ANNA UNIVERSITY, CHENNAI  
AFFILIATED INSTITUTIONS  
R - 2013  
B.E. INDUSTRIAL ENGINEERING AND MANAGEMENT  
I – VIII SEMESTERS CURRICULUM AND SYLLABUS  

SEMESTER I  

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS6151</td>
<td>Technical English – I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MA6151</td>
<td>Mathematics – I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>PH6151</td>
<td>Engineering Physics – I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>CY6151</td>
<td>Engineering Chemistry – I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE6151</td>
<td>Computer Programming</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>GE6152</td>
<td>Engineering Graphics</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE6161</td>
<td>Computer Practices Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>GE6162</td>
<td>Engineering Practices Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>GE6163</td>
<td>Physics and Chemistry Laboratory - I</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td>17</td>
<td>2</td>
<td>11</td>
<td>26</td>
</tr>
</tbody>
</table>

SEMESTER II  

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS6251</td>
<td>Technical English – II</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>MA6251</td>
<td>Mathematics – II</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>PH6251</td>
<td>Engineering Physics – II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>CY6251</td>
<td>Engineering Chemistry – II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE6252</td>
<td>Basic Electrical and Electronics Engineering</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>GE6253</td>
<td>Engineering Mechanics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE6261</td>
<td>Computer Aided Drafting and Modeling Laboratory</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>GE6262</td>
<td>Physics and Chemistry Laboratory - II</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td>19</td>
<td>4</td>
<td>4</td>
<td>25</td>
</tr>
</tbody>
</table>
### SEMESTER III

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>IE6301</td>
<td>Work System Design</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>MA6351</td>
<td>Transforms and Partial Differential Equations</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>ME6302</td>
<td>Manufacturing Technology - I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AT6302</td>
<td>Mechanics of Machines</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>CE6306</td>
<td>Strength of Materials</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>IE6401</td>
<td>Operations Research - I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>ME6311</td>
<td>Manufacturing Technology Laboratory I</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>IE6311</td>
<td>Work System Design Laboratory</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>CE6315</td>
<td>Strength of Materials Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>18</td>
<td>4</td>
<td>8</td>
<td>27</td>
</tr>
</tbody>
</table>

### SEMESTER IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MA6468</td>
<td>Probability and Statistics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>CE6451</td>
<td>Fluid Mechanics and Machinery</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>MG6851</td>
<td>Principles of Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>ME6402</td>
<td>Manufacturing Technology - II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>IE6501</td>
<td>Operations Research - II</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>IE6302</td>
<td>Engineering Economy, Costing and Accounting</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CE6461</td>
<td>Fluid Mechanics and Machinery Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>ME6411</td>
<td>Manufacturing Technology Laboratory - II</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>GE6674</td>
<td>Communication and Soft Skills - Laboratory Based</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>18</td>
<td>3</td>
<td>10</td>
<td>27</td>
</tr>
</tbody>
</table>
### SEMESTER V

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IE6503</td>
<td>Applied Ergonomics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>IE6604</td>
<td>Facility Layout and Material Handling</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>IE6502</td>
<td>Statistical Quality Control</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>MG6571</td>
<td>Human Resource Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>IE6504</td>
<td>Manufacturing Automation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Elective I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>AN6611</td>
<td>Automation Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>IM6511</td>
<td>Industrial Engineering Laboratory</td>
<td>0</td>
<td>0</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><strong>TOTAL</strong></td>
<td>18</td>
<td>0</td>
<td>5</td>
<td>21</td>
</tr>
</tbody>
</table>

### SEMESTER VI

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MG6652</td>
<td>Management Accounting and Financial Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>IE6701</td>
<td>Design of Experiments</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>IE6603</td>
<td>Reliability Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>GE6757</td>
<td>Total Quality Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>IM6601</td>
<td>Operations Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Elective – II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>IM6611</td>
<td>Production System Design Project</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>IE6612</td>
<td>Statistical Applications and Optimization Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>IM6612</td>
<td>Technical Seminar</td>
<td>0</td>
<td>0</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><strong>TOTAL</strong></td>
<td>18</td>
<td>0</td>
<td>11</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>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>IM6701</td>
<td>Value Engineering and Project Management</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>MG6089</td>
<td>Supply Chain Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>IE6702</td>
<td>Simulation Modeling and Analysis</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>IE6010</td>
<td>Decision Support and Intelligent Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Elective – III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Elective – IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>IE6711</td>
<td>Discrete Simulation Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>IM6711</td>
<td>Comprehension</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>18</td>
<td>1</td>
<td>5</td>
<td>22</td>
</tr>
</tbody>
</table>

### SEMESTER VIII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MG6072</td>
<td>Marketing Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>GE6351</td>
<td>Environmental Science and Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Elective V</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>IM6811</td>
<td>Project Work</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td>9</td>
<td>0</td>
<td>12</td>
<td>15</td>
</tr>
</tbody>
</table>

**TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 187**

**LIST OF ELECTIVES FOR INDUSTRIAL ENGINEERING AND MANAGEMENT**

### SEMESTER V

**Elective I**

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MG6082</td>
<td>Maintenance Engineering and Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE6601</td>
<td>Productivity Management and Re-engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE6602</td>
<td>Operations Scheduling</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>IM6001</td>
<td>Services Operations Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE6084</td>
<td>Human Rights</td>
<td>3</td>
<td>0</td>
<td>0</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>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IE6801</td>
<td>Safety Engineering and Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE6003</td>
<td>Advanced Optimization Techniques</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE6004</td>
<td>Technology Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>IE6008</td>
<td>Metrology and Inspection</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>GE6083</td>
<td>Disaster Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VII
#### Elective III

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IE6005</td>
<td>Modeling of Manufacturing Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE6006</td>
<td>Evolutionary Optimization</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE6007</td>
<td>Systems Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>IE6009</td>
<td>Computational Methods and Algorithms</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

#### Elective IV

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>IM6002</td>
<td>Management Information Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE6001</td>
<td>Multivariate and Statistical Analysis</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IM6003</td>
<td>Industrial Laws</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MF6001</td>
<td>Packaging Materials and Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VIII
#### Elective V

<table>
<thead>
<tr>
<th>SL. No.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>ME6009</td>
<td>Energy Conservation and Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>IE6011</td>
<td>Product Design and Development</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>IE6012</td>
<td>Industrial Robotics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>IM6004</td>
<td>World Class Manufacturing</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>MF6701</td>
<td>Flexible Manufacturing Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>MG6071</td>
<td>Entrepreneurship Development</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To enable learners of Engineering and Technology develop their basic communication skills in English.
- To emphasize specially the development of speaking skills amongst learners of Engineering and Technology.
- To ensure that learners use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading and writing leading to effective and efficient communication.

UNIT I
9+3
Listening - Introducing learners to GIE - Types of listening - Listening to audio (verbal & sounds); Speaking - Speaking about one's place, important festivals etc. - Introducing oneself, one's family / friend; Reading - Skimming a reading passage - Scanning for specific information - Note-making; Writing - Free writing on any given topic (My favourite place / Hobbies / School life, etc.) - Sentence completion - Autobiographical writing (writing about one's leisure time activities, hometown, etc.); Grammar - Prepositions - Reference words - Wh-questions - Tenses (Simple); Vocabulary - Word formation - Word expansion (root words / etymology); E-materials - Interactive exercises for Grammar & Vocabulary - Reading comprehension exercises - Listening to audio files and answering questions.

UNIT II
9+3
Listening - Listening and responding to video lectures / talks; Speaking - Describing a simple process (filling a form, etc.) - Asking and answering questions - Telephone skills - Telephone etiquette; Reading - Critical reading - Finding key information in a given text - Sifting facts from opinions; Writing - Biographical writing (place, people) - Process descriptions (general/specific) - Definitions - Recommendations - Instructions; Grammar - Use of imperatives - Subject-verb agreement; Vocabulary - Compound words - Word Association (connotation); E-materials - Interactive exercises for Grammar and Vocabulary - Reading exercises with sample telephone conversations / lectures - Picture-based activities.

UNIT III
9+3
Listening - Listening to specific task - focused audio tracks; Speaking - Role-play - Simulation - Group interaction - Speaking in formal situations (teachers, officials, foreigners); Reading - Reading and interpreting visual material; Writing - Jumbled sentences - Coherence and cohesion in writing - Channel conversion (flowchart into process) - Types of paragraph (cause and effect / compare and contrast / narrative / analytical) - Informal writing (letter/e-mail/blogs) - Paraphrasing; Grammar - Tenses (Past) - Use of sequence words - Adjectives; Vocabulary - Different forms and uses of words, Cause and effect words; E-materials - Interactive exercises for Grammar and Vocabulary - Excerpts from films related to the theme and follow up exercises - Pictures of flow charts and tables for interpretations.

UNIT IV
9+3
Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing - Different types of essays; Grammar - Adverbs - Tenses - future time reference; Vocabulary - Single word substitutes - Use of abbreviations and acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.
UNIT V
Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast and telecast from Radio and TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email; Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar and Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents - Interpreting posters.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
Learners should be able to
• Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
• Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
• Read different genres of texts adopting various reading strategies.
• Listen/view and comprehend different spoken discourses/excerpts in different accents

TEXTBOOKS:

REFERENCES:

EXTENSIVE Reading (Not for Examination)

WEBSITES:

TEACHING METHODS:
• Lectures
• Activities conducted individually, in pairs and in groups like self introduction, peer introduction, group poster making, grammar and vocabulary games, etc.
• Discussions
• Role play activities
• Short presentations
• Listening and viewing activities with follow up activities like discussion, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc.
EVALUATION PATTERN:

Internal assessment: 20%
3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like

- Project
- Assignment
- Reviews
- Creative writing
- Poster making, etc.

All the four skills are to be tested with equal weightage given to each.

- Speaking assessment: Individual speaking activities, Pair work activities like role play, Interview, Group discussions
- Reading assessment: Reading passages with comprehension questions graded from simple to complex, from direct to inferential
- Writing assessment: Writing paragraphs, essays etc. Writing should include grammar and vocabulary.
- Listening/Viewing assessment: Lectures, dialogues, film clippings with questions on verbal as well as audio/visual content.

End Semester Examination: 80%

MA6151 MATHEMATICS – I

OBJECTIVES:

- To develop the use of matrix algebra techniques this is needed by engineers for practical applications.
- To make the student knowledgeable in the area of infinite series and their convergence so that he/she will be familiar with limitations of using infinite series approximations for solutions arising in mathematical modeling.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To introduce the concepts of improper integrals, Gamma, Beta and Error functions which are needed in engineering applications.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES


UNIT II SEQUENCES AND SERIES

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS  
Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes - Evolute as envelope of normals.

UNIT IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES  

UNIT V MULTIPLE INTEGRALS  

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
1. This course equips students to have basic knowledge and understanding in one fields of materials, integral and differential calculus.

TEXT BOOKS:

REFERENCES:

PH6151 ENGINEERING PHYSICS – I  
L T P C  
3 0 0 3

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

UNIT I CRYSTAL PHYSICS  
Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – Diamond and graphite structures (qualitative treatment) - Crystal growth techniques –solution, melt (Bridgman and Czochralski) and vapour growth techniques (qualitative)
UNIT II   PROPERTIES OF MATTER AND THERMAL PHYSICS

Elasticity- Hooke’s law - Relationship between three modulii of elasticity (qualitative) – stress -strain diagram – Poisson’s ratio –Factors affecting elasticity –Bending moment – Depression of a cantilever –Young’s modulus by uniform bending- I-shaped girders


UNIT III  QUANTUM PHYSICS


UNIT IV  ACOUSTICS AND ULTRASONICS


Production of ultrasonics by magnetostriction and piezoelectric methods - acoustic grating -Non Destructive Testing – pulse echo system through transmission and reflection modes - A,B and C – scan displays, Medical applications - Sonogram

UNIT V  PHOTONICS AND FIBRE OPTICS

Spontaneous and stimulated emission- Population inversion -Einstein’s A and B coefficients - derivation. Types of lasers – Nd:YAG, CO\textsubscript{2}, Semiconductor lasers (homojunction & heterojunction)- Industrial and Medical Applications.

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle - Types of optical fibres (material, refractive index, mode) – attenuation, dispersion, bending - Fibre Optical Communication system (Block diagram) - Active and passive fibre sensors- Endoscope.

TOTAL: 45 PERIODS

OUTCOMES:
• The students will have knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

TEXT BOOKS:
1. Arumugam M. Engineering Physics. Anuradha publishers, 2010

REFERENCES:
1. Searls and Zemansky. University Physics, 2009
5. Rajagopal K. Engineering Physics. PHI, New Delhi, 2011
OBJECTIVES:

- To make the students conversant with basics of polymer chemistry.
- To make the student acquire sound knowledge of second law of thermodynamics and second law based derivations of importance in engineering applications in all disciplines.
- To acquaint the student with concepts of important photophysical and photochemical processes and spectroscopy.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.
- To acquaint the students with the basics of nano materials, their properties and applications.

UNIT I POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerization. Types and mechanism of polymerization: Addition (Free Radical, cationic and anionic); condensation and copolymerization. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerization: Bulk, emulsion, solution and suspension. Preparation, properties and uses of Nylon 6,6, and Epoxy resin.

UNIT II CHEMICAL THERMODYNAMICS
Terminology of thermodynamics - Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions (problems); Criteria of spontaneity; Gibbs-Helmholtz equation (problems); Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochole(problems).

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

UNIT IV PHASE RULE AND ALLOYS

UNIT V NANOCHEMISTRY
Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: nano cluster, nano rod, nanotube(CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrode position, chemical vapour deposition, laser ablation; Properties and applications

OUTCOMES:
- The knowledge gained on polymer chemistry, thermodynamics. spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.
TEXT BOOKS:

REFERENCES:

GE6151 COMPUTER PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:
The students should be made to:
- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.

UNIT I INTRODUCTION

UNIT II C PROGRAMMING BASICS

UNIT III ARRAYS AND STRINGS

UNIT IV FUNCTIONS AND POINTERS
UNIT V STRUCTURES AND UNIONS
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
• Design C Programs for problems.
• Write and execute C programs for simple applications.

TEXTBOOKS:

REFERENCES:

GE6152 ENGINEERING GRAPHICS

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

CONCEPTS AND CONVENTIONS (Not for Examination)
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 HAND SKETCHING
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-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.
UNIT III PROJECTION OF SOLIDS  5+9
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES  5+9
Sectioning of above solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS  6+9
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.

COMPUTER AIDED DRAFTING (Demonstration Only)  3
Introduction to drafting packages and demonstration of their use.

TOTAL : 75 PERIODS

OUTCOMES:
On Completion of the course the student will be able to
• perform free hand sketching of basic geometrical constructions and multiple views of objects.
• do orthographic projection of lines and plane surfaces.
• draw projections and solids and development of surfaces.
• prepare isometric and perspective sections of simple solids.
• demonstrate computer aided drafting.

TEXT BOOK:

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. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day.

GE6161 COMPUTER PRACTICES LABORATORY

OBJECTIVES:
The student should be made to:
- Be familiar with the use of Office software.
- Be exposed to presentation and visualization tools.
- Be exposed to problem solving techniques and flow charts.
- Be familiar with programming in C.
- Learn to use Arrays, strings, functions, structures and unions.

LIST OF EXPERIMENTS:
1. Search, generate, manipulate data using MS office/ Open Office
2. Presentation and Visualization – graphs, charts, 2D, 3D
3. Problem formulation, Problem Solving and Flowcharts
4. C Programming using Simple statements and expressions
5. Scientific problem solving using decision making and looping.
6. Simple programming for one dimensional and two dimensional arrays.
7. Solving problems using String functions
8. Programs with user defined functions – Includes Parameter Passing
9. Program using Recursive Function and conversion from given program to flow chart.
10. Program using structures and unions.

OUTCOMES:
At the end of the course, the student should be able to:
- Apply good programming design methods for program development.
- Design and implement C programs for simple applications.
- Develop recursive programs.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:
Standalone desktops with C compiler 30 Nos.
(or)
Server with C compiler supporting 30 terminals or more.
OBJECTIVES:
- To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE

Buildings:
(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

Plumbing Works:
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:
   Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high-rise buildings.

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

II MECHANICAL ENGINEERING PRACTICE

Welding:
(a) Preparation of arc welding of butt joints, lap joints and tee joints.
(b) Gas welding practice

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

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

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

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

III  ELECTRICAL ENGINEERING PRACTICE  10
1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case wiring
5. Measurement of energy using single phase energy meter.

IV  ELECTRONICS ENGINEERING PRACTICE  13
1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EOR and NOT.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to fabricate carpentry components and pipe connections including plumbing works.
• Ability to use welding equipments to join the structures.
• Ability to fabricate electrical and electronics circuits.

REFERENCES:

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

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

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

ELECTRICAL

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

ELECTRONICS

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

GE6163 PHYSICS AND CHEMISTRY LABORATORY – I

OBJECTIVES:
• To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS
(Any FIVE Experiments)

1. (a) Determination of Wavelength, and particle size using Laser
(b) Determination of acceptance angle in an optical fiber.
2. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer.
3. Determination of wavelength of mercury spectrum – spectrometer grating
5. Determination of Young’s modulus by Non uniform bending method
6. Determination of specific resistance of a given coil of wire – Carey Foster’s Bridge
OUTCOMES:
- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
1. Diode laser, lycopodium powder, glass plate, optical fiber.
2. Ultrasonic interferometer
3. Spectrometer, mercury lamp, grating
4. Lee’s Disc experimental set up
5. Traveling microscope, meter scale, knife edge, weights
6. Carey foster’s bridge set up
   (vernier Caliper, Screw gauge, reading lens are required for most of the experiments)

CHEMISTRY LABORATORY- I

OBJECTIVES:
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.

LIST OF EXPERIMENTS
(Any FIVE Experiments)

1. Determination of DO content of water sample by Winkler’s method.
2. Determination of chloride content of water sample by argentometric method.
3. Determination of strength of given hydrochloric acid using pH meter.
4. Determination of strength of acids in a mixture using conductivity meter.
5. Estimation of iron content of the water sample using spectrophotometer.
   (1,10- phenanthroline / thiocyanate method).
7. Conductometric titration of strong acid vs strong base.

TOTAL: 30 PERIODS

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

REFERENCES:
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Iodine flask - 30 Nos
2. pH meter - 5 Nos
3. Conductivity meter - 5 Nos
4. Spectrophotometer - 5 Nos
5. Ostwald Viscometer - 10 Nos

Common Apparatus: Pipette, Burette, conical flask, porcelain tile, dropper (each 30 Nos.)

HS6251

TECHNICAL ENGLISH II

OBJECTIVES:
• To make learners acquire listening and speaking skills in both formal and informal contexts.
• To help them develop their reading skills by familiarizing them with different types of reading strategies.
• To equip them with writing skills needed for academic as well as workplace contexts.
• To make them acquire language skills at their own pace by using e-materials and language lab components.

UNIT I
9+3
Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on topics like weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using ‘emoticons’ as symbols in email messages; Grammar - Regular and irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. ‘can’) - Homophones (e.g. ‘some’, ‘sum’); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

UNIT II
9+3
Listening - Listening to situation based dialogues; Speaking - Conversation practice in real life situations, asking for directions (using polite expressions), giving directions (using imperative sentences), Purchasing goods from a shop, Discussing various aspects of a film (they have already seen) or a book (they have already read); Reading - Reading a short story or an article from newspaper, Critical reading, Comprehension skills; Writing - Writing a review / summary of a story / article, Personal letter (Inviting your friend to a function, congratulating someone for his / her success, thanking one’s friends / relatives); Grammar - modal verbs, Purpose expressions; Vocabulary - Phrasal verbs and their meanings, Using phrasal verbs in sentences; E-materials - Interactive exercises on Grammar and vocabulary, Extensive reading activity (reading stories / novels), Posting reviews in blogs - Language Lab - Dialogues (Fill up exercises), Recording students’ dialogues.

UNIT III
9+3
Listening - Listening to the conversation - Understanding the structure of conversations; Speaking - Conversation skills with a sense of stress, intonation, pronunciation and meaning - Seeking information – expressing feelings (affection, anger, regret, etc.); Reading - Speed reading – reading passages with time limit - Skimming; Writing - Minutes of meeting – format and practice in the preparation of minutes - Writing summary after reading articles from journals - Format for journal articles – elements of technical articles (abstract, introduction, methodology, results, discussion, conclusion, appendices, references) - Writing strategies; Grammar - Conditional clauses - Cause
and effect expressions; Vocabulary - Words used as nouns and verbs without any change in the spelling (e.g. ‘rock’, ‘train’, ‘ring’); E-materials - Interactive exercise on Grammar and vocabulary - Speed Reading practice exercises; Language Lab - Intonation practice using EFLU and RIE materials – Attending a meeting and writing minutes.

UNIT IV

Listening - Listening to a telephone conversation, Viewing model interviews (face-to-face, telephonic and video conferencing); Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar and Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V

Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading; Writing – Checklist - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises; Language Lab - Different models of group discussion.

OUTCOMES:
Learners should be able to
• speak convincingly, express their opinions clearly, initiate a discussion, negotiate, argue using appropriate communicative strategies.
• write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
• read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
• listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.

TEXTBOOKS:

REFERENCES:
EXTENSIVE Reading (Not for Examination)

Websites
2. http://owl.english.purdue.edu

TEACHING METHODS:
• Lectures
• Activities conducted individually, in pairs and in groups like individual writing and presentations, group discussions, interviews, reporting, etc
• Long presentations using visual aids
• Listening and viewing activities with follow up activities like discussions, filling up worksheets, writing exercises (using language lab wherever necessary/possible) etc
• Projects like group reports, mock interviews etc using a combination of two or more of the language skills

EVALUATION PATTERN:
Internal assessment: 20%
  3 tests of which two are pen and paper tests and the other is a combination of different modes of assessment like
  • Project
  • Assignment
  • Report
  • Creative writing, etc.
All the four skills are to be tested with equal weightage given to each.
✓ Speaking assessment: Individual presentations, Group discussions
✓ Reading assessment: Reading passages with comprehension questions graded following Bloom’s taxonomy
✓ Writing assessment: Writing essays, CVs, reports etc. Writing should include grammar and vocabulary.
✓ Listening/Viewing assessment: Lectures, dialogues, film clippings with questions on verbal as well as audio/visual content graded following Bloom’s taxonomy.

End Semester Examination: 80%

MA6251 MATHEMATICS – II
L  T  P  C
3  1  0  4

OBJECTIVES:
• To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
• To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
• To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.
• To make the student 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  9+3
Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.

UNIT II  ORDINARY DIFFERENTIAL EQUATIONS  9+3
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT III  LAPLACE TRANSFORM  9+3

UNIT IV  ANALYTIC FUNCTIONS  9+3
Functions of a complex variable – Analytic functions: Necessary conditions – Cauchy-Riemann equations and sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping: \( w = z+k, \ kz, \ 1/z, \ z^2, \ e^z \) and bilinear transformation.

UNIT V  COMPLEX INTEGRATION  9+3
Complex integration – Statement and applications of Cauchy’s integral theorem and Cauchy’s integral formula – Taylor’s and Laurent’s series expansions – Singular points – Residues – Cauchy’s residue theorem – Evaluation of real definite integrals as contour integrals around unit circle and semi-circle (excluding poles on the real axis).

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
- The subject helps the students to develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions. Students will be able to solve problems related to engineering applications by using these techniques.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
• To enrich the understanding of various types of materials and their applications in engineering and technology.

UNIT I  CONDUCTING MATERIALS

UNIT II  SEMICONDUCTING MATERIALS

UNIT III  MAGNETIC AND SUPERCONDUCTING MATERIALS
Superconductivity: properties – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High $T_c$ superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV  DIELECTRIC MATERIALS

UNIT V  ADVANCED ENGINEERING MATERIALS

TOTAL: 45 PERIODS

OUTCOMES:
• The students will have the knowledge on physics of materials and that knowledge will be used by them in different engineering and technology applications.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- Principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.

UNIT I   WATER TECHNOLOGY

Introduction to boiler feed water-requirements-formation of deposits in steam boilers and heat exchangers- disadvantages (wastage of fuels, decrease in efficiency, boiler explosion) prevention of scale formation -softening of hard water -external treatment zeolite and demineralization - internal treatment- boiler compounds (phosphate, calgon, carbonate, colloidal) - caustic embrittlement -boiler corrosion-priming and foaming- desalination of brackish water –reverse osmosis.

UNIT II   ELECTROCHEMISTRY AND CORROSION


UNIT III  ENERGY SOURCES

Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion- differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator-classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells:Types of batteries- alkaline battery- lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H₂ -O₂ fuel cell- applications.

UNIT IV   ENGINEERING MATERIALS

Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of alumina, magnesite and silicon carbide, Portland cement- manufacture and properties - setting and hardening of cement, special cement- waterproof and white cement–properties and uses. Glass - manufacture, types, properties and uses.

UNIT V   FUELS AND COMBUSTION


TOTAL: 45 PERIODS
OUTCOMES:
- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:

REFERENCES:

GE6252 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C
4 0 0 4

OBJECTIVES:
- To explain the basic theorems used in Electrical circuits and the different components and function of electrical machines.
- To explain the fundamentals of semiconductor and applications.
- To explain the principles of digital electronics
- To impart knowledge of communication.

UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS

UNIT II ELECTRICAL MECHANICS

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS

UNIT IV DIGITAL ELECTRONICS
Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)
UNIT V  FUNDAMENTALS OF COMMUNICATION ENGINEERING  12
Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

TOTAL: 60 PERIODS

OUTCOMES:
• Ability to identify the electrical components explain the characteristics of electrical machines.
• Ability to identify electronics components and use of them to design circuits.

TEXT BOOKS:

REFERENCES:

GE6253  ENGINEERING MECHANICS  L T P C
3  1  0  4

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

UNIT I  BASICS AND STATICS OF PARTICLES  12

UNIT II  EQUILIBRIUM OF RIGID BODIES  12
Free body diagram – Types of supports –Action and reaction forces –stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force -Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III  PROPERTIES OF SURFACES AND SOLIDS  12
Centroids and centre of mass– Centroids of lines and areas - Rectangular, circular, triangular areas by integration – T section, I section, - Angle section, Hollow section by using standard formula – Theorems of Pappus - Area moments of inertia of plane areas – Rectangular, circular, triangular areas by integration – T section, I section, Angle section, Hollow section by using standard formula –

UNIT IV DYNAMICS OF PARTICLES

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

OUTCOMES:
• Ability to explain the differential principles applies to solve engineering problems dealing with force, displacement, velocity and acceleration.
• Ability to analyse the forces in any structures.
• Ability to solve rigid body subjected to dynamic forces.

TEXT BOOKS:

REFERENCES:

GE6261 COMPUTER AIDED DRAFTING AND MODELING LABORATORY

OBJECTIVES:
• To develop skill to use software to create 2D and 3D models.

List of Exercises using software capable of Drafting and Modeling
1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using B spline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).
6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

Note: Plotting of drawings must be made for each exercise and attached to the records written by students.

TOTAL: 45 PERIODS

OUTCOMES:
• Ability to use the software packers for drafting and modeling
• Ability to create 2D and 3D models of Engineering Components

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Description of Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pentium IV computer or better hardware, with suitable graphics facility</td>
<td>30 No.</td>
</tr>
<tr>
<td>2.</td>
<td>Licensed software for Drafting and Modeling.</td>
<td>30 Licenses</td>
</tr>
<tr>
<td>3.</td>
<td>Laser Printer or Plotter to print / plot drawings</td>
<td>2 No.</td>
</tr>
</tbody>
</table>

GE6262 PHYSICS AND CHEMISTRY LABORATORY – II

OBJECTIVES:
• To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter.

LIST OF EXPERIMENTS
(Any FIVE Experiments)

1. Determination of Young’s modulus by uniform bending method
2. Determination of band gap of a semiconductor
3. Determination of Coefficient of viscosity of a liquid – Poiseuille’s method
4. Determination of Dispersive power of a prism - Spectrometer
5. Determination of thickness of a thin wire – Air wedge method
6. Determination of Rigidity modulus – Torsion pendulum
OUTCOMES:
- The students will have the ability to test materials by using their knowledge of applied physics principles in optics and properties of matter.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Traveling microscope, meter scale, Knife edge, weights
2. Band gap experimental set up
3. Burette, Capillary tube, rubber tube, stop clock, beaker and weighing balance
4. Spectrometer, prism, sodium vapour lamp.
5. Air-wedge experimental set up.
6. Torsion pendulum set up.
   (vernier Caliper, Screw gauge, reading lens are required for most of the experiments)

CHEMISTRY LABORATORY - II

OBJECTIVES:
- To make the student acquire practical skills in the wet chemical and instrumental methods for quantitative estimation of hardness, alkalinity, metal ion content, corrosion in metals and cement analysis.

LIST OF EXPERIMENTS
(Any FIVE Experiments)
1. Determination of alkalinity in water sample
2. Determination of total, temporary & permanent hardness of water by EDTA method
3. Estimation of copper content of the given solution by EDTA method
4. Estimation of iron content of the given solution using potentiometer
5. Estimation of sodium present in water using flame photometer
6. Corrosion experiment – weight loss method
7. Conductometric precipitation titration using BaCl$_2$ and Na$_2$SO$_4$

TOTAL: 30 PERIODS

OUTCOMES:
- The students will be conversant with hands-on knowledge in the quantitative chemical analysis of water quality related parameters, corrosion measurement and cement analysis.

REFERENCES:
5. Laboratory classes on alternate weeks for Physics and Chemistry.
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Potentiometer - 5 Nos
2. Flame photo meter - 5 Nos
3. Weighing Balance - 5 Nos
4. Conductivity meter - 5 Nos

Common Apparatus : Pipette, Burette, conical flask, percelain tile, dropper (30 Nos each)

IE6301 WORK SYSTEM DESIGN

OBJECTIVES
- To impart knowledge in the area of Method study and Time study, principles and techniques to improve productivity in manufacturing and Service sectors.

UNIT I PRODUCTIVITY
Production and Productivity - Total time for a job or operation, total work content and ineffective time, Measures of Productivity - Productivity and standard of living, Factors affecting Productivity, Productivity measurement Models.

UNIT II METHODS ENGINEERING
Methods Engineering - Steps - Tools and techniques, Motion study.

UNIT III WORK MEASUREMENT

UNIT IV APPLIED WORK MEASUREMENT
Work sampling, Group Timing Technique (GTT), predetermined time systems, types, Methods Time Measurement (MTM), Introduction to MOST standard, Wage incentive plans.

UNIT V WORK DESIGN FOR OFFICE WORK
Organization and methods (O & M), Work measurement of office work, Work Analysis techniques applied to support staff, Form design and control.

TOTAL: 45 PERIODS

OUTCOMES:
- The Students should be able to measure productivity of a work system through work system design and apply various above mentioned techniques.

TEXT BOOKS:

REFERENCES:

31
MA6351 TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS  L T P C 3 1 0 4

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

UNIT I PARTIAL DIFFERENTIAL EQUATIONS  9+3
Formation of partial differential equations – Singular integrals -- Solutions of standard types of first order partial differential equations - Lagrange’s linear equation -- Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES  9+3

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS  9+3
Classification of PDE – Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction (excluding insulated edges).

UNIT IV FOURIER TRANSFORMS  9+3

UNIT V Z-TRANSFORMS AND DIFFERENCE EQUATIONS  9+3

OUTCOMES:
- The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To introduce the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

UNIT I  METAL CASTING PROCESSES

Sand Casting: Sand Mould – Type of patterns – Pattern Materials – Pattern allowances – Moulding sand Properties and testing – Cores – Types and applications – Moulding machines – Types and applications; Melting furnaces: Blast and Cupola Furnaces; Principle of special casting processes: Shell – investment – Ceramic mould – Pressure die casting – Centrifugal Casting – CO₂ process – Stir casting; Defects in Sand casting

UNIT II  JOINING PROCESSES

Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding – Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding – Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding – Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.

UNIT III  METAL FORMING PROCESSES


UNIT IV  SHEET METAL PROCESSES


UNIT V  MANUFACTURE OF PLASTIC COMPONENTS


OUTCOMES:

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

REFERENCES:

AT6302 MECHANICS OF MACHINES

OBJECTIVES:

- To understand the principles in the formation of mechanisms and their kinematics.
- To understand the effect of friction in different machine elements.
- To analyse the forces and toques acting on simple mechanical systems
- To understand the importance of balancing and vibration.

UNIT I KINEMATIC OF MECHANICS

UNIT II GEARS and GEAR TRAINS

UNIT III FRICTION

UNIT IV FORCE ANALYSIS

UNIT V BALANCING AND VIBRATION

TOTAL (L:45+T:15): 60 PERIODS
OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOKS:

REFERENCES:

CE6306 STRENGTH OF MATERIALS

OBJECTIVES:
To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

UNIT III TORSION
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
Double Integration method – Macaulay’s method – Area moment method for computation of slopes and deflections in beams - Conjugate beam and strain energy – Maxwell’s reciprocal theorems.

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

TOTAL (L:45+T:15): 60 PERIODS
OUTCOMES:

- Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures.
- Critically analyse problem and solve the problems related to mechanical elements and analyse the deformation behavior for different types of loads.

TEXT BOOKS:

REFERENCES:

IE6401 OPERATIONS RESEARCH - I

OBJECTIVES:
- To create awareness about optimization in utilization of resources.
- To enable the students to understand and apply operations research techniques in industrial operations.

UNIT I LINEAR PROGRAMMING

UNIT II ADVANCES IN LPP
Duality theory – Primal – Dual Relationship – simplex method solves both the primal and the dual - Dual simplex Algorithm - Sensitivity analysis – Change in values of objective function coefficients – Changes in RHS value – Changes in coefficient of constraint- Adding new product – Adding a new constraint.

UNIT III NETWORK MODELS

UNIT IV INTEGER PROGRAMMING
Integer programming formulation – Branch and bound technique for Integer programming – Gomory’s cutting plane algorithm

UNIT V DYNAMIC PROGRAMMING
Elements of dynamic programming – stage and state, characteristics of DP problems, recursive relationship, Bellman’s principle of optimality – computational procedure for shortest route problem, knapsack problem, production and inventory control problem.

TOTAL (L:45+T:15): 60 PERIODS
OUTCOMES:
- Identify and develop operational research models from the verbal description of the real system.
- Understand and use the mathematical tools that are needed to solve optimization problems.
- Develop a report that describes the model and the solving technique, analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

TEXT BOOKS:

REFERENCES:

ME6311 MANUFACTURING TECHNOLOGY LABORATORY – I

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

LIST OF EXPERIMENTS:
Machining and Machining time estimations for :
1. Taper Turning
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping

OUTCOMES:
- Upon completion of this course, the students can able to apply the demonstrate and fabricate different types of components using the machine tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Centre Lathes</td>
<td>7 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Milling Machine</td>
<td>1 No</td>
</tr>
<tr>
<td>4</td>
<td>Shaper</td>
<td>1 Nos.</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To understand the theory better and apply in practice, practical training is given in the following areas:

LIST OF EXPERIMENTS:
1. Graphic tools for method study
2. Peg board experiment
3. Stop watch time study
4. Performance rating exercise
   a. Walking rating
   b. Card dealing
5. Work sampling
6. MTM practice
7. Video Based Time Study

TOTAL: 30 PERIODS

OUTCOME:
- Students should be able to design, analyse and apply the above mentioned techniques to measure productivity

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
1. Peg Board
2. Stop Watch with Pad
3. Set of Cards
4. Sampling beads
5. MTM Tables
7. Nut, Bolt and Washer Assembly Setup

CE6315  
STRENGTH OF MATERIALS LABORATORY

OBJECTIVES
To supplement the theoretical knowledge gained in Mechanics of Solids with practical testing for determining the strength of materials under externally applied loads. This would enable the student to have a clear understanding of the design for strength and stiffness

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

OUTCOMES:
- Ability to perform different destructive testing
- Ability to characteristic materials

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

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

MA6468  PROBABILITY AND STATISTICS  

OBJECTIVES
- This course aims at providing the required skill to apply the statistical tools in engineering problems.

UNIT I  RANDOM VARIABLES  9+3
Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions.

UNIT II  TWO - DIMENSIONAL RANDOM VARIABLES  9+3
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III  TESTING OF HYPOTHESIS  9+3
Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.
UNIT IV

DESIGN OF EXPERIMENTS

9+3

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - \(2^2\) factorial design.

UNIT V

STATISTICAL QUALITY CONTROL

9+3

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES

- The students will have a fundamental knowledge of the concepts of probability. Have knowledge of standard distributions which can describe real life phenomenon. Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS:


REFERENCES:


CE6451

FLUID MECHANICS AND MACHINERY

L T P C

3 0 0 3

OBJECTIVES:

- The applications of the conservation laws to flow through pipes and hydraulic machines are studied
- To understand the importance of dimensional analysis.
- To understand the importance of various types of flow in pumps and turbines.

UNIT I

FLUID PROPERTIES AND FLOW CHARACTERISTICS

8

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

UNIT II

FLOW THROUGH CIRCULAR CONDUITS

8

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

UNIT IV  PUMPS

UNIT V  TURBINES

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course, the students can able to apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

REFERENCES:

MG6851  PRINCIPLES OF MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

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

OUTCOMES:
• Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

REFERENCES:

ME6402 MANUFACTURING TECHNOLOGY – II
OBJECTIVES:
• To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching. To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming

UNIT I THEORY OF METAL CUTTING
Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools – nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.
UNIT II TURNING MACHINES 9
Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle

UNIT III SHAPER, MILLING AND GEAR CUTTING MACHINES 9

UNIT IV ABRASIVE PROCESS AND BROACHING 9
Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications – concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

UNIT V CNC MACHINING 9
Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can understand and compare the functions and applications of different metal cutting tools and also demonstrate the programming in CNC machining.

TEXT BOOKS:

REFERENCES:

IE6501 OPERATIONS RESEARCH – II

OBJECTIVES:
• Understand the probability theory that is the foundation of the models.
• Derive the fundamental concepts associated with each model.
• Apply the models to real-world applications.

UNIT I DETERMINISTIC INVENTORY MODELS 9
Purchase model with no shortages – Manufacturing model with no shortages – purchase model with shortages – Manufacturing model with shortages – Inventory model with discount.
UNIT II PROBABILISTIC INVENTORY MODELS 9
Multiple items inventory model – constraint with total number of orders – constraint on inventory value – constraint on space - Probabilistic inventory model – Reorder point model – Periodic review system.

UNIT III QUEUING THEORY 9
Queuing theory terminology – Single server, multi server, -infinite queue – infinite population -limited queue capacity -, limited population capacity.

UNIT IV DECISION THEORY 9
Decision making under certainty – Decision making under risk – Decision making under uncertainty– Decision tree analysis –. Game Theory – Two person zero sum games, pure and mixed strategies – Theory of dominance - Graphical Solution – Solving by LP.

UNIT V NON-LINEAR PROGRAMMING 9
Introduction to non-linear programming – Unconstrained extreme points – Constrained problems with equality constraints: Lagrangean method - Constrained problems with inequalities: Kuhn tucker conditions – Quadratic programming.

TOTAL (L:45+T:15): 60 PERIODS

OUTCOMES:
• Have the ability to classify, formulate, and solve operations research problems.
• Have knowledge of operations research areas such as probabilistic modeling, applied statistics, mathematical programming, simulation, and decision analysis to directly support decision and policy making activities.

TEXT BOOKS:

REFERENCES:

IE6302 ENGINEERING ECONOMY, COSTING AND ACCOUNTING  L T P C
3 1 0 4

OBJECTIVES:
• To impart knowledge in the areas of cost estimation, pricing of products, cost control methods and principles of accounting.

UNIT I INTRODUCTION 6

UNIT II PRODUCTION ANALYSIS AND PRICING 9
Production Function-Least Cost Combination of Inputs-Factor Productivities & Return to Scale- Determinants of Price-Pricing under different objectives and Market Structures-Price Discrimination & Pricing methods in practice-
UNIT III ESTIMATION
Estimation of Material, Labor and Overhead Cost, Allocation of Overheads. Estimation for different types of jobs.

UNIT IV COSTING

UNIT V ACCOUNTING AND INVESTMENT DECISION
Balance Sheet-Profit & Loss Statement-Evaluation of Investment decisions- Average Rate of Return-Payback Period-Net Present Value & IRR.

OUTCOMES:
- Students will be able to estimate cost of products, analyze product cost and suggest cost reduction measure.

TEXT BOOKS:

REFERENCES:

CE6461 FLUID MECHANICS AND MACHINERY LABORATORY

OBJECTIVES:
- Upon Completion of this subject, the students can able to have hands on experience in flow measurements using different devices and also perform calculation related to losses in pipes and also perform characteristic study of pumps, turbines etc.,

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

TOTAL: 45 PERIODS
OUTCOMES:
- Ability to use the measurement equipments for flow measurement
- Ability to do performance trust on different fluid machinery

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

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

ME6411 MANUFACTURING TECHNOLOGY LABORATORY – II

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

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

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to use different machine tools to manufacturing gears.
- Ability to use different machine tools for finishing operations
- Ability to manufacture tools using cutter grinder
- Develop CNC part programming

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turret and Capstan Lathes</td>
<td>1 No each</td>
</tr>
<tr>
<td>2</td>
<td>Horizontal Milling Machine</td>
<td>2 No</td>
</tr>
<tr>
<td>No.</td>
<td>Equipment</td>
<td>Quantity</td>
</tr>
<tr>
<td>-----</td>
<td>--------------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>3</td>
<td>Vertical Milling Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Surface Grinding Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Cylindrical Grinding Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Radial Drilling Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Lathe Tool Dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Milling Tool Dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Gear Hobbing Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Tool Makers Microscope</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>CNC Lathe</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>CNC Milling machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>13</td>
<td>Gear Shaping machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>14</td>
<td>Centerless grinding machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>15</td>
<td>Tool and cutter grinder</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

**GE6674 COMMUNICATION AND SOFT SKILLS - LABORATORY BASED**

**OBJECTIVES:**
To enable learners to,
- Develop their communicative competence in English with specific reference to speaking and listening
- Enhance their ability to communicate effectively in interviews.
- Strengthen their prospects of success in competitive examinations.

**UNIT I LISTENING AND SPEAKING SKILLS**
Conversational skills (formal and informal)- group discussion- making effective presentations using computers, listening/watching interviews conversations, documentaries. Listening to lectures, discussions from TV/ Radio/ Podcast.

**UNIT II READING AND WRITING SKILLS**
Reading different genres of tests ranging from newspapers to creative writing. Writing job applications- cover letter- resume- emails- letters- memos- reports. Writing abstracts- summaries- interpreting visual texts.

**UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS**
International English Language Testing System (IELTS) - Test of English as a Foreign Language (TOEFL) - Civil Service(Language related)- Verbal Ability.

**UNIT IV INTERVIEW SKILLS**
Different types of Interview format- answering questions- offering information- mock interviews-body language( paralinguistic features)- articulation of sounds- intonation.

**UNIT V SOFT SKILLS**
Motivation- emotional intelligence-Multiple intelligences- emotional intelligence- managing changes-time management-stress management-leadership straits-team work- career planning - intercultural communication- creative and critical thinking

**TOTAL: 60 PERIODS**
Teaching Methods:
1. To be totally learner-centric with minimum teacher intervention as the course revolves around practice.
2. Suitable audio/video samples from Podcast/YouTube to be used for illustrative purposes.
3. Portfolio approach for writing to be followed. Learners are to be encouraged to blog, tweet, text and email employing appropriate language.
4. GD/Interview/Role Play/Debate could be conducted off the laboratory (in a regular classroom) but learners are to be exposed to telephonic interview and video conferencing.
5. Learners are to be assigned to read/write/listen/view materials outside the classroom as well for graining proficiency and better participation in the class.

Lab Infrastructure:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Description of Equipment (minimum configuration)</th>
<th>Qty Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Server</td>
<td>1 No.</td>
</tr>
<tr>
<td></td>
<td>• PIV System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 1 GB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000 server</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Client Systems</td>
<td>60 Nos.</td>
</tr>
<tr>
<td></td>
<td>• PIII or above</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 256 or 512 MB RAM / 40 GB HDD</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• OS: Win 2000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Audio card with headphones</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• JRE 1.3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Handicam</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Television 46&quot;</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Collar mike</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Cordless mike</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Audio Mixer</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>DVD recorder/player</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>LCD Projector with MP3/CD/DVD provision for Audio/video facility</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

Evaluation:
Internal: 20 marks
Record maintenance: Students should write a report on a regular basis on the activities conducted, focusing on the details such as the description of the activity, ideas emerged, learning outcomes and so on. At the end of the semester records can be evaluated out of 20 marks.

External: 80 marks
Online Test - 35 marks
Interview - 15 marks
Presentation - 15 marks
Group Discussion - 15 marks

Note on Internal and External Evaluation:
1. Interview – mock interview can be conducted on one-on-one basis.
2. Speaking – example for role play:
   a. Marketing engineer convincing a customer to buy his product.
   b. Telephonic conversation- fixing an official appointment / placing an order / enquiring and so on.
3. Presentation – should be extempore on simple topics.
4. Discussion – topics of different kinds; general topics, and case studies.

OUTCOMES:
At the end of the course, learners should be able to
- Take international examination such as IELTS and TOEFL
- Make presentations and Participate in Group Discussions.
- Successfully answer questions in interviews.

REFERENCES:
2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.
4. Interactive Multimedia Programs on Managing Time and Stress.

Web Sources:
http://www.slideshare.net/rohitjsh/presentation-on-group-discussion
http://www.washington.edu/doit/TeamN/present_tips.html
http://www.oxforddictionaries.com/words/writing-job-applications
http://www.kent.ac.uk/careers/cv/coveringletters.htm
http://www.mindtools.com/pages/article/newCDV_34.htm

IE6503 APPLIED ERGONOMICS  L T P C
3 0 0 3

OBJECTIVES:
- To explain the general principles that governs the interaction of humans and their working environment for improving worker performance and safety.

UNIT I INTRODUCTION

UNIT II HUMAN PERFORMANCE

UNIT III PHYSIOLOGICAL ASPECTS OF HUMAN AT WORK

UNIT IV WORK PLACE DESIGN
Problems of body size, Anthropometry measures, Work posture – Work space layout and work station
design – Design of displays, controls and VDT work stations – Hand tool design, illumination.

UNIT V OCCUPATIONAL HEALTH AND SAFETY 9
Industrial accidents, Personnel Protective devices, Safety Management practices – Effect of Environment – heat, cold & noise – NIOSH regulations and Factories Act

TOTAL: 45 PERIODS

OUTCOMES
• The Student should apply ergonomic principles to design workplaces for the improvement of human performance and implement latest occupational health and safety to the work place.

TEXT BOOKS:

REFERENCES:

IE6604 FACILITY LAYOUT AND MATERIALS HANDLING L T P C 3 0 0 3

OBJECTIVES:
• To explain the basic principles in facilities planning, location, layout designs and material handling systems

UNIT I PLANT LOCATION 9

UNIT II FACILITY LAYOUT DESIGN 9
Need for Layout study, Factors influencing plant layout, 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 – Information gathering, flow analysis and activity analysis, relationship diagram, space requirements and availability, designing the layout. Utilities planning

UNIT III COMPUTERISED LAYOUT PLANNING 9

UNIT IV DESIGNING PRODUCT LAYOUT 9
Line balancing - Objectives, Line balancing techniques – Largest Candidate rule- Kilbridge and Wester method- RPW method- COMSOAL.

UNIT V MATERIAL HANDLING AND PACKAGING 9
Objectives and benefits of Material handling, Relationship between layout and Material handling,
Principles of material handling, Unit load concept, Classification of material handling equipments, Equipment selection, Packaging.

TOTAL: 45 PERIODS

OUTCOMES
• Students must analyse, design and apply layout principles for layout product, material handling and packaging.

TEXT BOOK:

REFERENCES:

IE6502 STATISTICAL QUALITY CONTROL

OBJECTIVES:
• To impart knowledge on the application of statistical methods for measuring and controlling quality of processes / products.

UNIT I QUALITY FUNDAMENTALS

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 evaluation- 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- Military, Dodge-Roming, IS 2500.

TOTAL: 45 PERIODS

OUTCOMES:
• Able to implement statistical process control and acceptance sampling procedures in manufacturing environment to improve quality of processes / products

TEXT BOOK:

REFERENCES:

MG6571 HUMAN RESOURCE MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
• To acquaint students with the issues related to staffing, training, performance and compensation of Human Resources.

UNIT I INTRODUCTION TO HUMAN RESOURCE MANAGEMENT 5

UNIT II HUMAN RESOURCE PLANNING 8

UNIT III TRAINING AND EXECUTIVE DEVELOPMENT 10
Types of training and Executive development methods – purpose – benefits.

UNIT IV EMPLOYEE COMPENSATION 12

UNIT V PERFORMANCE EVALUATION AND CONTROL 10

TOTAL: 45 PERIODS

OUTCOMES:
• To understand the process of effective Human Resource Management.

TEXTBOOKS :

REFERENCES :
IE6504  MANUFACTURING AUTOMATION  L  T  P  C
3 0 0 3

OBJECTIVES
- To give a brief exposure to automation principles and applications to production systems covering few types of automation.

UNIT I  MANUFACTURING OPERATIONS  9
Automation in production systems, principles and strategies, Product/production relationships, Production concepts and mathematical models, Costs of manufacturing operations.

UNIT II  CONTROL TECHNOLOGIES  9
Automated systems – elements, functions, levels, Continuous Vs discrete control, Computer process control, Sensors, Actuators, ADC, DAC, Programmable logic controllers – ladder logic diagrams.

UNIT III  NUMERICAL CONTROL AND ROBOTICS  9

UNIT IV  AUTOMATED HANDLING AND STORAGE  9

UNIT V  COMPUTER-AIDED DESIGN  9
Fundamentals of CAD – design process, manufacturing database – Computer graphics – functions, constructing the geometry, transformation, wire frame Vs solid modelling.

TOTAL : 45 PERIODS

OUTCOMES
- Ability to understand the requirements of automation in manufacturing systems.
- Knowledge in the techniques of machinery automation, shop floor automation.
- Selection of material handling systems for automated industries.
- Gaining basic knowledge in CAD systems.

REFERENCES

AN6611  AUTOMATION LABORATORY  L  T  P  C
0 0 3 2

OBJECTIVES
- To train the students to write part programming using G-codes and M-codes for machining operations
- To train the students to write programming for robot control and PLC

LIST OF EXPERIMENTS
1. Part programming for CNC lathe
2. Simulation and machining practice in CNC lathe
3. Part programming for CNC Milling machine
4. Practice in CNC milling machine
5. Programming exercise for robot
6. Programming of PLC using ladder logic diagram
7. Experiments using PLC.

OUTCOMES
- Ability to write CNC programming using G-code and M-code
- Ability to write programming for robot control
- Ability to use PLC for actuation

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
1. CNC Lathe
2. CNC Milling Machine
3. Pick and Place Robot
4. PLC Trainer

IM6511 INDUSTRIAL ENGINEERING LABORATORY

L T P C
0 0 2 1

OBJECTIVES:
- To introduce the students the concepts of ergonomics design

LIST OF EXPERIMENTS
- Effect of speed of walking on treadmill using heart rate and energy expenditure
- Effect of workload on heart rate using Ergo cycle.
- Evaluation of physical fitness using step test
- Effect of work-rest schedule on physical performance (Ergo cycle / treadmill)
- Development of anthropometric data for male and female.
- Application of anthropometric data for the design of desk for students
- Evaluation of physical facilities (chairs, tables etc.) through comfort rating.
- Analysis of noise level in different environments
- Study of Illumination at work places.
- Design of plant layout using Muther’s systematic layout planning
- Testing the goodness of fit for the given quality characteristic of component using normal/ Poisson / Binomial/ Uniform distribution.
- Assessment of process capability of the given manufacturing process using process capability indices.
- Construction of control chart for variable/attribute quality characteristic
- Construction of OC curve (Beads experiment)

OUTCOMES:
- Ability to do ergonomics design of industry considering human and environment factors.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS
1. Treadmill with Heart rate measurement and Energy Expenditure Measurement
2. Ergo Cycle with Heart rate measurement and Energy Expenditure Measurement
3. Step Test Arrangement
4. Sound Meter
5. LUX meter
7. Personal computer with C or equivalent language, MS Excel.
8. Sampling Beads
OBJECTIVES:

- To enable students to understand accounting mechanism and interpretation of financial statements and to comprehend nuances involved in costing, preparation of budgets and making 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.

OUTCOMES:

- Upon successful completion of the course, students will acquire the ability to prepare and interpret financial statements, draft budgets and make sound investment decisions.

TEXTBOOKS:

REFERENCES:

OBJECTIVES:

- To impart knowledge on various types of experimental designs conduct of experiments and data analysis techniques.
UNIT I  FUNDAMENTALS OF EXPERIMENTAL DESIGNS  
Hypothesis testing – single mean, two means, dependant/ correlated samples – confidence intervals, Experimentation – need, Conventional test strategies, Analysis of variance, 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, testing using Analysis of variance.

UNIT II  SINGLE FACTOR EXPERIMENTS  
Completely Randomized Design- effect of coding the observations- model adequacy checking - estimation of model parameters, residuals analysis- treatment comparison methods-Duncan’s multiple range test, Newman-Keuel’s test, Fisher’s LSD test, Tukey’s test- testing using contrasts- Randomized Block Design – Latin Square Design- Graeco Latin Square Design – Applications.

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 - Practical applications.

UNIT IV  SPECIAL EXPERIMENTAL DESIGNS  
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- one-half fraction of 2^K Design, design resolution, Construction of one-half fraction with highest design resolution, one-quarter fraction of 2^K Design

UNIT V  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.

OUTCOMES:
• Able to apply experimental techniques to practical problems to improve quality of processes / products by optimizing the process / product parameters.

TEXT BOOK:

REFERENCES:

IE6603  RELIABILITY ENGINEERING  
OBJECTIVES:
• To stress the importance of reliability in Engineering and products also the concept of maintability, failure modes and testing methods.
UNIT I CONCEPTS OF RELIABILITY, SYSTEM AND MODELS

UNIT II DESIGN FOR RELIABILITY AND MAINTAINABILITY

UNIT III OPTIMIZATION OF SYSTEM RELIABILITY
Optimization techniques for system reliability with redundancy – heuristic methods applied to optimal system reliability- redundancy allocation by dynamic programming – reliability optimization by non linear programming.

UNIT IV THE ANALYSIS OF FAILURE DATA AND RELIABILITY TESTING

UNIT V PACKAGING AND TRANSPORTATION FOR RELIABILITY

TOTAL: 45 PERIODS

OUTCOMES
- The Student must apply and optimize reliability for time independent and time dependent failure models through various testing methods for various manufacturing amnesty process

TEXT BOOK:

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

UNIT I INTRODUCTION

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

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

UNIT IV TQM TOOLS AND TECHNIQUES II

UNIT V QUALITY SYSTEMS

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

TEXTBOOK:

REFERENCES:

OBJECTIVES:
- To give an overview of decision making in manufacturing and service operations.
UNIT I  INTRODUCTION

UNIT II  FORECASTING
Need, Determinants of Demand, Demand Patterns, Measures of forecast error, 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
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 Rues, Master Production Schedule(MPS), Procedure for developing MPS, MRP, Lot sizing methods of MRP, MRP Implementation issues, MRP – II.

UNIT IV  CAPACITY MANAGEMENT
Measures of capacity, Factors affecting capacity, Capacity planning, Systematic approach to capacity planning, Long-term and short-term capacity decisions, Tools for capacity planning, Capacity Requirement planning- Business process outsourcing

UNIT V  PRODUCTION ACTIVITY CONTROL
Objectives and Activities of Production Activity Control, Flow-shop, Intermittent flow shop, Job shop, Shop floor control – High volume Production Activity Control, Job-shop Production Activity Control.

OUTCOMES:
• Recognize and apply appropriate basic analytical techniques related to decision making in forecasting, aggregate planning, capacity planning and production control.

TEXT BOOKS:

REFERENCES:

IM6611  PRODUCTION SYSTEM DESIGN PROJECT

OBJECTIVES:
• To apply the concepts of various techniques covered in the areas of Industrial Engineering in a given practical situation.
Projects shall be assigned in the following areas:

- Quality Control
- Reliability engineering
- Forecasting and Aggregate Planning
- Materials Requirement Planning and Capacity Planning
- Transportation and Distribution of goods
- Group technology and Cellular manufacturing
- Production and Project Scheduling
- Plant Layout Design
- Work System Design and Time Study
- Methods improvement in manufacturing and service organisation

TOTAL: 90 PERIODS

IE6612 STATISTICAL APPLICATIONS AND OPTIMIZATION LABORATORY

OBJECTIVES:
To give adequate exposure to applications of software packages in the areas of Applied Statistics, Operations Research and Reliability

LIST OF EXPERIMENTS
1. Mean, Median, Mode, measures of dispersion
2. Look up tables, Statistics
3. Data analysis

Simple Operation Research Programs
4. Initial Solution of TP, Inventory Price Break Models

Optimization Package (TORA /LINDO)
5. LP Models
6. Transportation
7. Assignment
8. Maximal flow
9. Minimal spanning tree
10. Shortest route
11. Network scheduling

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to use software packages in the area of statistical analysis operation research and reliability predictions.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS
1. Personal computers with following software, Language and packages
   a. MS Excel
   b. TORA
   c. LINDO
   d. C or Other equivalent Language.
IM6612  TECHNICAL SEMINAR  L  T  P  C
0  0  2  1
To enrich the communication skills of the student and presentations of technical topics of interest, this course is introduced. In this course, a student has to present three Technical papers or recent advances in engineering/technology that will be evaluated by a Committee constituted by the Head of the Department.

IM6701  VALUE ENGINEERING AND PROJECT MANAGEMENT  L  T  P  C
3  1  0  4
OBJECTIVES:
To give a brief account of the value analysis and engineering tool for productivity improvement through project management.

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  PROJECT FORMULATION AND APPRAISAL

UNIT IV  PROJECT IMPLEMENTATION AND CONTROL
Project planning, Project organization, Tools and techniques of project management, Project management Information system, Human resources, Financial aspects.

UNIT V  PROJECT COMPLETION AND EVALUATION
Monitoring and Control of project, Integrated project management control system, Managing transition from project to operations, project review.

OUTCOMES
• The Student must be able to apply the value engineering principles to plan execute and manage projects.

TEXT BOOKS:

REFERENCES
OBJECTIVES:

- To provide an insight on the fundamentals of supply chain networks, tools and techniques.

UNIT I INTRODUCTION
Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain - Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.

UNIT II SUPPLY CHAIN NETWORK DESIGN

UNIT III LOGISTICS IN SUPPLY CHAIN

UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN
Role of sourcing supply chain supplier selection assessment and 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 SUPPLY CHAIN AND INFORMATION TECHNOLOGY
The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

TOTAL: 45 PERIODS

OUTCOMES:

- The student would understand the framework and scope of supply chain networks and functions.

TEXT BOOK:

REFERENCES:

IE6702 SIMULATION MODELING AND ANALYSIS

OBJECTIVES

- To cover various aspects of discrete dynamic, stochastic systems modeling and conducting experiments with those models on a computer.
UNIT I  INTRODUCTION  3
Systems – Modelling – Types – Systems components – Simulation basics

UNIT II  RANDOM NUMBERS / VARIATES  10

UNIT III  DESIGN OF SIMULATION EXPERIMENTS  12
Steps on Design of Simulation Experiments – Development of models using High level language for systems like Queuing, Inventory, Replacement, Production etc., - Model validation and verification, Output analysis. Use of DOE tools.

UNIT IV  SIMULATION LANGUAGES  12
Need for simulation Languages – Modules of Simulation Package, Functions – Input- Reports - Study of GPSS.

UNIT V  CASE STUDIES USING SIMULATION  8
Case studies in Queuing, Inventory, Replacement and Production

TOTAL: 45 PERIODS

OUTCOMES
• Will be able to analyse, models and simulate experiments to meet real world system and evaluate the performance.

TEXT BOOKS:

REFERENCES:

IE6010  DECISION SUPPORT AND INTELLIGENT SYSTEMS  3 L T P C

OBJECTIVES:
• To learn about the components of decision support system and expert systems.

UNIT I  INTRODUCTION  5
Managerial decision making, system modeling and support - preview of the modeling process-phases of decision making process.

UNIT II  ANALYSIS  10
DSS components- Data warehousing, access, analysis, mining and visualization-modeling and analysis-DSS development.

UNIT III  TECHNOLOGIES  10
Group support systems- Enterprise DSS- supply chain and DSS - Knowledge management methods, technologies and tools.
UNIT IV  EXPERT SYSTEMS  
10
Artificial intelligence and expert systems - Concepts, structure, types - Knowledge acquisition and validation - Difficulties, methods, selection.

UNIT V  SEMANTIC NETWORKS  
10
Representation in logic and schemas, semantic networks, production rules and frames, inference techniques, intelligent system development, implementation and integration of management support systems.

OUTCOMES:

- The students will be able to make decisions in the semi structured and unstructured problem situations.

TEXT BOOKS:


REFERENCE:


IE6711  DISCRETE SIMULATION LABORATORY  
L T P C  0 0 3 2

OBJECTIVES:

- To give hands on experience with reference to computer based discrete system simulation experiments

LIST OF EXPERIMENTS

1. Random Number Generation
   - Mid Square, Constant Multiplier, Congruential
2. Random variates Generation Exponential, Poisson, Normal, Binomial
3. Testing of Random variates
   - Chi-Square, KS, Run, Poker 4-5. Monte Carlo Simulation
   - Random Walk Problem with graphical application Paper Boy Problem
   - 6-7. Queuing Models Single, Multi Server
   - 8-9. Other IE oriented Models
   - Inventory, Replacement, Production system etc.
   - 10-11. Use of Simulation Language/Package

OUTCOMES:

Ability to prepare computer based discrete system

LIST OF EQUIPMENT  FOR A BATCH OF 30 STUDENTS

1. Personal computers with following software, Language and packages
   a. C or Other equivalent Language
   b. GPSS
IM6711  COMPREHENSION  L T P C
0 0 2 1

OBJECTIVES:
- To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E Degree Course through periodic exercise.

METHOD OF EVALUATION:
The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics

TOTAL: 30 PERIODS

OUTCOMES:
- Ability to understand and comprehend any given problem related to mechanical engineering field.

MG6072  MARKETING MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
- To enable students to deal with newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation. The course will enable a student to take up marketing as a professional career.

UNIT I  MARKETING PROCESS 9
Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy.

UNIT II  BUYING BEHAVIOUR AND MARKET SEGMENTATION 9
Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic - Psycho graphic and geographic segmentation, process, patterns.

UNIT III  PRODUCT PRICING AND MARKETING RESEARCH 9
Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process of marketing research.

UNIT IV  MARKETING PLANNING AND STRATEGY FORMULATION 9
Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

UNIT V  ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

TOTAL: 45 PERIODS

OUTCOMES:
- The learning skills of Marketing will enhance the knowledge about Marketer’s Practices and create insights on Advertising, Branding, Retailing and Marketing Research.

TEXTBOOKS:
REFERENCES:

GE6351 ENVIRONMENTAL SCIENCE AND ENGINEERING

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

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

UNIT II ENVIRONMENTAL POLLUTION
Definition – causes, effects and control measures of: (a) Air pollution (Atmospheric chemistry-Chemical composition of the atmosphere; Chemical and photochemical reactions in the atmosphere -formation of smog, PAN, acid rain, oxygen and ozone chemistry; - Mitigation procedures- Control of particulate and gaseous emission, Control of SO2, NOX, CO and HC) (b) Water pollution : Physical and chemical properties of terrestrial and marine water and their environmental significance; Water quality parameters – physical, chemical and biological; absorption of heavy metals - Water treatment processes. (c) Soil pollution - soil waste management: causes, effects and control measures of municipal solid wastes – (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – pollution case studies – Field study of local polluted site – Urban / Rural / Industrial / Agricultural.
UNIT III   NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground 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. Energy Conversion processes – Biogas – production and uses, anaerobic digestion; case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Introduction to Environmental Biochemistry: Proteins –Biochemical degradation of pollutants, Bioconversion of pollutants. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT

TOTAL : 45 PERIODS

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

TEXT BOOKS : 

REFERENCES :
IM6811

PROJECT WORK

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
</tbody>
</table>

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

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

TOTAL: 180 PERIODS

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

MG6082

MAINTENANCE ENGINEERING AND MANAGEMENT

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

OBJECTIVES:
- To create an awareness for the need for maintenance.
- To impart the basic concepts in maintenance management and various maintenance policies.

UNIT I
MAINTENANCE CONCEPT

UNIT II
MAINTENANCE POLICIES
Planned vs unplanned maintenance-Preventive maintenance vs Breakdown maintenance-Predictive maintenance-Corrective maintenance-Opportunistic maintenance-Design out maintenance-Condition Based Maintenance (CBM)- Analysis of downtime-Repair time distribution (exponential, lognormal)-MTTR-System repair time-Maintainability prediction.

UNIT III
MAINTENANCE LOGISTICS

UNIT IV
FAULT DIAGNOSIS
UNIT V TOTAL PRODUCTIVE MAINTENANCE 9

OUTCOMES
• The students would gain knowledge on maintenance logistics, fault diagnosis and TPM.

TEXT BOOK:

REFERENCES:
UNIT V  BPR TOOLS AND IMPLEMENTATION  9
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

OUTCOMES:
The Student must be able to:
• Measure and evaluate productivity
• Plan and implement various productivity techniques.
• Reengineer the process for improving the productivity
• Implement BPR tools for improving the productivity.

TEXT BOOK:

REFERENCES:

IE6602  OPERATIONS SCHEDULING  L T P C  3 0 0 3

OBJECTIVES:
• To impart knowledge on various scheduling algorithms applicable to single machine, parallel machines, flow shop and job shop models.

UNIT I  SCHEDULING THEORY  8

UNIT II  SINGLE MACHINE SCHEDULING  10

UNIT III  PARALLEL MACHINE SCHEDULING  9

UNIT IV  FLOW SHOP SCHEDULING  9

UNIT V  JOB SHOP SCHEDULING  9
### OUTCOMES:
- Students will be able to design, analyse and implement single machine, parallel machine, flow shop, job shop scheduling techniques

### TEXT BOOK:

### IM6001 SERVICES OPERATIONS MANAGEMENT

<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

### OBJECTIVES
- To give the students a general understanding of how a business operations, both manufacturing and service.
- To help develop decision making and problem solving
- To develop a specific knowledge in operation issue.
- To provide a service of frameworks, tools and techniques to allow students to analyse and develop solutions to business operational problems.

### UNIT I INTRODUCTION TO SERVICES
- Manufacturing and services, definition of service, characteristic of service, nature of services, importance of activity, impact of technology

### UNIT II GLOBALIZATION AND STRATEGY
- Types of globalized services, outsourcing, issues in globalization, service strategies

### UNIT III OPERATIONS ISSUES
- Forecasting, inventory, capacity planning, scheduling

### UNIT IV SERVICE QUALITY AND PRODUCTIVITY
- Importance of quality, models for service quality, GAPS model, issues in productivity measurement, work measurement

### UNIT V TOOLS FOR SERVICES
- Data Envelopment Analysis, Queuing models, Vehicle Routing models

### OUTCOMES:
The student must be able to apply
- Principles and statistics behind globalization for multinational organization operation service and productivity quality.

### REFERENCES:
OBJECTIVES:

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

UNIT I

UNIT II

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

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

UNIT V

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

REFERENCES:

OBJECTIVES:

- To impart knowledge on safety engineering fundamentals and safety management practices.

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 – Ionizing Radiation 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

TOTAL : 45 PERIODS

OUTCOMES:
- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management.

TEXT BOOK:

REFERENCES:

IE6003  ADVANCED OPTIMIZATION TECHNIQUES  L T P C
3 0 0 3

OBJECTIVES:
- Understand the nonlinear problem.
- Know about multi-objective problem.
- To create awareness of meta heuristic algorithms.

UNIT I  DECISION ANALYSIS
Decision Trees, Utility theory, Game theory, MCDM – Goal programming, AHP and ANP; Markov Decision processes

UNIT II  NON-LINEAR OPTIMIZATION - I
Types of Non-linear programming problems, Unconstrained optimization, KKT conditions for constrained optimization, Quadratic programming

UNIT III  NON-LINEAR OPTIMIZATION - II
Separable programming, Convex programming, Non-convex programming, Geometric programming, Stochastic programming

UNIT IV  META-HEURISTICS OPTIMIZATION

UNIT V  NON-TRADITIONAL OPTIMIZATION
Neural network based optimization, Optimization of Fuzzy systems

TOTAL: 45 PERIODS

OUTCOMES:
• Solve a nonlinear problem through its linear approximation.
• Solve a multi-objective problem through weighted and constrained methods.
• Acquire an idea about the various direct and indirect search methods.

REFERENCES:

IE6004 TECHNOLOGY MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
• Study of this subject provides an understanding of the Technology Management principles to the various organizations.

UNIT I
Technology management - Scope, components, and overview. Technology and environment, Technology and society, Technology Impact analysis, environmental, social, legal, political aspects, techniques for analysis - steps involved. Technology policy strategy: Science and technology Policy of India, implications to industry

UNIT II

UNIT III
Technology Choice and Evaluation - Methods of analysing alternate technologies, Techno-economic feasibility studies, Need for multi-criteria considerations such as, social, environmental, and political, Analytic hierarchy method, Fuzzy multi-criteria decision making, and other methods.

UNIT IV
Technology Transfer and Acquisition - Import regulations, Implications of agreements like Uruguay Round and WTO, Bargaining process, Transfer option, MOU- Technology Adoption and Productivity - Adopting technology-human interactions, Organisational redesign and re-engineering, Technology productivity.

UNIT V

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of the course, students will be able to
• Have clear understanding of managerial functions like planning, organizing, staffing, leading and controlling
• Have same basic knowledge on international aspect of management

REFERENCES:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IE6008</td>
<td>METROLOGY AND INSPECTION</td>
<td>3</td>
</tr>
</tbody>
</table>

**OBJECTIVES:**
- To impart knowledge about linear and angular measuring instruments.
- To impart knowledge about CMM and Machine vision system.
- To create awareness of non-destructive testing methods.

**UNIT I**  
LINEAR MEASUREMENT AND ANGULAR MEASUREMENT: 12

**UNIT II**  
STANDARDS FOR LINEAR AND ANGULAR MEASUREMENTS: 8
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: 8

**UNIT IV**  
MODERN CONCEPTS: 8
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.

**OUTCOMES:**
- Ability to use various linear and angular measuring instruments.
- Ability to measure linear, angular and surface profile using CMM.
- Understanding various non-destructive techniques.

**TEXT BOOK:**

**REFERENCES:**
OBJECTIVES:

- To provide students an exposure to disasters, their significance and types.
- To ensure that students begin to understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- To gain a preliminary understanding of approaches of Disaster Risk Reduction (DRR).
- To enhance awareness of institutional processes in the country.
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

UNIT I INTRODUCTION TO DISASTERS

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks – Disasters: Types of disasters – Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)

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

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

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

UNIT IV DISASTER RISK MANAGEMENT IN INDIA

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

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS

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

TOTAL: 45 PERIODS
OUTCOMES:
The students will be able to
• Differentiate the types of disasters, causes and their impact on environment and society
• Assess vulnerability and various methods of risk reduction measures as well as mitigation.
• Draw the hazard and vulnerability profile of India, Scenario in the Indian context, Disaster damage assessment and management.

TEXTBOOK:

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

IE6005 MODELING OF MANUFACTURING SYSTEMS L T P C
3 0 0 3

OBJECTIVES
• To introduce the students different models used to describe the manufacturing systems and use of them for effective operations of manufacturing industries.

UNIT I INTRODUCTION
Manufacturing systems types and concepts, manufacturing automation, performance measures types, classification and uses of manufacturing system models

UNIT II FOCUSSED FACTORIES
Focused flow lines – Work cells- work centers, Group technology, Process planning types, General serial systems – Analysis of paced and unpaced lines, system effectiveness, impact of random processing times, FMS planning and scheduling – Part selection and loading problems.

UNIT III MARKOV AND PETRINET MODELS
Stochastic processes in manufacturing, Markov chain models – DTMC and CTMC, steady state analysis, Petrinets in manufacturing – Basic concepts, stochastic petrinets.

UNIT IV QUEUING MODELS OF MANUFACTURING
Basic queuing models, Queuing networks in manufacturing – Jackson and Gordon Newell, product form solution

UNIT V LEAN SYSTEMS
Characteristics of lean systems, Pull method of work flow, lot size reduction, Kanban system, Value stream mapping, JIT principles

TOTAL : 45 PERIODS
OUTCOMES
• The Student must be able to apply the principles behind focused factory, Markov and Petrinet Models, Queuing models, lean system to model modern manufacturing systems.

TEXT BOOKS:

REFERENCES:

IE6006 EVOLUTIONARY OPTIMIZATION

OBJECTIVES
• To introduce different evolutionary optimization techniques for the problems related to the manufacturing systems

UNIT I
Conventional Optimization techniques, Overview of evolutionary computation, Historical branches of evolutionary computation

UNIT II
Search operators, Selection schemes, Ranking methods, Importance of representation

UNIT III
Evolutionary combinatorial optimization: evolutionary algorithms, Constrained optimization, Evolutionary multi-objective optimization.

UNIT IV
Genetic programming – Steps, Search operators on trees, examples, Hybrid genetic algorithms, Combining choices of heuristics

UNIT V
Pareto optimality, Analysis of evolutionary algorithms

TOTAL: 45 PERIODS

OUTCOMES:
• The students will be able to make decisions in the semi structured and unstructured problem situations.

TEXT BOOK:

REFERENCES:
IE6007  SYSTEMS ENGINEERING

OBJECTIVES
- To introduce system engineering concepts to design the manufacturing system for optimum utilization of source for effective functioning.

UNIT I  INTRODUCTION  9
Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frame works for systems engineering.

UNIT II  SYSTEMS ENGINEERING PROCESSES  9
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  9
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  9
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  9
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

OUTCOMES
- The Student must be able to apply systems engineering principles to make decision for optimization.
- Hence an understanding of the systems engineering discipline and be able to use the core principles and processes for designing effective system.

TEXT BOOK:

IE6009  COMPUTATIONAL METHODS AND ALGORITHMS

OBJECTIVES
- A brief introduction to algorithmic design tools with some applications.

UNIT I  INTRODUCTION  5
Review of C/C++ - writing and debugging large programs - Controlling numerical errors.

UNIT II  ALGORITHM DESIGN METHODS  12
Greedy – Divide and conquer – Backtracking – Branch & bound – Heuristics- Meta heuristics

UNIT III  BASIC TOOLS  12
Structured approach – Networks – Trees – Data structures
UNIT IV Computational Performance 6
Time complexity – Space complexity – Algorithm complexity

UNIT V Applications 10
Sorting – Searching - Networks – Scheduling – Optimization models – IE applications

TOTAL: 45 PERIODS

OUTCOMES:
• Student must be able to design algorithm computational tools used in manufacturing process.

REFERENCES:
OUTCOMES:
- To develop an integrative knowledge of the Information Technology applied for management in organization
- Understand how modern Information Technology is shaping the operation of business environment
- Communicate effectively on Management Information System issues.

TEXT BOOKS:

REFERENCES:

IE6001 MULTIVARIATE AND STATISTICAL ANALYSIS

OBJECTIVES:
- To impart knowledge on the applications of multivariate statistical analysis

UNIT I MULTIVARIATE METHODS
An overview of multivariate methods, Multivariate normal distribution, Eigen values and Eigen vectors.

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

UNIT III FACTOR ANALYSIS
Principal components analysis – Objectives, estimation of principal components, testing for independence of variables, Factor analysis model – Factor analysis equations and solution.

UNIT IV DISCRIMINANT ANALYSIS
Discriminant analysis – Discrimination for two multi variate normal populations.

UNIT V CLUSTER ANALYSIS
Cluster analysis – Clustering methods, Multivariate analysis of variance.

TOTAL : 45 PERIODS

OUTCOMES:
- Can apply the multivariate, regression, factor, discriminant and cluster analysis techniques for statistical analysis.

TEXT BOOK:

REFERENCE:
OBJECTIVES

- To teach the students the laws that govern the functioning of the Industries in a systematic way.
- To teach the Students the important appeals different laws pertaining to the industrial activities.

UNIT I  THE INDUSTRIAL DISPUTES ACT, 1947  9

UNIT II  THE TRADE UNION ACT 1926  12
Draft Standing Orders, conditions for certification of Standing Orders, Appeals, Register of Standing Orders. Temporary application of model standing orders.

UNIT III  THE FACTORIES ACT, 1948  8

UNIT IV  THE SALE OF GOODS ACT, 1930 (3 OF 1930)  8

Monopolies and Restrictive Trade Practices Commission, Unfair and Restrictive trade practices. The Competition Commission

OUTCOMES:

- Ability to discuss and demonstrate knowledge of the industrial law
- Ability to explain industrial dispute act 1947
- Ability to implement the trade union act.
- Ability to implement factories act, sales and goods act.

TEXT BOOKS:
3. Taxman, Commercial Laws.

REFERENCE:
1. Bare Acts and Bare Acts with Cases for each of these
OBJECTIVES:
- To study the fundamentals of packaging, manufacturing process, packaging materials and package testing.

UNIT I  FUNDAMENTALS OF PACKAGING 6
Definition, functions of packaging, types and selection of package, Packaging hazards, interaction of package and contents, materials and machine interface, Environmental and recycling considerations - life cycle assessment Package Design - Fundamentals, factors influencing design, stages in package development, graphic design, Structural design – simulation softwares

UNIT II  PACKAGING MATERIALS 11
Major Plastic packaging materials viz. Polyolefins, Polystyrene, Polyvinylchloride, Polyesters, Polyamides (Nylons), Polycarbonate and newer materials such as High Nitrile Polymers, Polyethylene Naphthalate (PEN), Nanomaterials, biodegradable materials – properties and applications, recycling; Wood, Paper, Textile, Glass, Metals - Tin, Steel, aluminum, Labelling materials, Cushioning Materials – properties and areas of application.

UNIT III  CONVERSION TECHNOLOGY 12

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

UNIT V  TESTING 7

TOTAL: 45 PERIODS

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

TEXT BOOKS:

REFERENCES:

ME6009 ENERGY CONSERVATION AND MANAGEMENT

OBJECTIVES:
At the end of the course, the student is expected to
- Understand and analyse the energy data of industries
- Carryout energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings and
- Utilize the available resources in optimal ways

UNIT I INTRODUCTION

UNIT II ELECTRICAL SYSTEMS

UNIT III THERMAL SYSTEMS

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able to analyse the energy data of industries.
- Can carry out energy accounting and balancing
- Can suggest methodologies for energy savings

TEXT BOOK:

REFERENCES:

IE6011 PRODUCT DESIGN AND DEVELOPMENT

OBJECTIVES:
- The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.

UNIT I INTRODUCTION

UNIT II CONCEPT GENERATION AND SELECTION

UNIT III PRODUCT ARCHITECTURE

UNIT IV INDUSTRIAL DESIGN
UNIT V  DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT


OUTCOMES:
• The student will be able to design some products for the given set of applications; also the knowledge gained through prototyping technology will help the student to make a prototype of a problem and hence product design and development can be achieved.

TEXT BOOK:

REFERENCES:

IE6012  INDUSTRIAL ROBOTICS

OBJECTIVES:
• To introduce the basic concepts, parts of robots and types of robots.
• To make the student familiar with the various drive systems for robots, sensors and their applications in robots and programming of robots.
• To discuss about the various applications of robots, justification and implementation of robot.

UNIT I  FUNDAMENTALS OF ROBOT


UNIT II  ROBOT DRIVE SYSTEMS AND END EFFECTORS


UNIT III  SENSORS AND MACHINE VISION

Sensory Devices - Non optical - Position sensors - Optical position sensors - Velocity sensors- Proximity sensors - Contact and noncontact type - Touel and slip sensors - Force and torque sensors - AI and Robotics.

UNIT IV  ROBOT KINEMATICS AND ROBOT PROGRAMMING

Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom
(In 2 Dimensional)-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 8
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

OUTCOMES:
• The Student must be able to design automatic manufacturing cells with robotic control using the principle behind robotic drive system, end effectors, sensor, machine vision robot kinematics and programming.

TEXT BOOK:

REFERENCES:

IM6004 WORLD CLASS MANUFACTURING L T P C
3 0 0 3

OBJECTIVES
• Understanding of the concept and importance of strategy planning for manufacturing industries
• To apply principles and techniques in the identifiable formulation and implementation of manufacturing strategy for competitive in global context.

UNIT I INDUSTRIAL DECLINE AND ASCENDANCY 9
Manufacturing excellence - US Manufacturers - French Manufacturers - Japan decade - American decade - Global decade

UNIT II BUILDING STRENGTH THROUGH CUSTOMER – FOCUSED PRINCIPLES 9
Customer - Focused principles - General principles - Design - Operations - Human resources - Quality and Process improvement - Promotion and Marketing

UNIT III VALUE AND VALUATION 9
Product Costing - Motivation to improve - Value of the enterprises QUALITY - The Organization : Bulwark of stability and effectiveness - Employee stability – Quality Individuals Vs. Teams - Team stability and cohesiveness - Project cohesiveness and stability

UNIT IV STRATEGIC LINKAGES 9
Product decisions and customer service - Multi-company planning - Internal manufacturing planning - Soothing the demand turbulence

UNIT V IMPEDIMENTS 9
Bad plant design - Mismanagement of capacity - Production Lines - Assembly Lines – Whole
OUTCOMES:
- Understand the concept and the importance of manufacturing strategy for industrial enterprise competitiveness.
- Apply appropriate techniques in the analysis and evaluation of company’s opportunities for enhancing competitiveness in the local, regional and global context.
- Identify formulation and implement strategies for manufacturing and therefore enterprise competitiveness.

TEXT BOOKS:

MF6701 FLEXIBLE MANUFACTURING SYSTEMS

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

UNIT I PLANNING, SCHEDULING AND CONTROL OF FLEXIBLE MANUFACTURING SYSTEMS

UNIT II COMPUTER CONTROL AND SOFTWARE FOR FLEXIBLE MANUFACTURING SYSTEMS

UNIT III FMS SIMULATION AND DATA BASE

UNIT IV GROUP TECHNOLOGY AND JUSTIFICATION OF FMS
UNIT V APPLICATIONS OF FMS AND FACTORY OF THE FUTURE


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

TEXT BOOK

REFERENCES:

MG6071 ENTREPRENEURSHIP DEVELOPMENT

OBJECTIVES:
- To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I ENTREPRENEURSHIP

UNIT II MOTIVATION
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS

UNIT IV FINANCING AND ACCOUNTING
UNIT V SUPPORT TO ENTREPRENEURS

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXT BOOKS:

REFERENCES: