose to the
applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar
and turbulent) and c) forces on pipe bends with an exposure to the significance of boundary
layer theory and its thicknesses with expose to basic principles of working of hydraulic machineries and
to design Pelton wheel, Francis and Kaplan turbine, centrifugal and reciprocating pumps.
UNIT I  FLUID PROPERTIES AND FLOW CHARACTERISTICS  10
Properties of fluids- Pressure Measurements-Buoyancy and floatation-Flow characteristics-Eulerian and Lagrangian Principle of fluid flow– concept of control volume and system – Reynold’s transportation theorem- continuity equation, energy equation and momentum equation- Applications.

UNIT II  FLOW THROUGH PIPES AND BOUNDARY LAYER  9

UNIT III  DIMENSIONAL ANALYSIS AND MODEL STUDIES  7
Fundamental dimensions - Dimensional homogeneity - Rayleigh’s method and Buckingham Pi theorem - Dimensionless parameters - Similitude and model studies - Distorted and undistorted models.

UNIT IV  TURBINES  10

UNIT V  PUMPS  9
Classification of pumps- Centrifugal pumps– working principle - Heads and efficiencies– Velocity triangles- Work done by the impeller - performance curves - Reciprocating pump working principle – indicator diagram and it’s variations – work saved by fitting air vessels.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of the course, the student is expected to be able to

CO1 Understand the difference between solid and fluid, its properties and behaviour in static conditions.

CO2 Understand the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.

CO3 Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.

CO4 Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel.

CO5 Understand the concept of boundary layer and its application to find the drag force excreted by the fluid on the flat solid surface.

TEXT BOOKS:

REFERENCES:
<table>
<thead>
<tr>
<th>PO/PSO</th>
<th>Course Outcome</th>
<th>Overall Correlation of COs to POs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CO1</td>
<td>CO2</td>
</tr>
<tr>
<td>PO1</td>
<td>Knowledge of Engineering Sciences</td>
<td>H</td>
</tr>
<tr>
<td>PO2</td>
<td>Problem analysis</td>
<td>H</td>
</tr>
<tr>
<td>PO3</td>
<td>Design / development of solutions</td>
<td>M</td>
</tr>
<tr>
<td>PO4</td>
<td>Investigation</td>
<td>M</td>
</tr>
<tr>
<td>PO5</td>
<td>Modern Tool Usage</td>
<td>L</td>
</tr>
<tr>
<td>PO6</td>
<td>Individual and Team work</td>
<td>L</td>
</tr>
<tr>
<td>PO7</td>
<td>Communication</td>
<td>L</td>
</tr>
<tr>
<td>PO8</td>
<td>Engineer and Society</td>
<td>M</td>
</tr>
<tr>
<td>PO9</td>
<td>Ethics</td>
<td>L</td>
</tr>
<tr>
<td>PO10</td>
<td>Environment and Sustainability</td>
<td>M</td>
</tr>
<tr>
<td>PO11</td>
<td>Project Management and Finance</td>
<td>L</td>
</tr>
<tr>
<td>PO12</td>
<td>Life Long Learning</td>
<td>M</td>
</tr>
<tr>
<td>PSO1</td>
<td>Knowledge of Civil Engineering discipline</td>
<td>H</td>
</tr>
<tr>
<td>PSO2</td>
<td>Critical analysis of Civil Engineering problems and innovation</td>
<td>M</td>
</tr>
<tr>
<td>PSO3</td>
<td>Conceptualization and evaluation of engineering solutions to Civil Engineering Issues</td>
<td>H</td>
</tr>
</tbody>
</table>
**COURSE OBJECTIVES:**

- Explain the concepts of work study productivity and productivity measurement approaches.
- Plan and record and analyze selected tasks using different flowcharts.
- Use method study to improve a task. Apply principles of motion economy to improve performance.
- Plan and conduct a time study to improve the efficiency of the system.
- Appraise the standard times to assess the office work condition.

**UNIT I  PRODUCTIVITY**

Work Study and Productivity - Total time for a job or operation, total work content and ineffective time, – Production and Productivity- Productivity and standardofliving, Factors affecting Productivity, Productivity measurement Models.- procedure of work study

**UNIT II  METHODS ENGINEERING**


**UNIT III  WORK MEASUREMENT**

Purpose of work measurement –Techniques of work measurement- Time study- Equipment - selecting and timing the job - performance rating –allowances – Standard time – setting time standard for work with machines - learning effect

**UNIT IV  APPLIED WORK MEASUREMENT**

Work sampling and Structured estimating - Group sampling Technique-predicted time standards (PTS),types- use of time standard - Methods Time Measurement (MTM)- MOST technique - Wage incentive plans.

**UNIT V  WORK DESIGN FOR OFFICE WORK**

Method Study in office- Organization and methods(O&M) - Work measurement of office work-Work Analysis techniques applied to support staff - Form design and control.

**COURSE OUTCOMES:**

CO1: Ability to understand the concepts of work study productivity and productivity measurement approaches.
CO2: Ability to Record and analyze selected tasks using different flowcharts.
CO3: Ability to apply method study to improve a task. Apply principles of motion economy to improve performance.
CO4: Ability to conduct a time study to improve the efficiency of the system.
CO5: Ability to Estimate the standard times to assess the office work condition.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

**TEXT BOOKS:**

REFERENCES:

MF5351 THERMODYNAMICS

COURSE OBJECTIVES:
- To describe the basic concepts and first law of thermodynamics.
- To analyse the second law of thermodynamics.
- To evaluate the properties of pure substances.
- To gain knowledge on the concepts of conduction, convection and radiation.
- To apply the concepts of thermodynamics in IC engines, boilers, turbines, refrigeration and air-conditioning.

UNIT I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS
9
Basic concepts; Continuum and macroscopic approach; thermodynamic systems (closed and open); thermodynamic properties and equilibrium; state of a system, state postulate for simple compressible substances, paths and processes on state diagrams; concepts of heat and work, different modes of work; zeroth law of thermodynamics; concept of temperature. First Law of Thermodynamics; Concept of energy and various forms of energy; internal energy, enthalpy; specific heats; first law applied to elementary processes, closed systems and control volumes, steady and unsteady flow analysis.

UNIT II SECOND LAW OF THERMODYNAMICS
9
Second law of thermodynamics; Limitations of the first law of thermodynamics, concepts of heat engines and heat pumps/refrigerators, Kelvin-Planck and Clausius statements and their equivalence; reversible and irreversible processes; Carnot cycle and Carnot theorems; thermodynamic temperature scale; Clausius inequality and concept of entropy; the principle of increase of entropy, T-s diagrams; second law analysis of control volume; availability and irreversibility; third law of thermodynamics.

UNIT III PROPERTIES OF PURE SUBSTANCE
9
Thermodynamic properties of pure substances in solid, liquid and vapour phases; P-v-T behaviour of simple compressible substances, thermodynamic property tables and charts, psychrometric charts ideal and real gases: Vander waals equations - Reduced property - Compressibility chart - Properties of mixture of gases - Dalton's law and Gibbs - Internal energy, Enthalpy and specific heats of gas mixtures.

UNIT IV HEAT TRANSFER
9

UNIT V APPLICATIONS
9

TOTAL: 45 PERIODS
COURSE OUTCOMES:
At the end of this course the students shall be able to:
- CO1. Apply first law of thermodynamics to engineering applications.
- CO2. Differentiate first and second law of thermodynamics.
- CO3. Estimate the properties of real and ideal gas mixtures using thermodynamic charts.
- CO4. Evaluate the heat transfer through conduction, convection and radiation
- CO5. Analyse the operation of IC engine, boilers, turbine, refrigerator etc.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>3</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>4</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>5</td>
<td>0.3</td>
<td>0.3</td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

ME5452 MECHANICS OF MACHINES

COURSE OBJECTIVES:
1. To understand the principles in the formation of mechanisms and their kinematics.
2. To learn the basic concepts of toothed gearing and kinematics of gear trains.
3. To study the effect of friction in different machine elements.
4. To analyze the forces and torque acting on simple mechanical systems
5. To understand the importance of balancing and vibration.

UNIT I KINEMATIC ANALYSIS IN SIMPLE MECHANISMS AND CAMS

UNIT II TOOTHED GEARING AND GEAR TRAINS

UNIT III FRICTION ASPECTS IN MACHINE COMPONENTS
UNIT IV                  STATIC AND DYNAMIC FORCE ANALYSIS

UNIT V                     BALANCING OF ROTATING MASSES AND VIBRATION

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. design the linkages and the cam mechanisms for specified output motions.
2. determine the gear parameters of toothed gearing and speeds of gear trains in various applications.
3. evaluate the frictional torque in screw threads, clutches, brakes and belt drives.
4. determine the forces on members of mechanisms during static and dynamic equilibrium conditions.
5. determine the balancing masses on rotating machineries and the natural frequencies of free and forced vibratory systems.

TEXT BOOK:

REFERENCES:

CE5361                  STRENGTH OF MATERIALS AND FLUID MACHINERY
LABORATORY

L T P C
0 0 4 2

COURSE OBJECTIVES:
1. To study the mechanical properties of materials when subjected to different types of loading.
2. To verify the principles studied in Fluid Mechanics theory by performing experiments in lab.

PART – I                  STRENGTH OF MATERIALS

LIST OF EXPERIMENTS
1. Tension test on mild steel rod
2. Torsion test on mild steel rod
3. Hardness test on metal beam (Rockwell and Brinell Hardness Tests)
4. Compression test on helical spring
5. Deflection test on carriage spring
PART – II  FLUID MECHANICS AND MACHINES LABORATORY

LIST OF EXPERIMENTS

A. FLOW MEASUREMENT
1. Verification of Bernoulli’s theorem
2. Flow through orifice/venturi meter
3. Friction factor for flow through pipes
4. Impact of jet on fixed plate

B. METACENTER
5. Determination of metacentric height

C. PUMPS
6. Characteristics of centrifugal pumps
7. Characteristics of gear pump
8. Characteristics of submersible pump
9. Characteristics of reciprocating pump

D. TURBINES
10. Characteristics of Pelton wheel turbine

TOTAL: 60 PERIODS

OUTCOMES:
On completion of the course, the student is expected to be able to
1. Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.
2. Use the measurement equipment’s for flow measurement.
3. Perform test on different fluid machinery.
4. Verify and apply Bernoulli equation for flow measurement like orifice/venturi meter.
5. Measure friction factor in pipes and compare with Moody diagram and verify momentum conservation law.
6. Determine the performance characteristics of rotodynamic pumps.
7. Determine the performance characteristics of positive displacement pumps.
8. Determine the performance characteristics of turbine.

REFERENCES:

<table>
<thead>
<tr>
<th>PO/PSO</th>
<th>Course Outcome</th>
<th>Overall Correlation of COs to POs</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
<td>Knowledge of Engineering Sciences</td>
<td>M     H     H     H     H     H     H</td>
</tr>
<tr>
<td>PO2</td>
<td>Problem analysis</td>
<td>M     M     H     H     H     H</td>
</tr>
<tr>
<td>PO3</td>
<td>Design / development of solutions</td>
<td>L     L     M     M     M     M</td>
</tr>
<tr>
<td>PO4</td>
<td>Investigation</td>
<td>H     H     H     H     H     H</td>
</tr>
<tr>
<td>PO5</td>
<td>Modern Tool Usage</td>
<td>L     L     L     L     L     L</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:
- Develop different flowcharts by recording and analyzing selected tasks.
- Use and conduct time study to improve the efficiency of the system.
- Describe and perform performance rating experiments.
- Explain and perform peg board activities.
- Develop work sampling activities.

1. Application of outline process chart for method study
2. Application of Flow process chart for method study
3. Application of Two handed process chart for method study
4. Application of Man Machine Chart for method study
5. Determine the performance rating of the operator and rating capacity of the analyst using card dealing
6. Determine the performance rating of the operator and rating capacity of the analyst using walking
7. Determine the standard time using Peg board experiment
8. Determine the standard time using Stop watch time study
10. Determine the standard time using MTM practice
11. Determine the standard time using Time Study Trainer.

TOTAL: 30 PERIODS

COURSE OUTCOMES: Students should be able
CO1: Able to record and analyze selected tasks using different flowcharts.
CO2: Able to conduct a time study to improve the efficiency of the system.
CO3: Able to perform performance rating experiments.
CO4: Able to perform peg board activities.
CO5: Able to perform work sampling.
COURSE OBJECTIVES:
- To enhance the employability skills of students with a special focus on presentation skills, group discussion skills and interview skills
- To help them improve their reading skills, writing skills, and soft skills necessary for the workplace situations
- To make them employable graduates

UNIT I  WRITING SKILLS
Prepared job applications - writing covering letter and résumé - applying for jobs online - email etiquette – writing official letters (placing an order, letters to consumers, etc.)

UNIT II  SOFT SKILLS

UNIT III  PRESENTATION SKILLS
Preparing slides with animation related to the topic – organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice – presenting the visuals effectively – 5 minute presentation.

UNIT IV  GROUP DISCUSSION SKILLS
Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying – GD strategies (expressing opinions, accepting or refusing others opinions, turn taking) – activities to improve GD skills – viewing recorded GD - mock GD.

UNIT V  INTERVIEW SKILLS

TOTAL: 60 PERIODS

Teaching Methods
Seminar, Presentation, Group Discussion, Employability skills practice in the language laboratory

Evaluation
Continuous Assessment – 100 marks
- Group Discussion Skills: 25 marks
- Presentation skills: 25 marks
- Interview skills: 25 marks
- Assignment (Job Application and official letters): 25 marks

End Semester examination – NIL
COURSE OUTCOMES:
After the completion of the course, the learners will be able to,

- Perform well at placement interviews, group discussions and other recruitment exercises
- Acquire adequate competence in speaking, reading and writing skills needed for workplace related situations
- Gain a comprehensive knowledge about soft skills

REFERENCES:

WEB RESOURCES
1. www.humanresources.about.com
2. www.careerride.com

GE5451 TOTAL QUALITY MANAGEMENT L T P C
3 0 0 3

COURSE OBJECTIVES:
- Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQM framework, Barriers and Benefits of TQM.
- Explain the TQM Principles for application.
- Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.
- Describe Taguchi's Quality Loss Function, Performance Measures and apply Techniques like QFD, TPM, COQ and BPR.
- Illustrate and apply QMS and EMS in any organization.

UNIT I INTRODUCTION
Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM - Gurus of TQM (Brief introduction) -- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I
UNIT IV  TQM TOOLS & TECHNIQUES II
Quality circles – Quality Function Deployment (QFD) - Taguchi quality loss function – TPM –
Concepts, improvement needs – Performance measures- Cost of Quality - BPR.

UNIT V  QUALITY MANAGEMENT SYSTEM
Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards -
AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements-Implementation-Documentation-
Internal Audits-Registration-ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO
14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001-Benefits of EMS.

COURSE OUTCOMES:
CO1: Ability to apply TQM concepts in a selected enterprise.
CO2: Ability to apply TQM principles in a selected enterprise.
CO3: Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and
FMEA.
CO4: Ability to understand Taguchi’s Quality Loss Function, Performance Measures and apply
QFD, TPM, COQ and BPR.
CO5: Ability to apply QMS and EMS in any organization.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:
1. Dale H.Besterfiled, Carol B.Michna,Glen H. Bester field, MaryB. Sacre, HemantUrdhwareshe and
RashmiUrdhwareshe, “Total Quality Management”, Pearson Education Asia, Revised

REFERENCES:
Heinemann Ltd, 2016.
2003.
2006.

IE5552  OPERATIONS RESEARCH
L T P C
3 0 0 3

COURSE OBJECTIVES:
• Provide knowledge of optimization techniques and approaches.
• Formulate a real-world problem as a mathematical programming model.
• Enable the students apply mathematical, computational and communication skills needed
for the practical utility of Operations Research.
• Knowledge to solve networking problems.
• Knowledge to solve various inventory problems.
• Gain knowledge on solving different waiting line models.

Attested

DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
UNIT I  LINEAR PROGRAMMING  9  

UNIT II  ADVANCES IN LINEAR PROGRAMMING  9  

UNIT III  NETWORK ANALYSIS  9  

UNIT IV  INVENTORY MODELS  9  
Purchase model with no shortages – Manufacturing model with no shortages - Model with price breaks - Reorder point model - Probabilistic inventory model

UNIT V  QUEUING THEORY  9  
Queueing theory terminology – Single server, multi server- limited and unlimited queue capacity- limited and unlimited population –limited and infinite queue length.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Learned to translate a real-world problem, given in words, into a mathematical Formulation.
CO2: An understanding of the role of algorithmic thinking in the solution of operations research problems.
CO3: Be able to build and solve Transportation Models and Assignment Models, maximal flow problem, minimum spanning tree and shortest path problem.
CO4: Able to handle issues in various Inventory models.
CO5: The students acquire capability in applying and using of queuing models for day today problem

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</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>
<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>
<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>
<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>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:
1. Designing machine members subjected to static loads.
2. Designing shafts, couplings, welded joints, riveted joints and bearings for various applications.
3. Designing helical springs, flywheels, connecting rods and crankshafts for various applications.
4. Designing flexible elements like belt, ropes and chain drives for engineering applications.
5. Designing spur, helical gear drives and multi-speed gear box for power transmission.

UNIT I  STEADY STRESSES IN MACHINE MEMBERS  9+3
Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties - Preferred numbers, fits and tolerances - Direct, Bending and torsional stress equations - Impact and shock loading - calculation of principle stresses for various load combinations, eccentric loading - Factor of safety - theories of failure - Design based on strength and stiffness.

UNIT II  SHAFTS, COUPLINGS, JOINTS AND BEARINGS  9+3
Design of solid and hollow shafts based on strength, rigidity and critical speed - Keys, key ways and splines - Rigid and flexible couplings. Threaded fasteners, Welded joints and riveted joints for structures, Sliding contact and rolling contact bearings (Simple problems)

UNIT III  ENERGY STORING ELEMENTS AND ENGINE COMPONENTS  9+3
Various types of springs, optimization of helical springs - Flywheels considering stresses in rims and arms for engines and punching machines - Connecting Rods and crankshafts.

UNIT IV  DESIGN FOR FLEXIBLE ELEMENTS  9+3
Design of Flat belts and pulleys - Selection of V belts and pulleys - Selection of hoisting wire ropes and pulleys - Design of Transmission chains and Sprockets.

UNIT V  SPUR GEARS, HELICAL GEARS AND GEAR BOXES  9+3

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Design machine members subjected to static loads.
2. Design shafts, couplings, welded joints, riveted joints and bearings for various applications.
3. Design helical springs, flywheels, connecting rods and crankshafts for various applications.
4. Design flexible elements like belt, ropes and chain drives for engineering applications.
5. Design spur, helical gear drives and multi-speed gear box for power transmission.

TEXT BOOK:

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>2</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>3</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>4</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>5</td>
<td>0.6</td>
<td>0.6</td>
</tr>
</tbody>
</table>

IE5551 ENGINEERING QUALITY CONTROL L T P C
3 0 0 3

COURSE OBJECTIVES:
- Developing the basic concepts of quality control procedures.
- Impart knowledge to design and implement Statistical Process control in any industry.
- Design and implement acceptance sampling inspection methods in industry.
- Study the process and machine capability.
- Develop the applications of various charts.

UNIT I QUALITY FUNDAMENTALS
Importance of quality- evolution of quality- definitions of quality- dimensions of quality- quality control- quality assurance- areas of quality- quality planning- quality objectives and policies- quality costs- economics of quality- Quality loss function- quality Vs productivity- Quality Vs reliability.

UNIT II CONTROL CHARTS FOR VARIABLES
Process variation- preliminary decisions- control limits and their computation- construction and application of X bar, R and S charts - warning and modified control limits- process adjustment for trend- Comparison of process variation with specification limits- O.C. curve for X bar chart.

UNIT III STATISTICAL PROCESS CONTROL
Process stability- process capability study using control charts- capability indices- Cp, Cpk and Cpm – capability analysis using histogram and normal probability plot- machine capability study-gauge capability study- setting statistical tolerances for components and assemblies- individual measurement charts- X-chart, moving average and moving range chart, multi-vari chart.

UNIT IV CONTROL CHARTS FOR ATTRIBUTES
Limitations of variable control charts- Control charts for fraction non-conforming- p and np charts, variable sample size, operating characteristic function, run length- Control chart for nonconformities (defects)- c, u, ku charts, demerits control chart- applications.

UNIT V ACCEPTANCE SAMPLING
Need- economics of sampling- sampling procedure- single and double sampling- O.C. curves- Average outgoing quality- Average sample number- Average total inspection- Multiple and sequential sampling- Standard sampling plans- MIL Standards, Dodge-Roming, IS 2500.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Students will become familiar with details of quality costs, economies and planning.
CO2: Control the quality of processes using control charts for variables in manufacturing/service industries.
CO3: Good understanding and in depth knowledge has been imparted in the process capability study.
CO4: Control the occurrence of defects in product or services industries.
CO5: Determination of acceptance sampling procedures are practiced.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

IE5511 OPTIMIZATION LABORATORY

COURSE OBJECTIVES:
- Give adequate exposure to use different optimization software packages for solving Operations Research problems.
- Practice to solve Linear programming problems.
- Learn problem solving techniques, writing algorithms and procedures.
- Solve optimization problems using ‘C’ programming language.
- Practice C code for simple logic on OR problem.

LABORATORY EXPERIMENTS
Experiment 1: LP Models formulation and solving using softwares
Experiment 2: Formulation of Transportation Problem and solving using software package
Experiment 3: Formulation of Assignment Problems and solving using software package
Experiment 4: Solving Maximal Flow problem
Experiment 5: Solving Minimal Spanning Tree problems
Experiment 6: Solving shortest route problems
Experiment 7: Solving Project Management problems
Experiment 8: Solving Waitign line problems
Experiment 9: Solving Queuing problems
Experiment 10: Solving Inventory problems

TOTAL:30 PERIODS

COURSE OUTCOMES:
CO1: Use computer tools to solve a mathematical model for practical problems.
CO2: Acquired knowledge in using Optimization software Package.
CO3: Ability to develop C++ programming for solving optimization problem.

CO4: Able to design new simple models, like: CPM, MSPT to improve decision making and develop critical thinking and objective analysis of decision problems.

CO5: Ability to use logical thinking for solving OR problem.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

ME5361 COMPUTER AIDED MACHINE DRAWING  
L T P C  0 0 4 2

COURSE OBJECTIVES:
The main learning objective of this course is to provide hands on training to the students in:
1. Applying standard drawing practices using fits and tolerances.
4. Preparing standard drawing layout for modeled parts or assemblies with BoM.

PART I DRAWING STANDARDS & FITS AND TOLERANCES 4

PART II 2D DRAFTING 56
Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed Drawing.
1. Bearings – Bush Bearing
3. Couplings – Flange, Oldham’s, Muff, Gear couplings.
5. Engine parts – Piston, Connecting Rod, Crosshead (vertical and horizontal), Stuffing box, Multi-plate clutch.

Total: 20% of classes for theory classes and 80% of classes for practice
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 CAD software.

TOTAL(L: 4 + P: 56) = 60 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Apply standard drawing practices using fits and tolerances.
3. Model orthogonal views of assembled components.
4. Prepare standard drawing layout for modeled parts or assemblies with BoM.
IE5652 PRODUCTION AND OPERATIONS MANAGEMENT

COURSE OBJECTIVES:

- Recognize and appreciate the concept of Production and Operations Management in creating and enhancing a firm's competitive advantages.
- Describe the concept and contribution of various constituents of Production and Operations Management (both manufacturing and service).
- Relate the interdependence of the operations function with the other key functional areas of a firm.
- Teach analytical skills and problem-solving tools to the analysis of the operations problems.
- Apply scheduling and Lean Concepts for improving System Performance.

UNIT I INTRODUCTION


UNIT II FORECASTING

Need, Determinants of Demand, Demand Patterns, Qualitative Forecasting Methods-Delphi techniques. Market Research, Nominal Group Technique. Quantitative Forecasting methods – Moving Average Methods, Exponential Smoothing Methods, Regression methods, Monitoring and Control of Forecasts, Requirements and Selection of Good forecasting methods.

UNIT III AGGREGATE PLANNING AND MATERIAL REQUIREMENT PLANNING

Role of aggregate Product planning, Managerial inputs to Aggregate planning, Pure and Mixed strategies, Mathematical Models for Aggregate planning – Transportation Method, Linear programming Formulation, Linear Decision Rules, Master Production Schedule (MPS), Procedure for developing MPS, MRP - Lot sizing methods – Implementation issues, MRP – II, Introduction to ERP.

UNIT IV CAPACITY MANAGEMENT


UNIT V PRODUCTION ACTIVITY CONTROL AND LEAN MANUFACTURING

Objectives and Activities of Production Activity Control - JIT- Kanban- Introduction to Scheduling in different types of Production Systems. Lean Manufacturing - Principles – Activities - Tools and techniques - Case studies.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
CO1: The students will appreciate the role of Production and Operations management in enabling and enhancing a firm’s competitive advantages in the dynamic business environment.
CO2: The students will obtain sufficient knowledge and skills to forecast demand for Production and Service Systems.
CO3: The students will able to Formulate and Assess Aggregate Planning strategies and Material Requirement Plan.
CO4: The students will be able to develop analytical skills to calculate capacity requirements and developing capacity alternatives.
CO5: The students will be able to apply scheduling and Lean Concepts for improving System Performance.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:

IE5601 DESIGN OF EXPERIMENTS L T P C
3 0 0 3

COURSE OBJECTIVES:
- Explain the concepts of Classical Design of Experiments (DOE).
- Illustrate Single Factor Experiment and Post hoc tests.
- Describe about Factorial experiments and its extensions.
- Apply Taguchi method for parameter Optimization.
- Create exposure on Response Surface Method and Shainin DOE.

UNIT I FUNDAMENTALS OF EXPERIMENTAL DESIGNS
Hypothesis testing – single mean, two means, dependant/ correlated samples – confidence intervals, Experimentation – need, Conventional test strategies, F-test, terminology, basic principles of design, steps in experimentation – choice of sample size – Normal and half normal probability plot – simple linear and multiple linear regression, Analysis of variance.

UNIT II SINGLE FACTOR EXPERIMENTS
UNIT III  FACTORIAL DESIGNS
Main and Interaction effects - Two and three factor full factorial designs- Fixed effects and random effects model - Rule for sum of squares and Expected Mean Squares- $2^K$ Design with two and three factors- Yate’s Algorithm- fitting regression model- Randomized Block Factorial Design. Blocking and Confounding in $2^K$ Designs- blocking in replicated design- $2^K$ Factorial Design in two blocks- Complete and partial confounding- Confounding $2^K$ Design in four blocks - Two level Fractional Factorial Designs- Construction of one-half and one-quarter fraction of $2^K$ Design.

UNIT IV  TAGUCHI METHODS
Design of experiments using Orthogonal Arrays, Data analysis from Orthogonal experiments- Response Graph Method, ANOVA- Attribute data analysis- Robust design- noise factors, Signal to Noise ratios, Inner/outer OA design- case studies.

UNIT V  RESPONSE SURFACE METHODS AND SHAININ DOE

TOTAL : 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will

CO1: Understand the fundamental principles of Classical Design of Experiments.

CO2: Be able to apply single factor experiment for process parameter understanding and optimization.

CO3: Be able to apply Factorial Design principles for understanding of process parameters and its optimization.

CO4: Will gain knowledge on Taguchi’s approach to experimental design for attaining robustness.

CO5: Be able to apply Response Surface Method and Shainin DOE to evaluate quality.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES:
- Describe reliability concepts.
- Teach the students in filling the life data into theoretical distribution.
- Teach the students in reliability evaluation of various configuration.
- Describe knowledge in reliability monitoring methods.
- Appraise effectively various techniques to improve reliability of the system.

UNIT I RELIABILITY CONCEPT
Reliability definition – Reliability parameters- f(t), F(t) and R(t) functions - Measures of central tendency – Bath tub curve – A priori and posteriori probabilities of failure – Component mortality - Useful life.

UNIT II LIFE DATA ANALYSIS

UNIT III RELIABILITY ESTIMATION
Series parallel configurations – Parallel redundancy – m/n system – Complex systems: RBD approach – Baye’s method – Minimal path and cut sets - Fault Tree analysis – Standby system.

UNIT IV RELIABILITY MANAGEMENT

UNIT V RELIABILITY IMPROVEMENT

COURSE OUTCOMES:
CO1: Students will be able to conduct failure data analysis.
CO2: Students will be able to estimate reliability of standard systems as well as complex systems.
CO3: Students will be able to explore reliability management tools and techniques.
CO4: Students will be able to contribute in maintainability and availability demonstration programs.
CO5: Students will be able to take decisions on inspection and replacement.

TOTAL: 45 PERIODS

TEXT BOOK:

REFERENCE:
COURSE OBJECTIVES:
- Define automation and justification in manufacturing.
- Explain the control technologies in automation.
- Explain the concept of fixed automation using transfer lines.
- Describe the programmable automation such as CNC and industrial robotics.
- Use of automated material handling, storage and data capture.

UNIT I MANUFACTURING OPERATIONS
Automation in production systems, principles and strategies, Product/production relationships, Production concepts and mathematical models, manufacturing economics.

UNIT II CONTROL TECHNOLOGIES
Automated systems – elements, functions, levels, Continuous Vs discrete control, Computer process control, Sensors, Actuators, ADC, DAC, Programmable logic controllers – ladder logic diagrams.

UNIT III TRANSFER LINES
Automated production lines – applications, Analysis – with and without buffers, automated assembly systems, line unbalancing concept.

UNIT IV NUMERICAL CONTROL AND ROBOTICS

UNIT V AUTOMATED HANDLING AND STORAGE
Automated guided vehicle systems, AS/RS, Carousel storage, Automatic data capture - Bar code technology.

COURSE OUTCOMES:
CO1: Selection of automated equipment with cost justification.
CO2: Ability to understand control technologies.
CO3: Selection of buffer size and location in transfer lines.
CO4: Ability to prepare a simple CNC program, select a robot configuration for given application.
CO5: Recommend an appropriate automated material handling, storage and data capture method.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES:
This course aims to:
- Design a data analysis strategy that answers a hypothesis, including specifications for data elements, requirements of the statistic, and limitations to the interpretation.
- Understand how to select appropriate techniques
- Understand how to conduct a variety of statistical analyses, including testing of statistical assumptions, data transformations, and validation of statistical findings
- Understand how to interpret the results of statistical analyses.
- Understand how to present the results of statistical analyses.

Students will perform analysis of data in the following topics using Data Analysis package
1. Control Charts
2. Correlation Analysis
3. Simple Regression
4. Multiple Regression
5. Single factor Experiment
6. Factorial experiment
7. Factor Analysis
8. Discriminant Analysis
9. Cluster Analysis
10. Estimation of model parameters of the system to predict Reliability

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Upon completion of the laboratory course, the students will
CO1: Able to independently formulate, perform and assess hypothesis
CO2: Able to select appropriate techniques
CO3: Able to apply various data analysis techniques
CO4: Able to interpret the results
CO5: Able to present the results properly to extract meaningful information from data sets for effective decision making

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IE5612 AUTOMATION LABORATORY

COURSE OBJECTIVES:
- Write CNC programming using G-code and M-code.
- Develop robot control programs
- Use of PLC for actuation.
- Design ladder logic for automation.
- Develop PLC program for automation.
1. Part programming and Machining of Simple Turning using CNC Lathe
2. Part programming and Machining of Taper Turning using CNC Lathe
3. Part programming and Machining using Multiple Turning cycle in CNC Lathe
4. Part programming and Simulation of Thread Cutting using CNC Lathe
5. Part programming and Machining of Contour using CNC Milling Machine
6. Part programming and Machining using Mirroring Cycle in CNC Milling Machine
7. Programming Exercise for Robots
8. Programming of PLC using Ladder Logic Diagram
9. PLC Programming – Experiment 1
10. PLC Programming – Experiment 2

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1: Ability to write CNC programming using G-code and M-code.
CO2: Ability to write programming for robot control.
CO3: Ability to use PLC for actuation.
CO4: Ability to design ladder logic for automation.
CO5: Ability to write PLC program for automation.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

IE5701  APPLIED ERGONOMICS  L T P C
3 0 0 3

COURSE OBJECTIVES:

- Explain the knowledge of basic human science and Engineering science.
- Teach skills associated with ergonomic measurement methods and analytical techniques to workplace ergonomic problems.
- Plan and conduct an ergonomic analysis and ergonomic recommendations for modern work environment problems.
- Use the occupational health and safety rules to improve the work place.
- Teach and apply ergonomic principles to design workplaces for the improvement of human performance.

UNIT I  INTRODUCTION
Brief history of human factors Engineering/Ergonomics – Interdisciplinary nature- Human–machine systems -Ergonomics and its areas of application in the work system - Future directions for ergonomics- Biostatic and Biodynamic Mechanics

UNIT II  WORK PLACE DESIGN
Problems of body size- Anthropometry measures- Work posture– Design for standing and seated workers - Design of repetitive tasks - Design of manual handling tasks- VDT work stations – Hand tool design

UNIT III  PHYSIOLOGICAL ASPECTS OF HUMAN AT WORK
Stress and fatigue -Physical work capacity - Physiological factors affecting work capacity –Fitness for work –Working hours and shift work- Quantitative work load analysis – Psychological work Demands.
UNIT IV  DESIGN OF ENVIRONMENT

UNIT V  HUMAN PERFORMANCE
Human Information receiving and processing – Information theory and its application – Cognitive systems - Mental Work Load - Signal detection theory -- Design of Displays and controls

COURSE OUTCOMES:
CO1: Ability to apply Knowledge of basic human science and Engineering science .
CO2: Ability to Apply skills associated with ergonomic measurement methods and analytical techniques to workplace ergonomic problems.
CO3: Ability to conduct an ergonomic analysis and ergonomic recommendations for modern work environment problems.
CO4: Ability to implement the occupational health and safety rules to improve the work place.
CO5: Ability to apply ergonomic principles to design workplaces for the improvement of human performance.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

IE5702  SIMULATION MODELING AND ANALYSIS  L T P C
3 0 0 3

COURSE OBJECTIVES:
- Knowledge about generation of the random numbers using different algorithms.
- Enable to generate random variates.
- Enable to design the simulation experiment.
- Solving different simulation problems using various simulation softwares.
- Learn to study the various applications of simulation models.

UNIT I  INTRODUCTION AND RANDOM NUMBERS

UNIT II  RANDOM VARIATES GENERATION AND TESTING
UNIT III  
DESIGN OF SIMULATION EXPERIMENTS  
Steps on Design of Simulation Experiments – Development of models using of High level language for systems like Queuing, Inventory, Replacement, Production etc., Model validation and verification, Output analysis.

UNIT IV  
SIMULATION LANGUAGES  
Need for simulation Languages – Study of GPSS and introduction to ARENA.

UNIT V  
CASE STUDIES USING SIMULATION LANGUAGES  
Waiting line models, inventory models, and production models.

COURSE OUTCOMES:
CO1: Learned to generate random numbers and variates.
CO2: Learned to test the statistical stability of random variates.
CO3: Learned to develop simulation models for real life systems.
CO4: Learned to use simulation language to simulate and analyze systems.
CO5: Able to solve various waiting line model, inventory models and production models problems using simulation.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>☑</td>
<td></td>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

IE5751  
SUPPLY CHAIN MANAGEMENT  
L T P C  
3 0 0 3

COURSE OBJECTIVES
- Describe the role and drivers of and supply chain management in achieving competitiveness.
- Explain about Supply Chain Network Design.
- Illustrate about the issues related to Logistics in Supply Chain.
- Appraise about Sourcing and Coordination in Supply Chain.
- Application of Information Technology and Emerging Concepts in Supply Chain.

UNIT I  
INTRODUCTION  
UNIT II  SUPPLY CHAIN NETWORK DESIGN  

UNIT III  LOGISTICS IN SUPPLY CHAIN  

UNIT IV  SOURCING AND COORDINATION IN SUPPLY CHAIN  
Role of Sourcing in supply chain - Supplier selection - Contracts - Design Collaboration - Sourcing planning and analysis - Supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT V  IT AND EMERGING CONCEPTS IN SUPPLY CHAIN  
TOTAL: 45 PERIODS

COURSE OUTCOMES:  
After undergoing this course, students will acquire  
CO1: Ability to understand the scope of Supply Chain Management and the Drivers of SC performance .  
CO2: Ability to design suitable SC network for a given situation.  
CO3: Ability to solve the issues related to Logistics in SCM.  
CO4: Ability to understand Sourcing , Coordination and current issues in SCM.  
CO5: Ability to appraise about the applications of IT in SCM and apply SCM concepts in selected enterprise.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

TEXT BOOK:  

REFERENCES:  
IE5711 DISCRETE SIMULATION LABORATORY

COURSE OBJECTIVES:
- Knowledge to generate random numbers and random Variate.
- Practice to test the statistical stability of random Variate.
- Knowledge to develop simulation models for real life systems.
- Practice using various simulation software packages.
- Able to analyze various simulation models.

Experiment 1. Random Number Generation
  Mid Square, Constant Multiplier, Congruential

Experiment 2. Random variates Generation
  Exponential, Poisson, Normal, Binomial

Experiment 3. Testing of Random variates
  Chi-Square, KS, Run, Poker

Experiment 4. Monte Carlo Simulation: Random Walk Problem

Experiment 5. Monte Carlo Simulation: Paper vendor problem

Experiment 6. Single Server Queuing Model

Experiment 7. Multi Server Queuing Model

Experiment 8. Alternate service queuing model

Experiment 9. Inventory Model

Experiment 10. Use of Simulation Language; Servers in series queuing system

TOTAL: 30 PERIODS

COURSE OUTCOMES:

CO1: Hands on experience in generation of random numbers and random Variate.

CO2: Hands on experience in testing the statistical stability of random Variate.

CO3: Hands on experience in developing simulation models for real life problems.

CO4: Hands on experience in the use simulation softwares to simulate.

CO5: Hands on experience in analyzing various simulation models.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IE5712 ERGONOMICS LABORATORY

COURSE OBJECTIVES:
- Design equipment and the workplace to fit people.
- Identify and understand effects of walking on tread mill.
- Summarize and analyze noise levels in different environment.
- Design the industry with ergonomics consideration.
- Use and conduct an ergonomic analysis for physical ergonomics topics.
1. Effect of speed of walking on treadmill using heart rate and energy expenditure
2. Effect of workload on heart rate using Ergo cycle.
3. Evaluation of physical fitness using step test
4. Effect of work-rest schedule on physical performance (Ergo cycle / treadmill)
5. Development of anthropometric data for male and female.
6. Application of Ergo Software for the design of desk for students
7. Evaluation of physical facilities (chairs, tables etc.) through comfort rating.
8. Analysis of noise level in different environments
10. Experiment using Vibrometer.

**TOTAL: 30 PERIODS**

**COURSE OUTCOMES:**
The Students should be able to

**CO1:** Design equipment and the workplace to fit people.

**CO2:** Able to understand effects of walking on treadmill.

**CO3:** Able to analyse noise levels in different environments.

**CO4:** Design the industry with ergonomics consideration.

**CO5:** Conduct an ergonomic analysis for physical ergonomics topics.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CO1**

IE5713

**PROJECT I**

**COURSE OBJECTIVE:**
The objective is to develop skill in applying industrial engineering techniques to real/practical problems.

A student is expected to select a topic in the industrial engineering area such as Forecasting, production planning, scheduling, operations research, facilities planning and layout, transportation and distribution, quality, supply chain, simulation etc. Identify a problem and collect necessary data and analyse using appropriate tool/technique.

Data can be collected from industry or standard data sets available in literature can be used. A comprehensive report is to be submitted towards the end of the VIIth semester. Report and oral examination will be evaluated by two member committee constituted by the Head of the Department.

**TOTAL: 90 PERIODS**
COURSE OBJECTIVE:
To apply the principles/techniques that they have learnt to a new problem situation which may be the design and manufacture of a device, a research investigation, a computer or management project or a design problem.

A project topic must be selected either from published list or students themselves can propose suitable topics in consultation with the guides. It can be a theoretical research projector industry oriented. Generally it is a group project.

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 jointly by external and internal examiners constituted by the Head of the Department based on oral presentation and the project report.

TOTAL : 240 PERIODS

COURSE OBJECTIVES:
- Extract knowledge on the applications of multivariate statistical analysis.
- Understanding the simple regression, multiple regression and correlation procedures.
- Develop the implementation of factor analysis in real life applications.
- Study the classification and implementation of discriminant analysis to various cases.
- Study the classification and implementation of cluster analysis to various cases.

UNIT I MULTIVARIATE METHODS
Review of basic matrix operations and random vectors, Eigen values and Eigen vectors. An overview of multivariate methods, Multivariate normal distribution.

UNIT II REGRESSION
Inferences about population parameters - Simple Regression, and Correlation – Estimation using the regression line, correlation analysis, Multiple Regression– Logistic Regression - Canonical Correlation analysis-Multivariate analysis of variance.

UNIT III FACTOR ANALYSIS
Principal components analysis – Objectives, estimation of principal components, testing for independence of variables, Factor analysis model – Method of estimation – Factor rotation – Factor Scores - EFA and CFA.

UNIT IV DISCRIMINANT ANALYSIS
Discriminant analysis – Classification with two multi Variate normal populations- Evaluating classification function – Classification with several populations – Fishers Method for Discriminating among several Populations.

UNIT V CLUSTER ANALYSIS
Cluster analysis – Clustering methods, Hierarchical clustering methods – Single Linkage, Complete Linkage, Average Linkage, Ward's Hierarchical Clustering Method, Non Hierarchical Clustering methods - K-means Method, Validation and profiling of clusters

TOTAL: 45 PERIODS
COURSE OUTCOMES:
Students should be able to:
CO1: Predict the values of one or more variables on the basis of observations on the other variables.
CO2: Formulate the specific statistical hypotheses, in terms of the parameters of multivariate populations.
CO3: Data reduction or structural simplification as simply as possible without sacrificing valuable information and will make interpretation easier.
CO4: Sorting and Grouping "similar" objects or variables are created, based upon measured characteristics.
CO5: Able to understand appropriate use of methods.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

IE5002 COMPUTATIONAL METHODS AND ALGORITHMS

COURSE OBJECTIVES:
- Articulate the C / C++ syntax.
- Use of algorithm design methods for heuristic design.
- Compare various data structures and its applications.
- Analysis of the complexity of Algorithms.
- Use of search procedure for IE applications.

UNIT I REVIEW OF A LANGUAGE
- Review of C/C++ - writing and debugging large programs - Controlling numerical errors.

UNIT II ALGORITHM DESIGN METHODS
- Greedy – Divide and conquer – Backtracking – Branch & bound – Heuristics- Meta heuristics

UNIT III BASIC TOOLS
- Structured approach – Networks – Trees – Data structures

UNIT IV COMPUTATIONAL PERFORMANCE
- Time complexity – Space complexity – Algorithm complexity

UNIT V APPLICATIONS
- Sorting – Searching - Networks – Scheduling – Optimization models – IE applications

TOTAL: 45 PERIODS
COURSE OUTCOMES:
CO1: Will be able to use a structured language for programming.
CO2: Will be able to use various algorithm design methods.
CO3: Will be able to choose appropriate data structure.
CO4: Will be able to analyse the time complexity of algorithm.
CO5: Ability to choose appropriate search and sort procedure in IE applications.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
1. Dromey,R.G., “How to solve it with computers?”,PHI, 2002

IE5073 CREW SIX SIGMA

COURSE OBJECTIVES:
- Explain the basics of Lean and Six Sigma.
- Teach the need and the process of integrating Lean and Six sigma.
- Summarize to identify and select the resources required for LSS Projects and selection of projects including Team building.
- Teach the DMAIC process and study the various tools for undertaking LSS projects.
- Illustrate to institutionalize the LSS efforts.

UNIT I INTRODUCTION TO LEAN AND SIX SIGMA
Introduction to Lean- Definition, Purpose, Features of Lean ; Top seven wastes, Need for Lean management, The philosophy of lean management, Creating a lean enterprise, Elements of Lean, Lean principles, the lean metric, Hidden time traps. Introduction to quality, Definition of six sigma, origin of six sigma, Six sigma concept and Critical success factors for six sigma.

UNIT II INTEGRATION OF LEAN AND SIX SIGMA
Evolution of lean six sigma, the synergy of Lean and six sigma, Definition of lean six sigma, the principles of lean six sigma, Scope for lean six sigma, Features of lean six sigma. The laws of lean six sigma, Key elements of LSS, the LSS model and the benefits of lean six sigma. Initiation - Top management commitment – Infrastructure and deployment planning, Process focus, organizational structures, Measures – Rewards and recognition, Infrastructure tools, structure of transforming event and Launch preparation.

UNIT III PROJECT SELECTION AND TEAM BUILDING
Resource and project selection, Selection of Black belts, Training of Black belts and Champions, Identification of potential projects, top down (Balanced score card) and Bottom up approach – Methods of selecting projects – Benefit/Effort graph, Process mapping, value stream mapping, Predicting and improving team performance, Nine team roles and Team leadership.
UNIT IV  THE DMAIC PROCESS AND TOOLS

The DMAIC process – Toll gate reviews; The DMAIC tools – Define tools – Project definition form, SIPOC diagram; Measure tools – Process mapping, Lead time/cycle time, Cause and Effect matrix, Idea – generating and organizing tools – Brainstorming, Nominal group technique and Multi-voting; Data collection and accuracy tools- Check sheet, Gauge R&R; Understanding and eliminating variation- run charts; Analyze tools - Scatter plots, ANOVA, Regression analysis, Time trap analysis; Improve tools – Mistake proofing, Set up time reduction (SMED) and the pull system; Control tools – statistical process control.

UNIT V  INSTITUTIONALIZING AND DESIGN FOR LSS

Institutionalizing lean six sigma – improving design velocity, creating cycle time base line, valuing projects, gating the projects, reducing product line complexity, Design for lean six sigma, QFD, Theory of Inventive Problem solving (TRIZ), Robust design; Case study presentations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1: The students will be able to understand what is Lean and Six sigma and their importance in the globalized competitive world.
CO2: The students will be able to understand the importance of integrating Lean and Six sigma and also the process of their integration.
CO3: The students will be able to plan the Resources required to undertake the LSS projects and also acquire how to select the suitable projects and the teams.
CO4: The students will be able apply DMAIC methodology to execute LSS projects and in this regard they will be acquainted with various LSS tools.
CO5: The students will be able to understand the process of institutionalizing the LSS effort and also understand the Design for LSS.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:

IE5074  MACHINE LEARNING ALGORITHMS

COURSE OBJECTIVES:

- To understand basic concepts of learning.
- To understand decision tree learning.
- To evaluate hypotheses.
- To understand Bayesian learning.
- To understand computational learning theory.
UNIT I CONCEPT LEARNING

A Concept Learning Task: Notation, The Inductive Learning Hypothesis, Concept Learning as Search, FIND-S: Algorithm for finding a Maximally Specific Hypothesis: Version Spaces and the CANDIDATE-ELIMINATION Algorithm; Convergence of CANDIDATE-ELIMINATION Algorithm to the correct Hypothesis; Appropriate Training Examples for learning; Applying Partially Learned Concept, Inductive Bias: A Biased Hypothesis Space; An Unbiased Learner; The Futility of Bias-Free Learning.

UNIT II DECISION TREE LEARNING

Decision Tree Representation, Appropriate problems for decision tree learning, The basic decision tree Learning Algorithm, Hypothesis Space Search in decision tree learning, Inductive Bias in Decision Tree Learning, Issues in Decision Tree Learning: Over fitting the Data; Incorporating Continuous-Valued Attributes; Alternative Measures for Selecting Attributes; Handling Training Examples with Missing Attribute Values; Handling Attributes with differing Costs.

UNIT III EVALUATING HYPOTHESES


UNIT IV BAYESIAN LEARNING

Bayes Theorem, Bayes Theorem and Concept Learning, Maximum Likelihood and Least-Squared Error Hypotheses, Maximum Likelihood Hypotheses for predicting probabilities: Gradient search to maximize likelihood in a neural net. Minimum description length principle, Bayes Optimal Classifier, Gibbs Algorithm, Naive Bayes Classifier, Bayesian Belief Networks: Conditional Independence; Representation; Inference; Learning Bayesian Belief Networks; Gradient Ascent Training of Bayesian Networks; Learning the structure of Bayesian Networks; The EM Algorithm: Estimating Means of k Guassions; General Statement of EM Algorithm; Derivation of the k Means Algorithm.

UNIT V COMPUTATIONAL LEARNING THEORY

Introduction, probably learning an approximately correct hypothesis: The Problem Setting; Error of a Hypothesis; Learnability. Sample Complexity for Finite Hypothesis Spaces: Agnostic Learning and Inconsistent Hypotheses; Conjunctions of Boolean earnability of Other Concept Classes. Sample Complexity for infinite hypothesis spaces: Shattering a set of Instances; The Vapnik-Chervonenkis Dimension; Sample Complexity and the VC Dimension. The mistake bound model of learning: Mistake bound for the FIND-S Algorithm; Mistake bound for the HALVING Algorithm; Optimal Mistake Bounds; WEIGHTED-MAJORITY Algorithm.

COURSE OUTCOMES:

CO1: Ability to understand basic concepts of learning.
CO2: Ability to understand decision tree learning.
CO3: Ability to evaluate hypotheses.
CO4: Ability to understand Bayesian learning.
CO5: Ability to understand computational learning theory.
TEXT BOOK:

IE5003 ACCOUNTING AND FINANCE FOR MANAGEMENT

L T P C
3 0 0 3

COURSE OBJECTIVES
- Understanding the Basics of accounting and accounting standards.
- Evaluating P&L statements, Balance sheets and other accounting statements.
- Learn and apply the various cost accounting methods.
- Study the various cost control procedures.
- Sketch and prepare a budget and make investment decisions.

UNIT I INTRODUCTION

UNIT II FINANCIAL ACCOUNTING
Salient features of Balance Sheet and Profit and Loss statement, cash flow and Fund flow Analysis (Elementary), working capital management, ratio analysis – Depreciation.

UNIT III COST ACCOUNTING
Cost accounting systems: Job Costing, process costing, allocation of overheads, Activity based costing, variance analysis – marginal costing – Break even analysis.

UNIT IV BUDGETING
Requirements for a sound budget, fixed budget – preparation of sales and production budget, flexible budgets, zero based budgets and budgetary control.

UNIT V FINANCIAL MANAGEMENT
Investment decisions – Investment appraisal techniques – payback period method, accounting rate of return, net present value method, internal rate of return and profitability index method - cost of capital.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Ability to apply accounting principles in a selected enterprise.
CO3: Ability to apply the various cost accounting methods.
CO4: Ability to prepare a budget and make investment decisions.
CO5: Ability to understand concepts of financial management.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>*****</td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TEXT BOOK:

REFERENCES:

IE5004 ADVANCED OPTIMIZATION TECHNIQUES

COURSE OBJECTIVES:
- Knowledge to model and solve Integer programming problems.
- Knowledge to model and solve problems using dynamic programming.
- Enable to make decision under certainty and uncertainty situations.
- Knowledge to solve single- and multiple-variable unconstrained and constrained nonlinear.
- Learn to solve non-linear problem using KKT condition, quadratic programming and separable programming.

UNIT I INTEGER PROGRAMMING AND GOAL PROGRAMMING
- Branch and Bound technique – cutting plane algorithm method - Traveling Salesman Problem - Branch and Bound Algorithms for TSP - Heuristics for TSP. Goal programming - Goal programming formulation - Goal programming algorithms – The weights method – Pre-emptive method

UNIT II DYNAMIC PROGRAMMING

UNIT III DECISION ANALYSIS &GAME THEORY
- Decision Making under certainty - Decision Making under risk - Decision Trees – Decision making under certainty - Utility Theory- The Formulation of Two-Person, Zero-Sum Games - Solving Simple Games -Games with Mixed Strategies - Graphical Solution Procedure - Solving by Linear Programming

UNIT IV NONLINEAR PROGRAMMING I
- Types of Nonlinear Programming Problems - One-Variable Unconstrained Optimization - Multivariable Unconstrained Optimization -

UNIT V NONLINEAR PROGRAMMING II

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Acquired knowledge how to solve integer programming problems.
CO2: Learned how to solve various dynamic programming problems.
CO3: Acquired knowledge to make decision under certainty and uncertainty situations and selecting strategies for players in Two player zero sum game.
CO4: Knowledge to solve nonlinear unconstrained problems.
CO5: Knowledge to solve nonlinear constrained problems. Apply resource management techniques to industrial operations.
COURSE OBJECTIVES:

- Explain maintenance concepts and maximize profit and minimize downtime in maintenance.
- Summarize and take optimum maintenance decisions.
- Plan analyze the root cause for maintenance problems.
- Plan manage the spare parts for maintenance activity.
- Define and describe the losses and improve the Overall Equipment Effectiveness.

UNIT I MAINTENANCE CONCEPT


UNIT II MAINTENANCE MODELS


UNIT III MAINTENANCE QUALITY


UNIT IV MAINTENANCE MANAGEMENT


UNIT V TOTAL PRODUCTIVE MAINTENANCE


TOTAL: 45 PERIODS
COURSE OUTCOMES:
CO1: Able to understand the equipment availability and downtime.
CO2: Able to implement maintenance policies for maximizing the profit.
CO3: Able to make a diagnosis of maintenance problems.
CO4: Able to improve uptime of machines by effective spare parts management.
CO5: Able to improve the overall Equipment Effectiveness.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

IE5006 ROBOTICS ENGINEERING  L T P C 3 0 0 3

COURSE OBJECTIVES:
- Classify and Recognize different robots and its specifications.
- Identify the appropriate drives and grippers required based on application.
- Specify the sensors for particular application.
- Control various robot links using kinematic equations.
- Perform a justification check before implementation of robots in industry.

UNIT I  FUNDAMENTALS OF ROBOT  9

UNIT II  ROBOT DRIVE SYSTEMS AND END EFFECTORS  9

UNIT III  SENSORS AND MACHINE VISION  9
Sensory Devices - Non optical - Position sensors - Optical position sensors - Velocity sensors- Proximity sensors - Contact and noncontact type - Tactile and slip sensors - Force and torque sensors- Introduction to Image Processing
UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING  9
Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of
Freedom (In 2 Dimensional)- Homogeneous Transformation- D-H Representation of forward
kinematics. Teach Pendant Programming, Lead through programming, Robot programming
Languages – VAL Programming – Motion Commands, Sensor Commands, End effector
commands, and Simple programs.

UNIT V  ROBOT CELL DESIGN, CONTROL AND ECONOMICS  9
Work cell control - Robot and machine Interface - Robot cycle time analysis – Economic analysis
of robots - Pay back method, EUAC method, Rate of return method.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Able to identify the type of robot required for applications.
CO2: Able to suggest a suitable robot drive, gripper and sensors required for particular
application.
CO3: Perform selection of sensor for a particular task .
CO4: Able to analyse robot arm kinematics and understand simple programs.
CO5: Able to analyse the robot cycle time and economics of robot implementation.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., “Robotics Control, Sensing, Vision and

IE5007  PRODUCTIVITY MANAGEMENT AND RE-ENGINEERING  L T P C
3 0 0 3

COURSE OBJECTIVES:
• Explain the concept of productivity and significance of productivity.
• Appraise, measure and evaluate productivity.
• Plan and implement various productivity techniques .
• Rewrite the process for improving the productivity .
• Use and implement BPR tools for improving the productivity.

UNIT I  INTRODUCTION
Basic concept and meaning of Productivity – Significance of Productivity – Factors affecting
Productivity – Productivity cycle, Scope of Productivity Engineering and Management.
UNIT II  PRODUCTIVITY MEASUREMENT AND EVALUATION  

UNIT III  PRODUCTIVITY PLANNING AND IMPLEMENTATION  
Need for Productivity Planning – Short term and long term productivity planning – Productivity improvement approaches, Principles - Productivity Improvement techniques – Technology based, Material based, Employee based, Product based techniques – Managerial aspects of Productivity Implementation schedule, Productivity audit and control.

UNIT IV  REENGINEERING PROCESS  

UNIT V  BPR TOOLS AND IMPLEMENTATION  
Analytical and Process Tools and Techniques - Role of Information and Communication Technology in BPR – Requirements and steps in BPR Implementation – Case studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

CO1 : Ability to understand the concept of productivity and significance of productivity.
CO2 : Ability to Measure and evaluate productivity.
CO3 : Ability to Plan and implement various productivity techniques.
CO4 : Ability to Reengineer the process for improving the productivity.
CO5 : Ability to Implement BPR tools for improving the productivity.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCE:

IE5008  MANUFACTURING SYSTEMS AND MODELS

COURSE OBJECTIVES:
- Compare different manufacturing systems and its performance measures.
- Use DTMC models for industrial problems.
- Use CTMC models for industrial problems.
- Design and analysis of manufacturing systems for queuing problems.
- Solve the industrial problems using Petrinet-models.
UNIT I MANUFACTURING SYSTEMS - PERFORMANCE MEASURES 9

UNIT II DISCRETE TIME MARKOV CHAINS 9

UNIT III CONTINUOUS TIME MARKOV CHAINS 9
Introduction to CTMC, Properties of CTMC, Sojourn Times in CTMC Models, Applications of CTMC Models in Manufacturing Systems.

UNIT IV QUEUING MODELS 9
Birth and death process, performance measures in queuing models, open queuing networks and closed queuing networks - applications in manufacturing systems.

UNIT V PETRINET MODELS 9
Introduction to petrinet models - Representational powers of Petri nets - Reachability graphs, Markings, Applications of petrinet models in manufacturing systems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Able to identify and measure the performance of manufacturing system.
CO2: Able to apply the DTMC model to a Manufacturing Problem.
CO3: Able to apply the CTMC model to a Manufacturing Problem.
CO4: Able to apply the Queuing model to a Manufacturing Problem.
CO5: Able to apply the Petrinet model to a Manufacturing Problem.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</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>
<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>
<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>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOK:

IE5009 OPERATIONS SCHEDULING

COURSE OBJECTIVES:
- Define the basic concepts of scheduling theory.
- Illustrate the application of single machine scheduling algorithms.
- Transfer knowledge in parallel machine scheduling algorithms.
- Teach the concept of flow shop scheduling and its algorithm.
- Describe the use of algorithms for job shop scheduling algorithms.

UNIT I SCHEDULING THEORY 9
UNIT II  SINGLE MACHINE SCHEDULING

UNIT III  PARALLEL MACHINE SCHEDULING

UNIT IV  FLOW SHOP SCHEDULING

UNIT V  JOB SHOP SCHEDULING

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Able to understand fundamental concepts of scheduling theory.
CO2: Students will be able to solve single machine sequencing problems with an objective to minimize mean flow time or mean tardiness.
CO3: Students will be able to design a parallel machine schedule which can minimize mean flow time, or makespan.
CO4: Students will be able to determine an optimal schedule for a flow shop.
CO5: Students will be able to solve complex job shop problems, design and evaluate various feasible job shop schedules.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CO2</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CO3</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CO4</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>CO5</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCE:
COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:

1. Explaining the types, characteristics of entrepreneurship and its role in economic development.
2. Applying the theories of achievement motivation and the principles of entrepreneurship development program to enterprise.
3. Selecting the appropriate form of business ownership in setting up an enterprise.
4. Applying the fundamental concepts of finance and accounting to enterprise.
5. Identifying sickness in industry, selecting the appropriate corrective measures, and identifying the growth strategies in enterprise.

UNIT I ENTREPRENEURSHIP

UNIT II MOTIVATION

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING

UNIT V SUPPORT TO ENTREPRENEURS

TOTAL (L: 45) = 45 PERIODS

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

1. Explain the types, characteristics of entrepreneurship and its role in economic development.
2. Apply the theories of achievement motivation and the principles of entrepreneurship development program.
3. Select the appropriate form of business ownership in setting up an enterprise.
4. Apply the fundamental concepts of finance and accounting to enterprise.
5. Identify sickness in industry, select the appropriate corrective measures, and identify the growth strategies in enterprise.

TEXT BOOKS:
REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO 1</th>
<th>PO 2</th>
<th>PO 3</th>
<th>PO 4</th>
<th>PO 5</th>
<th>PO 6</th>
<th>PO 7</th>
<th>PO 8</th>
<th>PO 9</th>
<th>PO 10</th>
<th>PO 11</th>
<th>PO 12</th>
<th>PSO 1</th>
<th>PSO 2</th>
<th>PSO 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
<td>0.9</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.6</td>
<td>0.3</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.6</td>
<td>0.6</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MG5451 PRINCIPLES OF MANAGEMENT

COURSE OBJECTIVES:
- Sketch the Evolution of Management.
- Extract the functions and principles of management.
- Learn the application of the principles in an organization.
- Study the various HR related activities.
- Analyze the position of self and company goals towards business.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS

UNIT II PLANNING

UNIT III ORGANISING

UNIT IV DIRECTING
UNIT V CONTROLLING
System and process of controlling – Budgetary and non-Budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive control – Reporting.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling.
CO2: Have same basic knowledge on international aspect of management.
CO3: Ability to understand management concept of organizing.
CO4: Ability to understand management concept of directing.
CO5: Ability to understand management concept of controlling.

TEXT BOOKS:

REFERENCES:

IE5010 PRODUCT DESIGN AND VALUE ENGINEERING L T P C 3 0 0 3

COURSE OBJECTIVES:
- Relate product development integrated with value engineering.
- Summarize the development of new products through conceptualization, design and development phases.
- Relate various aspects of product development with industrial design and manufacturing.
- Describe the value of a product using tools and techniques.
- Design products which are suitable for the needs of the society.

UNIT I VALUE ENGINEERING BASICS
Origin of Value Engineering, Meaning of value, Definition of Value Engineering and Value analysis, Difference between Value analysis and Value Engineering, Types of Value, function - Basic and Secondary functions, concept of cost and worth, creativity in Value Engineering.

UNIT II VALUE ENGINEERING JOB PLAN AND PROCESS
Seven phases of job plan, FAST Diagram as Value Engineering Tool, Behavioural and organizational aspects of Value Engineering, Ten principles of Value analysis, Benefits of Value Engineering.
UNIT III IDENTIFYING CUSTOMER NEEDS and PRODUCT SPECIFICATIONS

UNIT IV CONCEPT GENERATION, SELECTION AND PRODUCT ARCHITECTURE

UNIT V INDUSTRIAL DESIGN, PROTOTYPING AND ECONOMICS OF PRODUCT DEVELOPMENT
Need for industrial design – Impact of industrial design – Industrial design process – Management of industrial design process – Assessing the quality of industrial design.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: The Students should be able to understand the basic concept of product development.
CO2: Design and develop new products in a systematic manner considering the concept of value engineering.
CO3: Able to understand customer requirements.
CO4: Able to understand product architecture.
CO5: Able to do prototyping.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

IE5077 SYSTEMS ENGINEERING

COURSE OBJECTIVES:
- Illustrate the life cycle phases and framework for systems engineering.
- Describe about systems engineering process.
- Apply ergonomic and system dynamic models for evaluation of alternatives.
- Create knowledge on Reliability, Markov and Time series models for analysis of alternatives.
- Describe about decision assessment methods in systems engineering.

UNIT I INTRODUCTION
Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frames for systems engineering.
UNIT II SYSTEMS ENGINEERING PROCESSES
Formulation of issues with a case study, Value system design, Functional analysis, Business Process Reengineering, Quality function deployment, System synthesis, Approaches for generation of alternatives.

UNIT III ANALYSIS OF ALTERNATIVES - I
Cross-impact analysis, Structural modeling tools, System Dynamics models with case studies, Economic models: present value analysis – NPV, Benefits and costs over time, ROI, IRR; Work and Cost breakdown structure.

UNIT IV ANALYSIS OF ALTERNATIVES – II
Reliability, Availability, Maintainability, and Supportability models; Stochastic networks and Markov models, Queuing network optimization, Time series and Regression models, Evaluation of large scale models

UNIT V DECISION ASSESSMENT
Decision assessment types, Five types of decision assessment efforts, Utility theory, Group decision making and Voting approaches, Social welfare function; Systems Engineering methods for Systems Engineering Management

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will
CO1: Be able to recognize life cycle phases in systems engineering.
CO2: Apply steps in systems engineering process for large scale problems.
CO3: Able to develop system dynamic models for analyzing alternatives.
CO4: Gain ability to evaluate alternatives in large scale problems.
CO5: Be able to attain confidence in assessment and arrive decisions for complex problems.

<table>
<thead>
<tr>
<th></th>
<th>P01</th>
<th>P02</th>
<th>P03</th>
<th>P04</th>
<th>P05</th>
<th>P06</th>
<th>P07</th>
<th>P08</th>
<th>P09</th>
<th>P10</th>
<th>P11</th>
<th>P12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:

IE5011 METROLOGY AND INSPECTION L T P C 3 0 0 3

COURSE OBJECTIVES:
- Contrast linear and angular measuring Instruments.
- Identify the standards and applications of measurement in industries.
- Recognize the modern concepts and equipments for measurement.
- Classify various measurement devices used.
- Contrast destructive and non-destructive testing methods.
UNIT I  LINEAR MEASUREMENT AND ANGULAR MEASUREMENT  9

UNIT II  STANDARDS FOR LINEAR AND ANGULAR MEASUREMENTS  9
Shop floor standards and their calibration, light interference, Method of coincidence, Slip gauge calibration, Measurement errors, Limits, fits, Tolerance, Gauges, Gauge design.

UNIT III  MEASUREMENT APPLICATION  9

UNIT IV  MODERN CONCEPTS  9
Image processing and its application in Metrology, Co-ordinate measuring machine, Types of CMM, Probes used, Application, Non-contact CMM using Electro-optical sensors for dimensional metrology.

UNIT V  INTRODUCTION TO MEASUREMENT SYSTEMS  9
System configuration, basic characteristics of measuring devices. Displacement, force and torque measurement, standards, Calibration, Sensors, Basic principles and concepts of temperature, Pressure and flow measurement, Destructive testing – Nondestructive testing.  
TOTAL: 45 PERIODS

COURSE OUTCOMES:
The student must be able to
CO1: Understanding the basic theoretical technical and legislative aspects of metrology and testing.
CO2: Measure a variety of engineering parts using a variety of measuring techniques.
CO3: Present and analyze measurement results obtained.
CO4: Acquire capability to select right method of non-destructive testing.
CO5: Able to understand measurement systems concepts.

<table>
<thead>
<tr>
<th>CO1</th>
<th>CO2</th>
<th>CO3</th>
<th>CO4</th>
<th>CO5</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES:
- Knowledge to evaluate and select the most desirable projects.
- Ability to plan and implement the projects.
- Ability to control the projects.
- Knowledge to close the projects.
- Knowledge about software projects.

UNIT I  INTRODUCTION TO PROJECT MANAGEMENT AND PROJECT SELECTION  

UNIT II  PROJECT PLANNING AND IMPLEMENTATION  
Work break down structure- Estimate work packages – Identify task relationship – project schedule

UNIT III  PROJECT MONITORING AND CONTROL  
Resource aggregations - Resource levelling - limited resource allocation – project monitoring and control.

UNIT IV  PROJECT CLOSURE  

UNIT V  SPECIAL TOPICS IN PROJECT MANAGEMENT  
Project management for modern information system – critical success factors for IT project - software project selection and initiation - project management discipline – project overall planning

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Evaluate and select the most desirable projects.
CO2: Apply appropriate approaches to plan a new project.
CO3: Apply appropriate methodologies to develop a project schedule.
CO4: Identify important risks facing a new project.
CO5: Understanding the project management skills in IT industries.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES:
• Describe an idea about ERP.
• Grasp the activities of ERP project management cycle.
• Understanding the emerging trends in ERP developments.
• Creating awareness of core and extended modules of ERP.
• Understand the ERP trending concepts.

UNIT I INTRODUCTION
Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems.

UNIT II ERP SOLUTIONS AND FUNCTIONAL MODULES
Overview of ERP software solutions- Small, medium and large enterprise vendor solutions, BPR, and best business practices - Business process Management, Functional modules.

UNIT III ERP IMPLEMENTATION

UNIT IV POST IMPLEMENTATION
Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of ERP Implementation.

UNIT V EMERGING TRENDS ON ERP

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Knowledge of ERP implementation cycle.
CO2: Awareness of core and extended modules of ERP.
CO3: Able to understand ERP implementation steps.
CO4: Able to understand post implementation procedure.
CO5: Able to understand ERP trending concepts.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES:
- Study the basics of software development.
- Study the customer needs and apply in software development.
- Design the code and do the testing analysis.
- Develop quality tools and techniques used in software industry.
- Develop and implement the software standards.

UNIT I SOFTWARE ENGINEERING AND MODELS

UNIT II REQUIREMENTS ANALYSIS
Software requirements specifications – Structured tools for Software development– Structured analysis.

UNIT III SOFTWARE COST ESTIMATION
Planning a Software project – Cost Estimation and models – Software configuration management plans – Project monitoring plans.

UNIT IV SOFTWARE DESIGN

UNIT V SOFTWARE TESTING

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: To practice the various software modeling tools and techniques.
CO2: To study the various performance measurement tools and techniques.
CO3: Able to estimate time and cost of projects.
CO4: Able to select appropriate monitoring plan.
CO5: To study the importance of software design and software testing.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑️</td>
<td></td>
<td></td>
<td>☑️</td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES:
- Identify unsafe conditions and recognize unsafe alerts.
- Interpret the rules and regulations for safety operations.
- Capable of solving problem of accidents.
- Capable of solving the present for criticizing the present for improved safety.
- Collaborate and modify processes / procedures for safety.

UNIT I INTRODUCTION
Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS
Chemical exposure – Toxic materials – Radiation Ionizing and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL
Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV HAZARD ANALYSIS
System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment.

UNIT V SAFETY REGULATIONS

COURSE OUTCOMES:
Students will be able to
CO1 : Identify and prevent chemical, environmental mechanical, fire hazard.
CO2 : Collect, analyze and interpret the accidents data based on various safety techniques.
CO3 : Apply proper safety techniques on safety engineering and management.
CO4 : Able to perform hazard analysis.
CO5 : Aid to design the system with environmental consciousness by implementing safety regulation.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td>✔</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:
COURSE OBJECTIVES:
- Define flexible automation and describe its components.
- Explain the process of computer aided design.
- Relate the enablers of CAD and CAM integration and business function.
- Tell the fundamentals of integrated management systems.
- Correlate CIM with DBMS.

UNIT I  GT AND FMS
Part families, production flow analysis, cellular manufacturing, ROC, Flexible manufacturing systems- components, FMS applications, FMS analysis – Bottleneck model.

UNIT II  COMPUTER-AIDED DESIGN
Fundamentals of CAD – design process, manufacturing database – Computer graphics –functions, constructing the geometry, transformation, wire frame Vs solid modelling.

UNIT III  MANUFACTURING SUPPORT SYSTEMS
Product design and CAD, CAD/CAM and CIM, Computer aided process planning- Variant and generative approaches, Concurrent engineering and design for manufacture, Lean production, Agile manufacturing.

UNIT IV  FUNDAMENTALS OF COMMUNICATIONS
Information, Communications matrix, Computer communications, Network architecture, Tools and techniques.

UNIT V  DATABASE AND CIM MANAGEMENT
Manufacturing data, database technology, Database management, Management of CIM – role, cost justification, expert systems

COURSE OUTCOMES:
CO1: Analyze a cellular and flexible manufacturing system for its performance measures.
CO2: Gain knowledge in the basics of computer aided design.
CO3: Make competitive manufacturing systems with the use of appropriate tools and techniques.
CO4: Develop integrated manufacturing system with the required network structure and manufacturing database.
CO5: Able to understand DBMS concepts.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCE:
COURSE OBJECTIVES:
- Summarize the basics of vehicle structure and engines.
- Illustrate the various auxiliary systems associated with IC engines.
- Illustrate the various components in transmission system.
- Illustrate the different steering, braking and suspension systems.
- Classify the types and applications of sensors and actuators.

UNIT I  FUNDAMENTALS  9
Introduction to automotive systems - history of automobiles - Types of automobiles, Vehicle structure: functions - type - layout of chassis, frames, body. Vehicle aerodynamics: resistance and moments. Introduction to IC engines – components - functions and materials - two and four stroke cycle engines; Technology and constructional details and principle of working of: SI, CI, CNG / LPG engines. Comparison of SI, CI, CNG & LPG engines; Performance curves -Torque vs speed; BHP vs. RPM; FHP vs. RPM; SFC vs. RPM. Hybrid vehicles and alternative fuels.

UNIT II  AUXILIARY SYSTEMS  9
Ignition systems: construction of spark plugs, ignition methods -transistorized coil ignition system, capacitive discharge ignition system - Fuel delivery systems – construction of fuel injector, Injection methods - Multi Point Fuel Injector (MPFI) and Common Rail Fuel Injector (CRDI). Supercharging - Turbo chargers, Engine emission control by three way catalytic converter system, Emission norms (Euro and BS).

UNIT III  TRANSMISSION SYSTEMS  9

UNIT IV  STEERING, BRAKES AND SUSPENSIONS  9

UNIT V  SENSORS AND ACTUATORS IN AUTOMOTIVE SYSTEMS  9

COURSE OUTCOMES:
CO1: Acquired knowledge about the basic knowledge about vehicle structure and engines.
CO2: Acquired knowledge about IC engines and associated components in automotive technology.
CO3: Acquired knowledge about various components in transmission system.
CO4: Acquired knowledge about the different steering, braking and suspension systems.
CO5: Acquired knowledge about the role of sensors and actuators in advanced automotive systems.

TOTAL: 45 PERIODS
<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TEXT BOOKS:**

**REFERENCES:**

IE5015  
**COST ESTIMATION AND COST CONTROL**  
L T P C  
3 0 0 3

**COURSE OBJECTIVES:**
- Gaining knowledge in the field of cost estimation.
- Enable the students to estimate the cost of various manufacturing processes.
- Controlling the manufacturing and software cost.
- Designing the cost analysis.
- Applying cost estimation procedures in all types of industries.

**UNIT I  ESTIMATION AND COSTING**  

**UNIT II  PRODUCT COST ESTIMATION**  
Estimation in Forging shop – in welding shop – in Foundry Shop – in Machining Shop etc.,

**UNIT III  SOFTWARE COST ESTIMATION**  

**UNIT IV  COSTING METHODS**  
Job costing – Operating costing – Process costing.

**UNIT V  COST ANALYSIS FOR PLANNING AND CONTROL**  
Marginal costing – Standard costing and Variance Analysis – Budgetary control

**TOTAL: 45 PERIODS**
COURSE OUTCOMES:
CO1: To estimate the manufacturing cost and computation of software cost.
CO2: Able to estimate product cost.
CO3: To control the manufacturing and software cost.
CO4: To enable both the costing and estimating procedures for all type of industry.
CO5: Able to perform cost analysis.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✔</td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔</td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:

IE5016 APPLIED SOFT COMPUTING

COURSE OBJECTIVES:
- Understand the fundamental concepts of soft computing.
- Explain about genetic algorithms.
- Illustrate the concept of neural networks.
- Appraise about fuzzy logic systems for decision making.
- Develop hybrid systems for decision making.

UNIT I INTRODUCTION
History and Applications of Artificial Intelligence – Algorithmic versus Heuristic reasoning, Representation and Intelligence. Knowledge Representation: Rule based, Model based, Case based and hybrid systems. Logic based Abductive Inference, Stochastic approach to uncertainty.

UNIT II GENETIC ALGORITHMS
Introduction to Genetic Algorithms (GA) : Reproduction, Cross over, Mutation - Applications

UNIT III NEURAL NETWORKS

UNIT IV FUZZY LOGIC

UNIT V HYBRID SYSTEMS
Adaptive Neuro-Fuzzy Inference Systems - Hybrid intelligence systems – AHP- ANP – DEA.

TOTAL: 45 PERIODS
COURSE OUTCOMES:
On completion of this course, students will be
CO1: Able to understand the fundamental concepts of soft computing.
CO2: Able to apply Genetic Algorithms for solving complex problems.
CO3: Able to use neural networks.
CO4: Able to use fuzzy logic.
CO5: Able to use hybrid systems.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

IE5071 DECISION SUPPORT AND INTELLIGENT SYSTEMS L T P C 3 0 0 3

COURSE OBJECTIVES:
• Explain the fundamental terms, concepts and theories associated with the phases of Decision Support Systems.
• Describe the uses of various mathematical models, data warehousing and mining.
• Discuss and develop skills in the analysis, design and implementation of group support systems and knowledge management systems.
• Illustrate expert system as a subsystem of DSS.
• Track the knowledge representation methods.

UNIT I  INTRODUCTION
Managerial decision making, system modeling and support - preview of the modeling process-phases of decision making process.

UNIT II  ANALYSIS
DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.

UNIT III  TECHNOLOGIES
Group support systems- Enterprise DSS- supply chain and DSS - Knowledge management methods, technologies and tools.
UNIT IV  EXPERT SYSTEMS  
Artificial intelligence and expert systems - Concepts, structure, types - Knowledge acquisition and validation - Difficulties, methods, selection.

UNIT V  SEMANTIC NETWORKS  
Representation in logic and schemas, semantic networks, production rules and frames, inference techniques, intelligent system development, implementation and integration of management support systems.

TOTAL : 45 PERIODS

COURSE OUTCOMES:
CO1: Make decisions in the semi structured and unstructured problem situations.
CO2: Able to apply data warehousing and data mining principles in basic applications.
CO3: Develop knowledge management system with simple tools and techniques.
CO4: Develop intelligent based DSS.
CO5: Able to use logical and analytical thinking

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOK:

REFERENCES:

AD5091  CONSTITUTION OF INDIA

COURSE OBJECTIVES:
- Teach history and philosophy of Indian Constitution.
- Describe the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- Summarize powers and functions of Indian government.
- Explain emergency rule.
- Explain structure and functions of local administration.

UNIT I  INTRODUCTION  
History of Making of the Indian Constitution-Drafting Committee- (Composition & Working) - Philosophy of the Indian Constitution-Preamble-Salient Features

UNIT II  CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES  
UNIT III ORGANS OF GOVERNANCE
Parliament-Composition-Qualifications and Disqualifications-Powers and Functions-Executive
President-Governor-Council of Ministers-Judiciary, Appointment and Transfer of Judges,
Qualifications Powers and Functions

UNIT IV EMERGENCY PROVISIONS

UNIT V LOCAL ADMINISTRATION
District's Administration head- Role and Importance-Municipalities- Introduction- Mayor and role of
Elected Representative-CEO of Municipal Corporation-Pachayati raj- Introduction- PRI- Zila
Pachayat-Elected officials and their roles- CEO ZilaPachayat- Position and role-Block level-
Organizational Hierarchy (Different departments)-Village level- Role of Elected and Appointed
officials-Importance of grass root democracy

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1: Able to understand history and philosophy of Indian Constitution.
CO2: Able to understand the premises informing the twin themes of liberty and freedom from a civil
rights perspective.
CO3: Able to understand powers and functions of Indian government.
CO4: Able to understand emergency rule.
CO5: Able to understand structure and functions of local administration.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>☑</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<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>
<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>
<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>
<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>
<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>
<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>
<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>
<td></td>
<td></td>
<td>☑</td>
</tr>
</tbody>
</table>

TEXT BOOKS:
4. The Constitution of India (Bare Act), Government Publication, 1950

AD5092 VALUE EDUCATION

COURSE OBJECTIVES:
- Develop knowledge of self-development
- Explain the importance of Human values
- Develop the overall personality through value education
- Overcome the self destructive habits with value education
- Interpret social empowerment with value education

UNIT I INTRODUCTION TO VALUE EDUCATION
Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of
humanism, Moral and non- moral valuation, Standards and principles, Value judgements
UNIT II     IMPORTANCE OF VALUES
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness, Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT III     INFLUENCE OF VALUE EDUCATION
Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.

UNIT IV     REINCARNATION THROUGH VALUE EDUCATION

UNIT V     VALUE EDUCATION IN SOCIAL EMPOWERMENT
Equality, Non violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45 PERIODS

COURSE OUTCOMES:
CO1 – Gain knowledge of self-development
CO2 – Learn the importance of Human values
CO3 – Develop the overall personality through value education
CO4 – Overcome the self destructive habits with value education
CO5 – Interpret social empowerment with value education

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REFERENCES:

AD5093 PEDAGOGY STUDIES
LT 3000
C

COURSE OBJECTIVES:
• Understand the methodology of pedagogy.
• Compare pedagogical practices used by teachers in formal and informal classrooms in developing countries.
• Infer how can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy.
• Illustrate the factors necessary for professional development.
• Identify the Research gaps in pedagogy.
UNIT I  INTRODUCTION AND METHODOLOGY:  9
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of
learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of
methodology and Searching.

UNIT II  THEMATIC OVERVIEW  9
Pedagogical practices are being used by teachers in formal and informal classrooms in developing
countries - Curriculum, Teacher education.

UNIT III  EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES  9
Methodology for the in depth stage: quality assessment of included studies - How can teacher
education (curriculum and practicum) and the school curriculum and guidance materials best
support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for
effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers' attitudes
and beliefs and Pedagogic strategies.

UNIT IV  PROFESSIONAL DEVELOPMENT  9
Professional development: alignment with classroom practices and follow up support - Peer support
- Support from the head teacher and the community - Curriculum and assessment - Barriers to
learning: limited resources and large class sizes

UNIT V  RESEARCH GAPS AND FUTURE DIRECTIONS  9
Research design – Contexts – Pedagogy - Teacher education - Curriculum and assessment -
Dissemination and research impact.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
- Understand the methodology of pedagogy.
- Understand Pedagogical practices used by teachers in formal and informal classrooms in
developing countries.
- Find how can teacher education (curriculum and practicum) and the school curriculum and
guidance materials best support effective pedagogy.
- Know the factors necessary for professional development.
- Identify the Research gaps in pedagogy.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

REFERENCES:
   245-261.
   research project (MUSTER) country report 1. London: DFID.
   basic maths and reading in Africa: Does teacher preparation count? International Journal
   Oxford and Boston: Blackwell.
COURSE OBJECTIVES:
- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do’s and Don’t’s in life through Yam
- Categorize Do’s and Don’t’s in life through Niyam
- Develop a healthy mind and body through Yog Asans
- Invent breathing techniques through Pranayam

UNIT I             INTRODUCTION TO YOGA
Definitions of Eight parts of yog. (Ashtanga)

UNIT II             YAM
Do’s and Don’t’s in life.
Shaucha, santosh, tapa, swadhyay, ishwarpranidhan

UNIT III            NIYAM
Do’s and Don’t’s in life.
Ahinsa, satya, astheya, bramhacharya and aparigraha

UNIT IV            ASAN
Various yog poses and their benefits for mind & body

UNIT V             PRANAYAM
Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 45 PERIODS

OUTCOMES:
CO1 : Develop healthy mind in a healthy body thus improving social health also improve efficiency
CO2 : Learn Do’s and Don’t’s in life through Yam
CO3 : Learn Do’s and Don’t’s in life through Niyam
CO4 : Develop a healthy mind and body through Yog Asans
CO5 : Learn breathing techniques through Pranayam

REFERENCES:
1. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. ‘Yogic Asanas for Group Tarining-Part-I’ : Janardan Swami Yogabhyasi Mandal, Nagpur
COURSE OBJECTIVES:
- Develop basic personality skills holistically
- Develop deep personality skills holistically to achieve happy goals
- Rewrite the responsibilities
- Reframe a person with stable mind, pleasing personality and determination
- Discover wisdom in students

UNIT I NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I 9
Verses- 19,20,21,22 (wisdom) - Verses- 29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue)

UNIT II NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II 9
Verses- 52,53,59 (dont's) - Verses- 71,73,75,78 (do's)

UNIT III APPROACH TO DAY TO DAY WORK AND DUTIES 9
Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48

UNIT IV STATEMENTS OF BASIC KNOWLEDGE – I 9
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12-Verses 13, 14, 15, 16,17, 18

UNIT V PERSONALITY OF ROLE MODEL - SHRIMAD BHAGWADGEETA 9
Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter18 – Verses 37,38,63

TOTAL: 45PERIODS

COURSE OUTCOMES:
CO1: To develop basic personality skills holistically
CO2: To develop deep personality skills holistically to achieve happy goals
CO3: To rewrite the responsibilities
CO4: To reframe a person with stable mind, pleasing personality and determination
CO5: To awaken wisdom in students

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

REFERENCES:
1. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari’s ThreeSatakam , Niti-sringar-vairagya, New Delhi,2010
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata,2016
COURSE OBJECTIVES
The course will introduce the students to
- get a knowledge about Indian Culture
- Know Indian Languages and Literature religion and philosophy and the fine arts in India
- Explore the Science and Scientists of Ancient, Medieval and Modern India
- Understand education systems in India

UNIT I  INTRODUCTION TO CULTURE  9
Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India.

UNIT II  INDIAN LANGUAGES AND LITERATURE  9
Indian Languages and Literature – I: Languages and Literature of South India, – Indian Languages and Literature – II: Northern Indian Languages & Literature

UNIT III  RELIGION AND PHILOSOPHY  9
Major religions practiced in India and Understanding their Philosophy – religious movements in Modern India (Selected movements only)

UNIT IV  FINE ARTS IN INDIA (ART, TECHNOLOGY& ENGINEERING)  9
Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT V  EDUCATION SYSTEM IN INDIA  9
Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

TOTAL: 45 PERIODS

COURSE OUTCOMES
After successful completion of the course the students will be able to
- Understand philosophy of Indian culture.
- Distinguish the Indian languages and literature.
- Learn the philosophy of ancient, medieval and modern India.
- Acquire the information about the fine arts in India.
- Know the contribution of scientists of different eras.
- Understand education systems in India

REFERENCES:
5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989
AD5098 SANGA TAMIL LITERATURE APPRECIATION  L T P C  3 0 0 0

COURSE OBJECTIVES:
The main learning objective of this course is to make the students an appreciation for:
1. Introduction to Sanga Tamil Literature.
2. ‘Agathinai’ and ‘Purathinai’ in Sanga Tamil Literature.
3. ‘Attruppadai’ in Sanga Tamil Literature.
4. ‘Puranaanuru’ in Sanga Tamil Literature.
5. ‘Pathitrupaththu’ in Sanga Tamil Literature.

UNIT I SANGA TAMIL LITERATURE AN INTRODUCTION  9
Introduction to Tamil Sangam – History of Tamil Three Sangams – Introduction to Tamil Sangam Literature – Special Branches in Tamil Sangam Literature - Tamil Sangam Literature’s Grammar - Tamil Sangam Literature’s parables.

UNIT II ‘AGATHINAI’ AND ‘PURATHINAI’  9
Tholkappiyar’s Meaningful Verses – Three literature materials – Agathinai’s message - History of Culture from Agathinai – Purathinai – Classification – Mesage to Society from Purathinai.

UNIT III ‘ATTRUPPADAI’  9

UNIT IV ‘PURANAANURU’  9
Puranaanuru on Good Administration, Ruler and Subjects – Emotion & its Effect in Puranaanuru.

UNIT V ‘PATHITRUPATHTHU’  9
Pathitrupaththu in ‘Ettuthogai’ – Pathithupaththu’s Parables – Tamil dynasty:Valor, Administration, Charity in Pathitrupaththu - Mesage to Society from Pathitrupaththu.

TOTAL (L: 45) = 45 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Appreciate and apply the messages in Sanga Tamil Literature in their life.
2. Differentiate ‘Agathinai’ and ‘Purathinai’ in their personal and societal life.
3. Appreciate and apply the messages in ‘Attruppadai’ in their personal and societal life.
4. Appreciate and apply the messages in ‘Puranaanuru’ in their personal and societal life.
5. Appreciate and apply the messages in ‘Pathitrupaththu’ in their personal and societal life.

REFERENCES:
HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

HU5171 LANGUAGE AND COMMUNICATION LT P C 3 0 0 3

COURSE DESCRIPTION
This course offers an introduction to language and communication. The primary goal of this course is to familiarize students with key ideas related to communication using language as well as nonverbal means. Ideas related to the use of language and the underlying power structures are also examined. The course also examines the role of media in communication and in the dissemination of ideas as well as opinions.

Objectives
✓ To familiarize students with the concept of communication using linguistic and nonlinguistic resources.
✓ To help students ask critical questions regarding facts and opinions.
✓ To provide students with the material to discuss issues such as language and power structures.
✓ To help students think critically about false propaganda and fake news.

Learning Outcomes
➢ Students will be able to use linguistic and nonlinguistic resources of language in an integrated manner for communication.
➢ Students will be able to analyse communication in terms of facts and opinions.
➢ Students will be able to discuss, analyse and argue about issues related to language and power.

UNIT I LINGUISTIC AND NON-LINGUISTIC RESOURCE OF COMMUNICATION: 9
a) Writing and Speech
b) Distinction between language structure and language use, form and function, acceptability and grammaticality
c) Gestures and Body language, pictures and symbols, cultural appropriacy
d) Communicative Competency, context and situation, combination of linguistic and non-linguistic elements of communication

UNIT II STRUCTURE OF WRITING/CONVERSATION: 9
a) Language skills and the communication cycle; speaking and listening, writing and reading
b) Initiating and closing conversations, intervention, turn taking
c) Writing for target reader, rhetorical devices and strategies
d) Coherence and Cohesion in speech and writing

UNIT III POWER STRUCTURE AND LANGUAGE USE: 9
a) Gender and language use
b) Politeness expressions and their use
c) Ethical dimensions of language use
d) Language rights as part of human rights

UNIT IV MEDIA COMMUNICATION: 9
a) Print media, electronic media, social media
b) Power of media
c) Manufacturing of opinion, fake news and hidden agendas

UNIT V PERSUASIVE COMMUNICATION AND MISCOMMUNICATION: 9
a) Fundamentals of persuasive communication
b) Persuasive strategies
c) Communication barriers

TOTAL: 45 PERIODS
TEXT BOOKS:

HU5172 VALUES AND ETHICS

OBJECTIVES:
- Teach definition and classification of values.
- Explain Purusartha.
- Describe Sarvodaya idea.
- Summarize sustenance of life.
- Conclude views of hierarchy of values.

UNIT I DEFINITION AND CLASSIFICATION OF VALUES
Extrinsic values- Universal and Situational values- Physical- Environmental- Sensuous- Economic- Social- Aesthetic- Moral and Religious values

UNIT II CONCEPTS RELATED TO VALUES
Purusartha-Virtue- Right- duty- justice- Equality- Love and Good

UNIT III IDEOLOGY OF SARVODAYA
Egoism- Altruism and universalism- The Ideal of Sarvodaya and Vasudhaiva Kutumbakam

UNIT IV SUSTENANCE OF LIFE
The Problem of Sustenance of value in the process of Social, Political and Technological Changes

UNIT V VIEWS ON HIERARCHY OF VALUES
The Problem of hierarchy of values and their choice, The views of Pt. Madan Mohan Malviya and Mahatma Gandhi

OUTCOMES:
CO1: Able to understand definition and classification of values.
CO2: Able to understand purusartha.
CO3: Able to understand sarvodaya idea.

TOTAL: 45 PERIODS
CO4: Able to understand sustenance of life.
CO5: Able to understand views of hierarchy of values.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></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>
<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>
<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>
<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>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TEXT BOOKS:
2. Little, William, : An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)

HU5173 HUMAN RELATIONS AT WORK L T P C
3003

OBJECTIVES:
- Illustrate human relations at work its relationship with self.
- Explain the importance of interacting with people at work to develop teamwork.
- Infer the importance of physical health in maintaining human relations at work.
- Describe the importance of staying psychologically healthy.
- Identify the essential qualities for progressing in career.

UNIT I UNDERSTANDING AND MANAGING YOURSELF
Human Relations and You: Self-Esteem and Self-Confidence; Self-Motivation and Goal Setting; Emotional Intelligence, Attitudes, and Happiness; Values and Ethics and Problem Solving and Creativity.

UNIT II DEALING EFFECTIVELY WITH PEOPLE
Communication in the Workplace; Specialized Tactics for Getting Along with Others in the Workplace; Managing Conflict; Becoming an Effective Leader; Motivating Others and Developing Teamwork; Diversity and Cross-Cultural Competence.

UNIT III STAYING PHYSICALLY HEALTHY
Yoga, Pranayam and Exercise: Aerobic and anaerobic.

UNIT IV STAYING PSYCHOLOGICALLY HEALTHY
Managing Stress and Personal Problems, Meditation.

UNIT V DEVELOPING CAREER THRUST

OUTCOMES:
Students will be able to
CO1: Understand the importance of self-management.
CO2: Know how to deal with people to develop teamwork.
CO3: Know the importance of staying healthy.
CO4: Know how to manage stress and personal problems.
CO5: Develop the personal qualities essential for career growth.
COURSE DESCRIPTION
Psychological Processes course is designed for students to be aware of the basic principles of psychology for the better understanding of people’s psyche and behavior around them. This course enables learners to use the optimal use of different forms of thinking skills and thereby results in effective communication in diverse situations. Every unit of the syllabus highlights the psychological process of people, the most powerful and constructive use of perceptions.

OBJECTIVES
The major objectives of this course is
- To develop students’ awareness – on psychology, learning behavior and usage of perception effectively.
- To learn to use the various kinds of thinking in a formal context.
- To critically evaluate content and comprehend the message on the bases of perception, personality and intelligence.

UNIT I
INTRODUCTION

UNIT II
SENSORY & PERCEPTUAL PROCESSES
Some general properties of Senses: Visual system – the eye, colour vision – Auditory system – Hearing, listening, Sounds - Other senses - Selective attention; physiological correlates of attention; Internal influences on perception learning – set - motivation & emotion - cognitive styles; External influences on perception figure and ground separation – movement – organization – illusion; Internal- external interactions: Constancy - Depth Perception- Binocular & Monocular Perception; Perceptual defense & Perceptual vigilance; Sensory deprivation -Sensory bombardment; ESP - Social Perception.

UNIT III
COGNITION & AFFECT

UNIT IV THINKING, PROBLEM-SOLVING & DECISION MAKING

UNIT V PERSONALITY & INTELLIGENCE
Psychological phenomena & Attributes of humans - cognition, motivation, and behavior - thoughts, feelings, perceptions, and actions – personality dimensions, traits, patterns - Specialized knowledge, performance accomplishments, automaticity or ease of functioning, skilled performance under challenge - generative flexibility, and speed of learning or behavior change.

REFERENCES

HU5175 EDUCATION, TECHNOLOGY AND SOCIETY L T P C
3 0 0 3

COURSE DESCRIPTION
This course introduces students to multidisciplinary studies in Education, Technology and Society. Students will get an understanding of the relationship between education, technology and society. They will also learn about the long lasting impact of good education in a technologically advanced society.

COURSE OBJECTIVES:
The course aims
- To help learners understand the basics of different types of technology utilised in the field of education
- To make them realize the impact of education in society
- To make them evolve as responsible citizen in a technologically advanced society

LEARNING OUTCOMES
By the end of the course, learners will be able to
- Understand the various apps of technology apps and use them to access, generate and present information effectively.
- Apply technology based resources and other media formats equitably, ethically and legally.
- Integrate their technical education for betterment of society as well as their personal life.
UNIT I INDIAN EDUCATION SYSTEM
Gurukul to ICT education – Teacher as facilitator – Macaulay’s Minutes – English medium vs Regional medium – Importance of Education in Modern India - Challenges in Education

UNIT II LEARNING THEORIES

UNIT III TECHNOLOGICAL ADVANCEMENTS
Web tools – Social media in education – elearning – MOOCs – Mobile assisted learning – Learning Apps – Blended learning - Self-directed learning

UNIT IV EDUCATIONAL TECHNOLOGY
Technological implications on Education – Teaching, Learning & Testing with Technology - Advantages and drawbacks – Critical analysis on the use of technology

UNIT V ETHICAL IMPLICATIONS
Plagiarism – Online Copyright issues – Ethical and value implications of education and technology on individual and society.

TOTAL:45 PERIODS

TEACHING METHODS
Teaching modes include guest lectures, discussion groups, presentations, visual media, and a practicum style of learning.

EVALUATION
As this is course is not a content based course, it focuses more on the ethical use of technology in education and society, and so, evaluation can be based on assignments and discussions. So there is no need for an end semester examination. Internals marks can be taken for the total marks.

INTERNAL (100 % WEIGHTAGE)
(a) Written Test (40 marks)
(b) Assignment: Write a real time report of the technology use in any school / college (15 marks)
(c) Presentation: Students choose any one of the technological tools and present its relevance to education and society (15 marks)
(d) Group discussion: Students discuss in groups on case studies relating to various challenges in education and technology use in society (20 marks)
(e) Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others’ posts. (10 marks)

REFERENCES
1) Education and Social order by Bertrand Russel
2) Theories of learning by Bower and Hilgard
3) Technology and Society by Jan L Harrington
OBJECTIVES

- To create a new understanding by teaching philosophy through a comparison of Indian and Western traditions.
- To foster critical thinking and imagination by dealing with inter-related concepts in literature and science.
- To bridge the gap between the sciences and humanities through introspective analyses.
- To nurture an understanding of the self and elucidates ways to progress towards a higher understanding of one’s self and others.

UNIT I KNOWLEDGE 9

UNIT II ORIGIN 9

UNIT III WORD 9

UNIT IV KNOWLEDGE AS POWER/OPPRESSION 9

UNIT V SELF KNOWLEDGE/BRAHMAN 9

TOTAL : 45 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Think sceptically, ask questions and to arrive at deductions.
2. Connect and relate different branches of thought.
3. Comprehends the relation between language, thought and action.
4. Arrive at a better understanding of self and others and forms a new outlook.

REFERENCES:
7. Bacon, Francis: Power as Knowledge
UNIT I  INTRODUCTION  7
Nature and fields.

UNIT II  PSYCHOLOGY IN INDUSTRIES AND ORGANIZATIONS  9
Job analysis; fatigue and accidents; consumer behavior.

UNIT III  PSYCHOLOGY AND MENTAL HEALTH  11
Abnormality, symptoms and causes psychological disorders

UNIT IV  PSYCHOLOGY AND COUNSELING  7
Need of Counseling, Counselor and the Counselee, Counseling Process, Areas of Counseling.

UNIT V  PSYCHOLOGY AND SOCIAL BEHAVIOUR  11
Group, group dynamics, teambuilding, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

TOTAL: 45 PERIODS

TEXT BOOKS
HSMC– ELECTIVES – HUMANITIES II (EVEN SEMESTER)

HU5271 GENDER, CULTURE AND DEVELOPMENT L T P C 3 0 0 3

COURSE DESCRIPTION
This course offers an introduction to Gender Studies that asks critical questions about the meanings of sex and gender in Indian society. The primary goal of this course is to familiarize students with key issues, questions and debates in Gender Studies, both historical and contemporary drawing from Indian literature and media studies, to examine cultural assumptions about sex, gender, and sexuality. This course integrates analysis of current events through student presentations, aiming to increase awareness of contemporary and historical experiences of women, and of the multiple ways that sex and gender interact with class, caste and other social identities. This course also seeks to build an understanding of the concepts of gender, gender-based violence, sexuality, and rights and their impact on development through a number of discussions, exercises and reflective activities.

Objectives
✓ To familiarize students with the concepts of sex and gender through literary and media texts.
✓ To help students ask critical questions regarding gender roles in society.
✓ To provide students with the material to discuss gender issues such as gender based discrimination, violence and development.
✓ To help students think critically about gender based problems and solutions.

Learning Outcomes
➢ Students will be able to critically read literary and media texts and understand the underlying gender perspectives in them.
➢ Students will be able to analyse current social events in the light of gender perspectives.
➢ Students will be able to discuss, analyse and argue about issues related to gender and their impact on society, culture and development.

UNIT I: Introduction to Gender
• Definition of Gender
• Basic Gender Concepts and Terminology
• Exploring Attitudes towards Gender
• Social Construction of Gender

Texts:
1. Sukhu and Dukhu (Amar Chitra Katha)
2. The Cat who Became a Queen (Folk tale, J. Hinton Knowles, Folk-Tales of Kashmir. London: Kegan Paul, Trench, Trübner, and Company, 1893, pp. 8-10.)

UNIT II: Gender Roles and Relations
• Types of Gender Roles
• Gender Roles and Relationships Matrix
• Gender-based Division and Valuation of Labour

Texts:
1. Muniyakka (Short Story, Lakshmi Kannan, Nandanvan and Other Stories, Hyderabad: Orient Blackswan, 2011)

UNIT III: Gender Development Issues
• Identifying Gender Issues
• Gender Sensitive Language
OBJECTIVES:

- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

ASSESSMENT AND GRADING:

- End Term Exam: 50%
- Project/Assignment: 30%
- Discussion & Classroom Participation: 20%

ASSESSMENT AND GRADING:

- Discussion & Classroom Participation: 20%
- Project/Assignment: 30%
- End Term Exam: 50%

UNIT IV: Gender-based Violence

- The concept of violence
- Types of Gender-based violence
- The relationship between gender, development and violence
- Gender-based violence from a human rights perspective

UNIT V: Gender and Culture

- Gender and Film
- Gender, Media and Advertisement

READINGS: Relevant additional texts for readings will be announced in the class. Classes will consist of a combination of activities: dialogue-based lectures, discussions, collaborative learning activities, group work and in-class assignments.

UNIT I: HUMAN LIFE, ITS AIM AND SIGNIFICANCE

The concept of a successful life, happy life and a meaningful life, Ethical and decision making capability and its development: Meaning of Ethical dilemma, sharing real life experiences.
UNIT II  CREATIVELY LEADERSHIP ABILITY AND THEIR DEVELOPMENT  
Intellectual, Emotional, Creative, Ethico - spiritual development, Aesthetic sense, Self-dependency, Activeness, Development of positive attitude.

UNIT III  HARMONY IN PERSONAL AND SOCIAL LIFE:  
Concept of personal and group Ethics; Balance between - rights and duties-welfare of self and welfare of all, Creating a value based work culture in hostel, classroom and other places in the campus and society.

UNIT IV  CHARACTER, RIGHTEOUSNESS AND VIRTUES FOR A MEANINGFUL LIFE  
Egolessness, Humility, Righteousness, Purity, Truthfulness, Integrity, Self-restraint, Self-control, Sense of responsibility, Empathy, Love, Compassion, Maitri / Comradeship, Cooperation, Tolerance.

UNIT V  DILEMMA BETWEEN MATERIALISTIC DEVELOPMENT AND HUMAN WELFARE  

TOTAL:45 PERIODS

OUTCOMES:  
On completion of the course, the students will be able to:  
1. Enable students to understand the concept of contemporary ethics at different levels: Individual, local and Global and enable them to cross examine the ethical and social consequences of the decisions of their life-view and world view.  
2. Develop the ability of students to create a balance between their individual freedom and social responsibilities and enable them to identify the personal, professional and social values and integrate them in their personality after cross examination.  
3. Enable students to cross examine their earlier decisions taken in life and understand the meaning of ethical dilemma to overcome the ethical dilemmas and engage in critical reflection.  
4. Develop positive habits of thought and conduct and work cohesively with fellow beings who have variety of strengths, experiences, shortcomings and challenges, hence to enable them to handle diverse type of personalities.  
5. Enable students to develop a method for making ethically sound decisions for themselves, within hostels, classrooms, university campus and society.

HU5273  LAW AND ENGINEERING  L T P C  3 0 0 3

UNIT I  THE LEGAL SYSTEM: SOURCES OF LAW AND THE COURT STRUCTURE  9  
Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court) Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.

UNIT II  LAWS  9  
Basic principles of contract law, sale of goods law, laws relating to industrial pollution, accident, environmental protection, health and safety at work, patent law, constitutional law: the supreme law of the land, Information technology law and cyber crimes.
UNIT III BUSINESS ORGANISATIONS
Sole traders (Business has no separate identity from you, all business property belongs to you).
Partnerships: Types of Partnerships - Limited Liability Partnership, General Partnership, Limited
Partnerships. Companies: The nature of companies, Classification of companies, Formation of
companies, Features of a public company, Carrying on business, Directors– Their Powers and
Responsibilities/Liabilities.

UNIT IV LAW AND SOCIETY
Interdisciplinary nature of law, legal ideologies/philosophy/ schools of jurisprudence.

UNIT V CASE STUDIES
Important legal disputes and judicial litigations

TOTAL: 45 PERIODS

HU5274 FILM APPRECIATION

COURSE DESCRIPTION
This is an intensive course designed to promote comprehensive understanding and insights into
the nature of cinema and other related forms and practices. Movies, though at times are used
more as escapism, they are also a true art form and expressive tool used by writers, directors and
actors. This course will explore the aesthetics of cinema, the concepts behind storytelling and
various other elements of a film. It will also explore the impact of movies in our society and in our
lives. It also encourages students to use films as a medium to analyse visual texts and read
underlying messages.

OBJECTIVES:
- To help learners understand the various movie genres and its types.
- To understand various elements that contributes to film making.
- To make them realize the impact of film in society.
- To analyse the visual media and interpret the underlying messages.

UNIT I THE COMPONENTS OF FILMS
Story, Screenplay & Script – Actors – Director – Crew Members – Mis En Scene – Structure of A
Film – Narrative Elements – Linear & Non-Linear – Types of Movie Genres: Mysteries, Romantic
Comedies, Horror Etc.

UNIT II EVOLUTION OF FILM
History of Films – Early Cinema – Silent Movies – Talkies – Film Language, Form, Movement –
Film Theories – Realist, Auteurists, Feminist, Psychoanalytic, Idealogical Theories.

UNIT III FILMS ACROSS THE WORLD
Culture – All Time Great Movies.

UNIT IV INDIAN FILMS
The Early Era – History Of Indian Cinema – Movies for Social Change – Hindi Movies that Created
Impact – Regional Movies – Documentaries – Cultural Identity.

UNIT V INTERPRETING FILMS
Film Criticism & Appreciation – Censorship in Movies – Cultural Representation in Movies –
Television – New Media & Online Media – Films Beyond Entertainment.

TOTAL: 45 PERIODS
OUTCOMES
On completion of the course, the students will be able to:
- Recognize types of films, their impact on society and their roles in our lives.
- Have an understanding of the concepts of storytelling, Mise en Scene, and other elements of film making.
- Interpret the underlying messages in the movies.

Teaching Methods
- Each unit consists of reading materials, learning activities videos, websites. Students are expected to watch movies sometimes in class and at times at home and discuss in class.

Evaluation
- As this is course is critical appreciation course on films, there is no written end semester examination. The course is more on learning how to critically analyse a movie and appreciate its finer elements. Therefore evaluation can be based on assignments and discussions. Internals marks can be taken for the total marks.

Internal (100 % weightage)
- Assignment 1: Write a movie review with critical analysis (20 marks).
- Assignment2 : Write a script for a scene taken from a short story / novella (20 marks).
- Presentation: Students choose any one topic related to films and present it to the audience. (25 marks)
- Group discussion : Students discuss in groups on the various aspects of movies and its impact on society. (25 marks)
- Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others’ posts. (10 marks)

REFERENCES
1. A Biographical Dictionary of Film by David Thomson, Secker & Warburg, 1975
2. Signs and Meaning in the Cinema by Peter Wollen, Secker & Warburg, 1969
3. The World Viewed by Stanley Cavell 1971
4. Film Style and Technology: History and Analysis by Barry Salt, Starword, 1983

HU5275 FUNDAMENTALS OF LANGUAGE AND LINGUISTICS L T P C
3 0 0 3

OBJECTIVES
- To broadly introduce students to the formal and theoretical aspects of linguistics.
- To enable learners to understand the various practical applications of language and recent findings in the field of applied linguistics.

CONTENTS :
UNIT I LANGUAGE AND LINGUISTICS: AN OVERVIEW 9

UNIT II MORPHOLOGY - WORDS OF LANGUAGE 9
UNIT III SYNTAX- THE SENTENCE PATTERNS OF LANGUAGE AND SEMANTICS-THE MEANING OF LANGUAGE

UNIT IV PHONETICS – THE SOUNDS OF LANGUAGE

UNIT V APPLIED LINGUISTICS - THE PRACTICAL APPLICATIONS OF LANGUAGE
Language learning and teaching (ELT)- lexicography-translation studies-computational linguistics-neurolinguistics (speech pathology and language disorders)- forensic linguistics – sociolinguistics.

TOTAL : 45 PERIODS

Teaching Methods :
Lectures, discussion.

Evaluation Internal and External :
Internal: 2 written tests + assignments, seminars, project (50+15+15+20).
External: A 3 hour written exam (50 marks)

REFERENCES :

HU5276 UNDERSTANDING SOCIETY AND CULTURE THROUGH LITERATURE

OBJECTIVES
- To internalize the importance of language by understanding its role in the transformation of man.
- To look at language, literature and culture as locus of identity and change.
- To extract meaning from existing literatures and cultures.
- To identify meanings in modern life by reconnecting with lost cultures.

UNIT I INTRODUCTION
Why study literature? Tracing the origin – pictures. Tokens as precursors of writing. Movement from three dimensions to two dimensions- Pictography. From visual to oral -Logography. Reading out literature to young children- Edmund J Farrell.

UNIT II READING CULTURE
Reading culture through language, signs and consumables- Roland Barthes. Culture through poems- Nissim Ezekiel’s ‘ The night of the Scorpion‘. ‘Nothing’s Changed’- Tatamkhulu Afrika-Apartheid. Ruskin Bond- 'Night train at Deoli‘- How real life is different from movies.

UNIT III IDENTIFYING MEANING
Searching and locating meaning through literature. Looking for order in a chaotic world. The Myth of Sisyphus (Albert Camus) and Adi Shankar’s ‘Jagat Mithya‘- the world as an illusion. The Indian version as ‘meaningless meaning’.

UNIT IV POST MODERNISM
‘If on a winter’s night a traveler‘- Italo Calvino. The book about the reader- the experience of reading as reading. Metafiction. Selfie Culture. Visual Culture as purpose of modern life.
UNIT V  RETURNING TO PICTURES

READING LIST
1. Bond, Ruskin: ‘Night train at Deoli’
2. Ezekiel, Nissim: ‘The Night of the Scorpion’
3. Afrika, Tatamkhulu: ‘Nothing’s Changed’
4. Barthes, Roland: Mythologies
5. Shankaracharya: Viveka Chudamani
6. Camus, Albert- The Myth of Sisyphus
7. Calvino, Italo: If on a winter’s night a traveler

OUTCOMES
- Can identify the connections among language, literature and culture.
- Is able to relate between seemingly different aspects of life.
- Understands the fractions in modern life and can assimilate meanings.