<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><strong>THEORY</strong></td>
<td></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><strong>PRACTICALS</strong></td>
<td></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><strong>TOTAL</strong></td>
<td></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><strong>THEORY</strong></td>
<td></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><strong>PRACTICALS</strong></td>
<td></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><strong>TOTAL</strong></td>
<td></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>CODE NO.</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>THEORY</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1</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>2</td>
<td>ME6301</td>
<td>Engineering Thermodynamics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</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>4</td>
<td>AT6301</td>
<td>Automotive Engines</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AT6302</td>
<td>Mechanics of Machines</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>ME6352</td>
<td>Manufacturing Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRACTICAL</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>7</td>
<td>AT6311</td>
<td>Automotive Components Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</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>9</td>
<td>ME6465</td>
<td>Manufacturing Technology 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>2</td>
<td>9</td>
<td>26</td>
</tr>
</tbody>
</table>

## SEMESTER IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</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>THEORY</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1</td>
<td>MA6452</td>
<td>Statistics and Numerical Methods</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>AT6401</td>
<td>Applied Thermodynamics and Heat Transfer</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>ME6403</td>
<td>Engineering Materials and Metallurgy</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>CE6306</td>
<td>Strength of Materials</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>EC6464</td>
<td>Electronics and Microprocessors</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AT6402</td>
<td>Automotive Chassis</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRACTICAL</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>7</td>
<td>PR6412</td>
<td>Computer Aided Machine Drawing Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>EC6466</td>
<td>Electronics and Microprocessors Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</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>3</td>
<td>9</td>
<td>27</td>
</tr>
</tbody>
</table>

## SEMESTER V

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</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>THEORY</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>1</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>2</td>
<td>ME6503</td>
<td>Design of Machine Elements</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AT6501</td>
<td>Automotive Transmission</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AT6502</td>
<td>Automotive Electrical and Electronics Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AT6503</td>
<td>Vehicle Design Data Characteristics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AT6504</td>
<td>Automotive Fuels and Lubricants</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRACTICAL</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>7</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>8</td>
<td>AT6511</td>
<td>Automotive Electrical and Electronics Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>AT6512</td>
<td>Automotive Fuels and Lubricants 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>0</td>
<td>10</td>
<td>24</td>
</tr>
</tbody>
</table>
### SEMESTER VI

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MG6851</td>
<td>Principles of Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AT6601</td>
<td>Automotive Engine Components Design</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AT6602</td>
<td>Automotive Chassis Components Design</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AT6603</td>
<td>Two and Three Wheelers</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AT6604</td>
<td>Vehicle Dynamics</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><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>AT6611</td>
<td>Computer Aided Engine and Chassis Design</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>AT6612</td>
<td>Two and Three Wheelers Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>18</td>
<td>0</td>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

### SEMESTER VII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>AT6701</td>
<td>Engine and Vehicle Management System</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>ME6603</td>
<td>Finite Element Analysis</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AT6702</td>
<td>Vehicle Maintenance</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AT6703</td>
<td>Automotive Pollution and Control</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Elective – II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Elective – III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>AT6711</td>
<td>Engine Performance and Emission Testing</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>AT6712</td>
<td>Vehicle Maintenance Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>19</td>
<td>0</td>
<td>6</td>
<td>23</td>
</tr>
</tbody>
</table>

### SEMESTER VIII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>AT6801</td>
<td>Vehicle Body Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Elective – IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>AT6811</td>
<td>Project Work</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>6</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 185
### ELECTIVES FOR B.E. AUTOMOBILE ENGINEERING

#### SEMESTER VI

**ELECTIVE – I**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td>Professional Ethics in Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>GE6075</td>
<td>Automotive Air-Conditioning</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AT6001</td>
<td>Alternative Fuels and Energy Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AT6002</td>
<td>Noise, Vibration and Harshness</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AT6003</td>
<td>Advance Theory of IC Engines</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AT6004</td>
<td>Metrology and Instrumentation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AT6005</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SEMESTER VII

**ELECTIVE – II**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td>Manufacturing of Automotive Components</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>AT6006</td>
<td>Design of Jigs, Fixtures and Press Tools</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>ME6006</td>
<td>Robotics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ME6010</td>
<td>New Generation and Hybrid Vehicles</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AT6007</td>
<td>Computer Simulation of IC Engines</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AT6008</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ELECTIVE – III**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td>Composite Materials and Mechanics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>ME6007</td>
<td>Automotive Aerodynamics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AT6009</td>
<td>Off Road Vehicles</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AT6010</td>
<td>Automotive Safety</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AT6011</td>
<td>Engine Auxiliary Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AT6012</td>
<td>Disaster Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>GE6083</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### SEMESTER VIII

**ELECTIVE – IV**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td>Transport Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>AT6013</td>
<td>Entrepreneurship Development</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>MG6071</td>
<td>Operations Research</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>ME6015</td>
<td>Total Quality Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>GE6757</td>
<td>Human Rights</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>GE6084</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></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 - Listening 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.

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 9+3
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 9+3

UNIT V MULTIPLE INTEGRALS 9+3

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

OUTCOMES:
- 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 9
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
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  9
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  9
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 isochore (problems).

UNIT III  PHOTOCHEMISTRY AND SPECTROSCOPY  9

UNIT IV  PHASE RULE AND ALLOYS  9

UNIT V  NANOCHEMISTRY  9
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

TOTAL :45 PERIODS

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

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
9
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:
Hill, 2006.

GE6152 ENGINEERING GRAPHICS L T P C
2 0 3 4

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

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

UNIT I PLANE CURVES AND FREE HAND SKETCHING 5+9
Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of
ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of
involute of square and circle – Drawing of tangents and normal to the above curves, Scales:
Construction of Diagonal and Vernier scales.
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 5+9
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.

TOTAL : 45 PERIODS

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.
Server with C compiler supporting 30 terminals or more.

GE6162 ENGINEERING PRACTICES LABORATORY

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

IV ELECTRONICS ENGINEERING PRACTICE
1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, 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.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

**ELECTRICAL**

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

**ELECTRONICS**

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

**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
3. Spectrophotometer - 5 Nos
4. Ostwald Viscometer - 10 Nos

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

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
9+3
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
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

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 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
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 parallelepipeds.

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).

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  9

UNIT II  SEMICONDUCTING MATERIALS  9

UNIT III  MAGNETIC AND SUPERCONDUCTING MATERIALS  9
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  9

UNIT V  ADVANCED ENGINEERING MATERIALS  9

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 \( \text{H}_2 - \text{O}_2 \) 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
Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal-analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) - petroleum- manufacture of synthetic petrol (Bergius process)- knocking-octane number - diesel oil- cetane number - natural gas- compressed natural gas(CNG)- liquefied

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
12
Operating Principles of Moving Coil and Moving Iron Instruments (Ameters and Voltmeters), Dynamometer type Watt meters and Energy meters.

UNIT II ELECTRICAL MECHANICS
12

UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12
UNIT IV  DIGITAL ELECTRONICS  12  
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  2  
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...

UNIT IV DYNAMICS OF PARTICLES 12

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction- Rolling resistance -Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

TOTAL : 60 PERIODS

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 L T P C
0 1 2 2

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 Bspline 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

PHYSICS 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 BaCl₂ and Na₂SO₄

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:
• 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)
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

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


UNIT III  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

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


UNIT V  Z-TRANSFORMS AND DIFFERENCE EQUATIONS


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

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:

ME6301 ENGINEERING THERMODYNAMICS

OBJECTIVES:

- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

UNIT I BASIC CONCEPTS AND FIRST LAW


UNIT II SECOND LAW AND AVAILABILITY ANALYSIS


UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE


UNIT IV IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS

UNIT V GAS MIXTURES AND PSYCHROMETRY

Mole and Mass fraction, Dalton’s and Amagat’s Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

OUTCOMES:

• Upon completion of this course, the students can able to apply the Thermodynamic Principles to Mechanical Engineering Application.

• Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

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 apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can critically analyse the performance of pumps and turbines.

TEXT BOOK:

REFERENCES:

AT6301 AUTOMOTIVE ENGINES L T P C
3 0 0 3

OBJECTIVES:
- To understand the basic principles of engines used for automobiles and different systems.

UNIT I CONSTRUCTION AND OPERATION


UNIT II FUEL SYSTEMS

UNIT III  
COMBUSTION AND COMBUSTION CHAMBERS  

UNIT IV  
SUPERCHARGING, TURBOCHARGING AND ENGINE TESTING  
Supercharging and Turbocharging, Different methods of turbocharging, Intercooling, Turbocharger controls including, waster gate, variable geometry, variable nozzle types. Dynamometers, Indicated thermal, brake thermal and volumetric efficiencies. Measurement of friction, Cylinder pressure measurement. Engine performance maps, Engine testing standards.

UNIT V  
COOLING AND LUBRICATION SYSTEMS  
Need for cooling, types of cooling systems- air and liquid cooling systems. Thermo syphon and forced circulation and pressurized cooling systems. Properties of coolants. Requirements of lubrication systems. Types-mist, pressure feed, dry and wet sump systems. Properties of lubricants.

TOTAL: 45 PERIODS

OUTCOMES:
• The main objective of this course is to impart knowledge in automotive engine. The detailed concept, construction and principle of operation of engine and various engine components, combustion, cooling and lubrication systems will be taught to the students. At the end of the course the students will have command over automotive engines and the recent development in the area of engines.

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  
Mechanisms – Terminology and definitions – kinematics inversions of 4 bar and slide crank chain – kinematics analysis in simple mechanisms – velocity and acceleration polygons – Analytical methods

UNIT II GEARs and GEAR TRAINS 9

UNIT III FRICTION 8

UNIT IV FORCE ANALYSIS 9

UNIT V BALANCING AND VIBRATION 9

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:
OBJECTIVES:

- The automobile components such as piston, connecting rod, crankshaft, engine block, front axle, frame, body etc., are manufactured by various types of production processes involving casting, welding, machining, metal forming, power metallurgy etc. Hence B.E. Automobile Engineering students must study this course Production Technology.

UNIT I CASTING

Casting types, procedure to make sand mould, types of core making, moulding tools, machine moulding, special moulding processes – CO2 moulding; shell moulding, investment moulding, permanent mould casting, pressure die casting, centrifugal casting, continuous casting, casting defects.

UNIT II WELDING


UNIT III MACHINING

General principles (with schematic diagrams only) of working and commonly performed operations in the following machines: Lathe, Shaper, Planer, Horizontal milling machine, Universal drilling machine, Cylindrical grinding machine, Capstan and Turret lathe. Basics of CNC machines. General principles and applications of the following processes: Abrasive jet machining, Ultrasonic machining, Electric discharge machining, Electro chemical machining, Plasma arc machining, Electron beam machining and Laser beam machining.

UNIT IV FORMING AND SHAPING OF PLASTICS


UNIT V METAL FORMING AND POWDER METALLURGY

Principles and applications of the following processes: Forging, Rolling, Extrusion, Wire drawing and Spinning, Powder metallurgy – Principal steps involved advantages, disadvantages and limitations of powder metallurgy.

TOTAL: 45 PERIODS

OUTCOMES:

- The Students can able to use different manufacturing process and use this in industry for component production

TEXT BOOKS:

REFERENCES:

AT6311 AUTOMOTIVE COMPONENTS LABORATORY

OBJECTIVES:

• To train the Students to know the details of different components, disassemble and assembling them.

LIST OF EXPERIMENTS

1. Dismantling and study of Multi-cylinder Petrol Engine
2. Assembling of Multi-cylinder Petrol Engine
3. Dismantling and study of Multi-cylinder Diesel Engine
4. Assembling of Multi-cylinder Diesel Engine
5. Study of petrol engine fuel system
6. Study of diesel engine fuel system
7. Study and measurement of light and heavy commercial
8. Vehicle Frame
9. Study, dismantling and assembling of front and rear
10. Axles
11. Study, dismantling and assembling of differential
12. Study, dismantling and assembling of Clutch
13. Study, dismantling and assembling of Gear Box
14. Study of steering system

TOTAL: 45 PERIODS

OUTCOMES

• Ability to dismantle and assemble the automobile components

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>Multi Cylinder Petrol Engine</td>
<td>2 No.</td>
</tr>
<tr>
<td>2</td>
<td>Multi Cylinder Diesel Engine</td>
<td>2 No.</td>
</tr>
<tr>
<td>3</td>
<td>Petrol and Diesel fuel systems</td>
<td>2 No. Each</td>
</tr>
<tr>
<td>4</td>
<td>Heavy duty vehicle chassis frame</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Light duty vehicle chassis frame</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Front axle</td>
<td>2 No.</td>
</tr>
<tr>
<td>7</td>
<td>Rear axle</td>
<td>2 No.</td>
</tr>
<tr>
<td>8</td>
<td>Differential</td>
<td>2 No.</td>
</tr>
<tr>
<td>9</td>
<td>Clutch and Gear box (light duty, heavy duty)</td>
<td>2 No. Each</td>
</tr>
<tr>
<td>10</td>
<td>Steering systems with different gearboxes</td>
<td>4 No.</td>
</tr>
</tbody>
</table>
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>

TOTAL: 45 PERIODS

OBJECTIVES:
- Demonstration and study of the various machines. The Main emphasis will be on a complete understanding of the machine capabilities and processes.
LIST OF EXPERIMENTS

UNIT I  LATHE PRACTICE
a. Plain Turning
b. Taper Turning
c. Thread Cutting
Estimation of machining time for the above turning processes.

UNIT II  DRILLING PRACTICE
a. Drilling
b. Tapping
c. Reaming.

UNIT III  MILLING
a. Surface Milling.
b. Gear Cutting.
c. Contour Milling.

UNIT IV  PLANNING AND SHAPING
a. Cutting Key Ways.
b. Dove tail machining.

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

TOTAL: 45 PERIODS

LIST OF EQUIPMENT  FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lathe</td>
<td>15 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Drilling Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Milling Machine</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>4</td>
<td>Planning Machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Shaping Machine</td>
<td>2 Nos.</td>
</tr>
</tbody>
</table>

MA6452  STATISTICS AND NUMERICAL METHODS

OBJECTIVES:
- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.

UNIT I  TESTING OF HYPOTHESIS
Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, $\chi^2$ and F distributions for testing means and variances – Contingency table (Test for Independency) – Goodness of fit.
UNIT II   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 III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS  9+3
values of a matrix by power method.

UNIT IV   INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION  9+3
Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward
difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical
single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

UNIT V   NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS  9+3
Taylor’s series method – Euler’s method – Modified Euler’s method – Fourth order Runge-Kutta
method for solving first order equations – Milne’s predictor corrector methods for solving first order
equations – Finite difference methods for solving second order equations.

OUTCOMES:
• It helps the students to have a clear perception of the power of statistical and numerical
techniques, ideas and would be able to demonstrate the applications of these techniques to
problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

REFERENCES:
Hill, New Delhi, 2007.
Delhi, 2006.

AT6401   APPLIED THERMODYNAMICS AND HEAT TRANSFER   L T P C
3 1 0 4

OBJECTIVES:
• To familiarize the students to understand the applied thermodynamics and heat transfer.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and
Psychrometric Chart permitted)
UNIT I  GAS POWER CYCLES  10
Air standard cycles-Otto-Diesel-Dual-Work output, Efficiency and MEP calculations – comparison of
the cycles for same compression ratio and heat addition, same compression ratio and heat rejection,
same peak pressure, peak temperature and heat rejection, same peak pressure and heat input, same
peak pressure and work output, Brayton cycle

UNIT II  RECIPROCATING AIRCOMPRESSORS & REFRIGERATION CYCLES  10
Single acting and double acting air compressors, work required, effect of clearance volume, volumetric efficiency, isothermal efficiency, free air delivery, Fundamentals of refrigeration, C.O.P.,
reversed canot cycle, simple vapour compression refrigeration system, T-S, P-H diagrams, simple vapour absorption refrigeration system, desirable properties of an ideal refrigerant.

UNIT III  CONDUCTION  10
Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – General
Differential equation of Heat Conduction – Fourier Law of Conduction – Cartesian – One Dimensional
Steady State Heat Conduction – Conduction through Plane Wall, Cylinders and Spherical systems –
Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady
Heat Conduction – Lumped Analysis – Use of Heislers Chart.

UNIT IV  CONVECTION  10
Basic Concepts – Convective Heat Transfer Coefficients – Boundary Layer Concept – Types of
Convection – Forced Convection – Dimensional Analysis – External Flow – Flow over Plates,
Free Convection – Dimensional Analysis – Flow over Vertical Plate.

UNIT V  RADIATION  5
Grey body radiation Shape Factor Algebra – Electrical Analogy – Radiation Shields –Introduction to
Gas Radiation.

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

OUTCOMES:
• It helps the students to have a clear idea of application of thermodynamics and heat transfer.
The student would be able to identify the applications of these techniques in their engineering
fields.

TEXT BOOKS:

REFERENCES:
Delhi, 2004
Delhi, 1998
OBJECTIVES:

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

UNIT I ALLOYS AND PHASE DIAGRAMS

UNIT II HEAT TREATMENT

UNIT III FERROUS AND NON-FERROUS METALS

UNIT IV NON-METALLIC MATERIALS
Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of $\text{Al}_2\text{O}_3$, $\text{SiC}$, $\text{Si}_3\text{N}_4$, PSZ and SIALON –Composites-Classifications- Metal Matrix and FRP - Applications of Composites.

UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS

OUTCOMES:
- Upon completion of this course, the students can able to use different materials, their processing, heat treatments in suitable application in mechanical engineering fields.

TEXT BOOKS:

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

UNIT I  STRESS, STRAIN AND DEFORMATION OF SOLIDS  9

UNIT II  TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM  9

UNIT III  TORSION  9
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts– Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

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

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

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:
OBJECTIVES:

- To enable the students to understand the fundamental concepts of Semiconductors, Transistors, Rectifiers, Digital Electronics and 8085 Microprocessors

UNIT I SEMICONDUCTORS AND RECTIFIERS
Classification of solids based on energy band theory-Intrinsic semiconductors-Extrinsic semiconductors-P type and N type-PN junction-Zenor effect-Zenor diode characteristics- Half wave and full wave rectifiers -Voltage regulation

UNIT II TRANSISTORS AND AMPLIFIERS
Bipolar junction transistor- CB, CE, CC configuration and characteristics-Biasing circuits- Class A, B and C amplifiers- Field effect transistor-Configuration and characteristic of FET amplifier-SCR, Diac, Triac, UJT-Characteristics and simple applications-Switching transistors-Concept of feedback-Negative feedback-Application in temperature and motor speed control.

UNIT III DIGITAL ELECTRONICS
Binary number system - AND, OR, NOT, NAND, NOR circuits-Boolean algebra- Exclusive OR gate - Flip flops-Half and full adders-Registers-Counters-A/D and D/A conversion.

UNIT IV 8085 MICROPROCESSOR
Block diagram of microcomputer-Architecture of 8085-Pin configuration-Instruction set- Addressing modes-Simple programs using arithmetic and logical operations.

UNIT V INTERFACING AND APPLICATIONS OF MICROPROCESSOR
Basic interfacing concepts - Interfacing of Input and Output devices-Applications of microprocessor Temperature control, Stepper motor control, traffic light control.

OUTCOMES:

- The students will be well versed in the fundamental knowledge of electronic and its applications.

TEXT BOOKS

REFERENCES
OBJECTIVES:
• Study of the Constructional details and Theory of important drive line, Structural, Steering, Braking and Suspension Systems of Automobiles. Problem–Solving in Steering Mechanism, Propeller Shaft, Braking and Suspension Systems are to be done.

UNIT I LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM 9

UNIT II DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL 9

UNIT III REAR AXLES, WHEELS, RIMS AND TYRES 9

UNIT IV SUSPENSION SYSTEM 9

UNIT V BRAKE SYSTEMS 9

TOTAL : 45 PERIODS

OUTCOMES
• The students will understand the constructional, working principle of various sub system of an automobile.

TEXT BOOKS

REFERENCES
PR6412  COMPUTER AIDED MACHINE DRAWING LABORATORY  L  T  P  C
0  0  3  2

OBJECTIVES:
• To introduce the students the Indian standard code of practice for engineering drawing and general symbols and abbreviation used on the drawing.
• To provide hands on experience to develop 2D and 3D models of engineering components.

LIST OF EXPERIMENTS
1. Drawing of automobile components such as piston, connecting rod, valves, manifold and crank shaft.
2. Assembly drawing of screw jack, piston – connecting rod assembly, valve assembly, clutch assembly and gear box assembly.

OUTCOMES
• Ability to develop engineering drawing for the industrial component using Indian Standard code of practice.

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>Computer nodes</td>
<td>30 Nos.</td>
</tr>
</tbody>
</table>
| 2      | Software
drafting software          | 15 licenses|
|        | modeling software           | 5 Nos.     |

EC6466  ELECTRONICS AND MICROPROCESSORS LABORATORY  L  T  P  C
0  0  3  2

OBJECTIVES:
• To supplement the theoretical knowledge with practical use of electronic components and programming and control using micro-processors.

LIST OF EXPERIMENTS
ELECTRONICS
1. VI Characteristics of PN Junction Diode
2. VI Characteristics of Zener Diode
3. Characteristics of CE Transistor
4. Characteristics of JFET
5. Characteristics of Uni Junction Transistor
6. RC or Wein Bridge Oscillator
7. Study of Logic Gates (Basic Gates)
8. Half Adder and Full Adder
9. Shift Registers and Counters
10. Operational Amplifier (Adder, Subtractor, Differentiator, Integrator, Inverting and Non-Inverting)
MICROPROCESSORS

1. Block Transfer
2. 8 bit Addition, Subtraction
3. Multiplication and Division
4. Maximum and Minimum of block of data
5. Sorting
6. Stepper Motor Interfacing

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to perform speed characteristic of different electronics and microprocessor machine

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>Voltmeters</td>
<td>5 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Ammeters</td>
<td>5 Nos.</td>
</tr>
<tr>
<td>3</td>
<td>PN Diode, BJT, JFET, Logic Gates, Shift Registers and Counters</td>
<td>1 set.</td>
</tr>
<tr>
<td>4</td>
<td>Digital Logic Trainer Kits</td>
<td>1 No</td>
</tr>
<tr>
<td>5</td>
<td>Breadboards</td>
<td>1 No</td>
</tr>
<tr>
<td>6</td>
<td>Microprocessor Kits – 8085</td>
<td>5 Nos.</td>
</tr>
<tr>
<td>7</td>
<td>D/A Converter Interface</td>
<td>1 No</td>
</tr>
<tr>
<td>8</td>
<td>Stepper Motor Interface</td>
<td>1 No</td>
</tr>
<tr>
<td>9</td>
<td>CRO</td>
<td>1 No</td>
</tr>
<tr>
<td>10</td>
<td>Waveform Generator</td>
<td>1 No</td>
</tr>
<tr>
<td>11</td>
<td>Multimeter</td>
<td>1 No</td>
</tr>
</tbody>
</table>

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>

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
12 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  10
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 SO$_2$, NO$_x$, 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  10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and 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  7
Public awareness.

UNIT V  HUMAN POPULATION AND THE ENVIRONMENT  6

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:

ME6503 DESIGN OF MACHINE ELEMENTS L T P C 3 0 0 3

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

UNIT I STEADY STRESSES AND VARIABLE STRESSES IN MACHINE MEMBERS 10

UNIT II SHAFTS AND COUPLINGS 8
Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines – crankshafts - Rigid and flexible couplings.

UNIT III TEMPORARY AND PERMANENT JOINTS 9
Threaded fastners - Bolted joints including eccentric loading, Knuckle joints, Cotter joints – Welded joints, riveted joints for structures - theory of bonded joints.
UNIT IV  ENERGY STORING ELEMENTS AND ENGINE COMPONENTS
Various types of springs, optimization of helical springs - rubber springs - Flywheels considering stresses in rims and arms for engines and punching machines - Connecting Rods and crank shafts.

UNIT V  BEARINGS
Sliding contact and rolling contact bearings - Hydrodynamic journal bearings, Sommerfeld Number, Raimondi and Boyd graphs, -- Selection of Rolling Contact bearings.

OUTCOMES:
- Upon completion of this course, the students can able to apply the successfully design various mechanical components

TEXT BOOKS:

REFERENCES:
UNIT III  EPICYCLIC GEARBOXES USED IN AUTOMATIC TRANSMISSION  9

UNIT IV  AUTOMATIC TRANSMISSION APPLICATIONS  9
Need for automatic transmission, Four speed longitudinally mounted automatic transmission - Chevrolet “Turboglide” Transmission, Continuously Variable Transmission (CVT) – Types – Operations of a typical CVT.

UNIT V  HYDROSTATIC AND ELECTRIC DRIVE  9

TOTAL : 45 PERIODS

OUTCOMES
• The students will understand the constructional, working principle of various types of manual and automotive transmission of an automobile.

TEXT BOOKS:

REFERENCES:
1. SAE Transactions 900550 & 930910.

AT6502 AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS  L  T  P  C
OBJECTIVES
• Knowledge in vehicle electrical and electronics components for engine operation.
• Enhancing the knowledge of reversor and microprocessor applications in vehicle control systems.
• Gaining information’s on modern safety system in vehicle braking.

UNIT I  BATTERIES AND STARTING SYSTEM  10
Different types of Batteries – principle, rating, testing and charging. Starter motors characteristics, capacity requirements. Drive mechanisms. Starter switches.

UNIT II  CHARGING SYSTEM LIGHTING AND ACCESSORIES  9
UNIT III ELECTRONIC IGNITION AND INJECTION SYSTEM 9
Spark plugs. Advance mechanisms. Different types of ignition systems. Electronic fuel injection systems, mono and multi point fuel injection system (MPFI).

UNIT IV SENSORS AND MICROPROCESSORS IN AUTOMOBILES 9
Basic sensor arrangements. Types of sensors – oxygen sensor, hot wire anaemometer sensor, vehicle speed sensor, detonation sensor, accelerometer sensor, crank position sensor. Microprocessor and microcomputer controlled devices in automobiles such voice warning system, travel information system, keyless entry system, automatic transmission system, electronic steering system.

UNIT V SAFETY SYSTEMS 8
Antilock braking system, air bag restraint system, voice warning system, seat belt system, road navigation system, anti theft system.

OUTCOMES:
• The student will have to know about all theoretical information and about electrical components used in a vehicle.

TEXTBOOK:

REFERENCES:

AT6503 VEHICLE DESIGN AND DATA CHARACTERISTICS L T P C
3 0 0 3

OBJECTIVES:
• Students have to collect important technical specifications of an automobile from Automobile Journals and keeping this, as a guide, they have to calculate and tabulate various vehicle performance parameters and design parameters and to draw curves using these data.

UNIT I INTRODUCTION 9
Assumptions to be made in designing a vehicle, Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, gradability in different gears, Basics of Automobile Design.

UNIT II RESISTANCE TO VEHICLE MOTION 9
Calculation, Tabulation and Plotting of Curves for Air and Rolling Resistances at various vehicle speeds, Calculation and Plotting of Driving force, Power requirement for different loads and acceleration, Maximum Power calculation.
UNIT III PERFORMANCE CURVES – I
Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure – Volume diagram, Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length.

UNIT IV PERFORMANCE CURVES – II
Connecting rod length to Crank Radius Ratio, Plotting of Piston Velocity and Acceleration against Crank Angle, Plotting Gas force, inertia force and Resultant force against Crank Angle, Turning Moment and Side Thrust against Crank Angle.

UNIT V GEAR RATIOS
Determination of Gear Ratios, Acceleration and Gradability, Typical Problems on Vehicle performance

OUTCOMES
• The students can able to understand the basic design principle of vehicle, able to draw the performance curves pertain to engine and chassis.

TEXT BOOKS

REFERENCE:

AT6504 AUTOMOTIVE FUELS AND LUBRICANTS

OBJECTIVES:
• To understand the properties of fuels and lubricants for the design and operation of the I.C engines.

UNIT I MANUFACTURE OF FUELS AND LUBRICANTS
Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II THEORY OF LUBRICATION
Engine friction: introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

UNIT III LUBRICANTS
Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, additives and additive mechanism, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, test used in grease.
UNIT IV  PROPERTIES AND TESTING OF FUELS
Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion etc.

UNIT V  COMBUSTION & FUEL RATING

OUTCOMES:
• At the end of the course, the student can understand the importance, manufacturing methods, testing methods, combustion methodology of automotive fuels and lubricants.

TEXT BOOKS:

REFERENCES:

GE6674  COMMUNICATION AND SOFT SKILLS- LABORATORY BASED  L T P C
0 0 4 2

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  12
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  12
International English Language Testing System (IELTS) - Test of English as a Foreign Language (TOEFL) - Civil Service (Language related)- Verbal Ability.

UNIT IV  INTERVIEW SKILLS  12
Different types of Interview format- answering questions- offering information- mock interviews-body language( paralinguistic features)- articulation of sounds- intonation.

UNIT V  SOFT SKILLS  12
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”</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
OBJECTIVES:
- To introduce the testing procedure for electrical and electronics system in automobile.

LIST OF EXPERIMENTS
a. Electrical Laboratory
   1. Testing of batteries and battery maintenance
   2. Testing of starting motors and generators
   3. Testing of regulators and cut–outs
   4. Diagnosis of ignition system faults
   5. Study of Automobile electrical wiring

b. Electronics Laboratory
   6. Study of rectifiers and filters
   7. Study of logic gates, adder and flip-flops
   8. Study of SCR and IC timer
   9. Interfacing Sensors like RTD, LVDT, Load Cell etc.
  10. Interfacing ADC for Data Acquisition
  11. Interfacing DAC for Control Application
  12. Interfacing A/D converter and simple data acquisition
  13. Micro controller programming and interfacing
  14. Interfacing Actuators
  15. EPROM Programming
  16. Fault Diagnosis of various sensors

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to rectify and faults in electrical and electronics systems and maintain the same.

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>Battery, hydrometer, voltage tester</td>
<td>1 No. each</td>
</tr>
<tr>
<td>2</td>
<td>Starter motor, regulator, cut-out</td>
<td>1 No. each</td>
</tr>
<tr>
<td>3</td>
<td>Distributor, ignition coil, spark plug</td>
<td>1 No. each</td>
</tr>
<tr>
<td>4</td>
<td>Auto electrical wiring system</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Rectifiers, filters</td>
<td>15 Nos. each</td>
</tr>
<tr>
<td>6</td>
<td>Bread board, Logic gates ICs,</td>
<td>15 Nos. each</td>
</tr>
<tr>
<td>7</td>
<td>Amplifier</td>
<td>15 Nos</td>
</tr>
<tr>
<td>8</td>
<td>IC timer</td>
<td>15 Nos</td>
</tr>
<tr>
<td>9</td>
<td>Data logger</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>8085 trainer kit</td>
<td>10 Nos</td>
</tr>
<tr>
<td>11</td>
<td>ADC interface board</td>
<td>2 Nos</td>
</tr>
<tr>
<td>12</td>
<td>DAC interface board</td>
<td>2 Nos</td>
</tr>
<tr>
<td>13</td>
<td>Sensors like RTD, Load cell, LVDT</td>
<td>2 Nos</td>
</tr>
<tr>
<td>14</td>
<td>Actuators like stepper motor</td>
<td>2 Nos</td>
</tr>
</tbody>
</table>
AT6512  AUTOMOTIVE FUELS AND LUBRICANTS LABORATORY  L T P C  0 0 3 2

OBJECTIVES:
- To study the characteristics of the fuels and Lubricants used in automobile

LIST OF EXPERIMENTS
2. Study of Octane and Cetane Number of fuels.
3. ASTM distillation test of liquid fuels
4. Aniline Point test of diesel
5. Calorific value of liquid fuel.
7. Reid vapour pressure test.
8. Flash and Fire points of petrol and diesel.
9. Copper strip Corrosion Test
10. Cloud & Pour point Test.
12. Viscosity Index of lubricants & Fuels by Saybolt Viscometer
13. Ash content and Carbon Residue Test
14. Drop point of grease and mechanical penetration in grease.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to characteristic and chase the fuels and Lubricantes for the automobiles.

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>Flash and fire point apparatus (for petrol)</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Aniline point Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Reid vapor pressure test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Bomb and Gas Calorimeters</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Carbon Residue Test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Copper Strip Corrosion Test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Cloud and Pour point Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Redwood Viscometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Saybolt Viscometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>ASTM distillation test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Ash content Test Apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Drop point and penetration Apparatus for grease</td>
<td>1 No.</td>
</tr>
</tbody>
</table>

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  9
Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and
contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II    PLANNING  9

UNIT III   ORGANISING  9

UNIT IV    DIRECTING  9

UNIT V    CONTROLLING  9
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

OUTCOME:
- 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

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To make the students understand the design concept and principles of various engine components. These concepts and principles are familiarized for design of components.

UNIT I  INTRODUCTION

Engineering materials - Introduction endurance limit, notch sensitivity. Tolerances, types of tolerances and fits, design considerations for interference fits, surface finish, surface roughness, Rankine's formula - Tetmajer's formula - Johnson formula - design of pushrods.

UNIT II  DESIGN OF CYLINDER, PISTON AND CONNECTING ROD

Choice of material for cylinder and piston, design of cylinder, piston, piston pin, piston rings, piston failures, lubrication of piston assembly. Material for connecting rod, determining minimum length of connecting rod, small end design, shank design, design of big end cap bolts.

UNIT III  DESIGN OF CRANKSHAFT

Balancing of I.C. engines, significance of firing order. Material for crankshaft, design of crankshaft under bending and twisting, balancing weight calculations, development of short and long crankarms. Front and rear-end details.

UNIT IV  DESIGN OF FLYWHEELS

Determination of the mass of a flywheel for a given co-efficient of speed fluctuation. Engine flywheel stresses on the rim of the flywheels. Design of hubs and arms of the flywheel, turning moment diagram.

UNIT V  DESIGN OF VALVES AND VALVE TRAIN


TOTAL: 45 PERIODS

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

OUTCOMES:

- Upon completion of the course, students will be able to impart knowledge in automotive engine. The detailed concept, construction and principle of operation of engine and various engine components, combustion, cooling and lubrication systems will be taught to the students. At the end of the course the students will have command over automotive engines and the recent development in the area of engines.

TEXT BOOK:


REFERENCES:

OBJECTIVES:
- The student will be able to understand the fundamental principles involved in design of components of automotive chassis, the complete design exercise and arrive at important dimensions of chassis components.

UNIT I  VEHICLE FRAME AND SUSPENSION  9
Study of loads-moments and stresses on frame members. Design of frame for passenger and commercial vehicle - Design of leaf Springs-Coil springs and torsion bar springs.

UNIT II  FRONT AXLE AND STEERING SYSTEMS  9

UNIT III  CLUTCH  9
Design of single plate clutch, multiplate clutch and cone clutch. Torque capacity of clutch. Design of clutch components, Design details of roller and sprag type of clutches.

UNIT IV  GEAR BOX  9
Gear train calculations, layout of gearboxes. Calculation of bearing loads and selection of bearings. Design of three speed and four speed gearboxes.

UNIT V  DRIVE LINE AND REAR AXLE  9
Design of propeller shaft. Design details of final drive gearing. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings and design aspects of final drive.

TOTAL: 45 PERIODS

OUTCOMES
- At the end of the course, the student can able to design the automotive components like frame, suspension systems, axles, clutch, gear box, drive line components etc

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- The aim of this course is to make the students to know and understand the constructional details operating characteristics and vehicle design aspects

UNIT I THE POWER UNIT
Two stroke and four stroke SI & CI engine Construction and Working, merits and demerits, Symmetrical and unsymmetrical valve & port timing diagrams. Scavenging process.

UNIT II FUEL AND IGNITION SYSTEMS
Fuel system – Different circuits in two wheeler fuel systems, fuel injection system. Lubrication system, Ignition systems - Magneto coil and battery coil spark ignition system, Electronic ignition System, Starting system - Kick starter system – Self starter system. Recent technologies.

UNIT III CHASSIS AND SUB-SYSTEMS
Main frame for two and three wheelers, its types, Chassis and different drive systems for two wheelers, Single, multiple plates and centrifugal clutches, Gear box and its and various gear controls in two wheelers. Front and rear suspension systems. Shock absorbers. Panel meters and controls on handle bar, Freewheeling devices

UNIT IV BRAKES AND WHEELS

UNIT V TWO & THREE WHEELERS – CASE STUDY
Case study of Sports bike, Motor cycles, Scooters and Mopeds - Auto rickshaws, Pick up van, Delivery van and Trailer. Servicing and maintenance. Recent developments.

TOTAL : 45 PERIODS

OUTCOMES:
- The students can able to understand the various subsystem of two and three wheeler and also know how it is different from light motors and heavy motor vehicles.

TEXT BOOKS:

REFERENCES:
4. Bryaut, R.V., Vespa "Maintenance and Repair series".
OBJECTIVES

- To know about the application of basic mechanics principles for dynamic analysis of vehicles.

UNIT I CONCEPT OF VIBRATION


UNIT II TIRES


UNIT III VERTICAL DYNAMICS


UNIT IV LONGITUDINAL DYNAMICS AND CONTROL


UNIT V LATERAL DYNAMICS


OUTCOMES

- The student will understand how passenger comfort is achieved along with vehicle stability.

TEXT BOOKS:


REFERENCES:

OBJECTIVES:
- To familiarise the students to use modeling software to model engine components and chassis design

LIST OF ENGINE DESIGN EXPERIMENTS
1. Design and drawing of piston, piston pin and piston rings and drawing of these components.
2. Design of connecting rod small end and big end, shank design, design of big end cap, bolts and drawing of the connecting rod assembly.
3. Design of crankshaft, balancing weight calculations.
4. Development of short and long crank arms, front end and rear end details, drawing of the crankshaft assembly.
5. Design and drawing of flywheel.
6. Ring gear design, drawing of the flywheel including the development of ring gear teeth.
7. Design and drawing of the inlet and exhaust valves.
8. Design of cam and camshaft, cam profile generation, drawing of cam and camshaft.

LIST OF CHASSIS DESIGN EXPERIMENTS

CLUTCH
10. Complete design of clutch components.
11. Assembly drawing of clutch using drafting software.

GEAR BOX
12. Gear train calculations.
13. Layout of gear box.
14. Calculation of bearing loads
15. Selection of bearings.
16. Assembly drawing of gear box using drafting software.

DRIVE LINE AND REAR AXLE
17. Design of propeller shaft.
18. Design details of final drive gearing.
19. Design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings
20. Design aspects of final drive.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to use the drafty and modeling software for automobile components design
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>Computer nodes</td>
<td>15 Nos.</td>
</tr>
<tr>
<td>2</td>
<td>Drafting and Modeling Softwares</td>
<td>15 licenses each</td>
</tr>
</tbody>
</table>

AT6612 TWO AND THREE WHEELERS LABORATORY

L T P C
0 0 3 2

OBJECTIVES:
- To train the students to conduct performance test on two and three wheelers
- To train the students to dismantle and assemble the gear box, steering system etc.,

LIST OF EXPERIMENTS
1. Performance test of a two wheeler using chassis dynamometer.
2. Performance test on shock absorber
3. Performance test on coil spring.
4. Two wheeler chain test
5. Brake and Clutch adjustment as per specification.
6. Dismantling and assembling of two wheeler gear box and finding gear ratios
7. Dismantling and assembling of three wheeler box and finding gear ratios
8. Three wheeler brake and clutch play adjustment
9. Dismantling and assembling of three wheeler steering system.
10. Study of three wheeler chassis frame and power transmission system.

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to assemble the engine components and conduct performance test on two and three wheelers.

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>Two wheeler chassis dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Coil spring test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Chain tension test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Shock absorber test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Two-wheeler gearbox</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>6</td>
<td>Two-wheeler clutch</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>7</td>
<td>Three-wheeler brake assembly</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>8</td>
<td>Three-wheeler steering assembly</td>
<td>2 Nos.</td>
</tr>
<tr>
<td>9</td>
<td>Three-wheeler gear box</td>
<td>2 Nos.</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To explain the principle of engines and vehicle electronic management system and different sensors used in the systems.

UNIT I  FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS  
10
Microprocessor architecture, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Parameters to be controlled in SI and CI enignes and in the other parts of the automobile.

UNIT II  SENSORS  
12
Inductive, Hall effect, hot wire, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, air mass flow, crank shaft position, cam position, engine and wheel speed, steering position, tire pressure, brake pressure, steering torque, fuel level, crash, exhaust oxygen level (two step and linear lambda), knock, engine temperature, manifold temperature and pressure sensors.

UNIT III  SI ENGINE MANAGEMENT  
13

UNIT IV  CI ENGINE MANAGEMENT  
13
Fuel injection system parameters affecting combustion, noise and emissions in CI engines. Pilot, main, advanced post injection and retarded post injection. Electronically controlled Unit Injection system. Layout of the common rail fuel injection system. Working of components like fuel injector, fuel pump, rail pressure limiter, flow limiter, EGR valves

UNIT V  VEHICLE MANAGEMENT SYSTEMS  
12

OUTCOMES:

- At the end of the course, the student will understand the role of various sensor, its construction and working principle and it influence in controlling pollution, enhancing safety of the vehicle.

TEXT BOOKS:


REFERENCES:

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

UNIT I INTRODUCTION

UNIT II ONE-DIMENSIONAL PROBLEMS

UNIT III TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS

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

UNIT V ISOPARAMETRIC FORMULATION

OUTCOMES:
- Upon completion of this course, the Students can able to understand different mathematical Techniques used in FEM analysis and use of them in Structural and thermal problem

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To know about the various methods of maintaining vehicles and their subsystems.

UNIT I MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS 10

UNIT II ENGINE AND ENGINE SUBSYSTEM MAINTENANCE 8
General Engine service- Dismantling of Engine components- Engine repair- working on the underside, front, top, ancillaries- Service of basic engine parts, cooling and lubricating system, fuel system, Intake and Exhaust system, electrical system - Electronic fuel injection and engine management service - fault diagnosis- servicing emission controls

UNIT III TRANSMISSION AND DRIVELINE MAINTENANCE 8
Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of cross and yoke joint and constant velocity joints- Rear axle service points- removing axle shaft and bearings- servicing differential assemblies- fault diagnosis.

UNIT IV STEERING, BRAKE, SUSPENSION, WHEEL MAINTENANCE 11
Inspection, Maintenance and Service of Hydraulic brake, Drum brake, Disc brake, Parking brake. Bleeding of brakes. Inspection, Maintenance and Service of Mc person strut, coil spring, leaf spring, shock absorbers. Dismantling and assembly procedures. Wheel alignment and balance, removing and fitting of tyres, tyre wear and tyre rotation. Inspection, Maintenance and Service of steering linkage, steering column, Rack and pinion steering, Recirculating ball steering service- Worm type steering, power steering system

UNIT V AUTO ELECTRICAL AND AIR CONDITIONING MAINTENANCE 10
Maintenance of batteries, starting system, charging system and body electrical -Fault diagnosis using Scan tools. Maintenance of air conditioning parts like compressor, condenser, expansion valve, evaporator - Replacement of hoses- Leak detection- AC Charging- Fault diagnosis
Vehicle body repair like panel beating, tinkering, soldering, polishing, painting.

TOTAL : 45 PERIODS

OUTCOMES
- Upon the completion of the course, the student can able to understand the importance of maintenance and also the step by step procedure for maintain the various automotive sub systems

TEXT BOOKS
3. Vehicle Service Manuals of reputed manufacturers

REFERENCES
OBJECTIVES:
• The main objective of this course is to impart knowledge in automotive pollution control. The detailed concept of formation and control techniques of pollutants like UBHC, CO, NOₓ, particulate matter and smoke for both SI and CI engine will be taught to the students. The instruments for measurement of pollutants and emission standards will also be introduced to the students. At the end of the course the students will have command over automotive pollution and control.

UNIT I INTRODUCTION

UNIT II EMISSIONS IN SI ENGINE
Chemistry of SI engine combustion – HC and CO formation in SI engines – NO formation in SI engines – Smoke emissions from SI engines – Effect of operating variables on emission formation.

UNIT III EMISSIONS IN CI ENGINE
Basics of diesel combustion – Smoke emission and its types in diesel engines – NOx emission and its types from diesel engines – Particulate emission in diesel engines. Odor, sulfur and Aldehyde emissions from diesel engines – effect of operating variables on emission formation.

UNIT IV CONTROL TECHNIQUES FOR REDUCTION OF EMISSION

UNIT V TEST PROCEDURE, INSTRUMENTATION & EMISSION MEASUREMENT

OUTCOMES:
• Upon the completion of the course, the student will understand the fundamentals of formation of automobile pollutions in SI and CI Engines, various control techniques, test procedures etc.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:
- To conduct performance test and emission test on the IC engines.

LIST OF EXPERIMENTS
1. Study of hydraulic, electrical and eddy current dynamometers
2. Valve timing and port timing diagram
3. Performance and emission test on two wheeler SI engine
4. Performance and emission test on automotive multi-cylinder SI engine
5. Performance and emission test on automotive multi-cylinder CI engine
7. Heat balance test on automotive multi-cylinder SI engine
8. Heat balance test on automotive multi-cylinder CI engine
9. Morse test on multi-cylinder SI engine
10. P-θ and P-V diagrams for IC engine with piezo-electric pick up, charge amplifier, angle encoder and PC

TOTAL: 45 PERIODS

OUTCOMES:
- Ability to control the emission and use of different equipments to conduct performance test.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hydraulic dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Eddy current dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Electrical dynamometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Single cylinder two stroke cut section engine</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Single cylinder four stroke cut section engine</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Two-wheeler engine test rig</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Automotive multicylinder SI engine test rig with heat balance arrangement</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Automotive multicylinder CI engine test rig with heat balance arrangement</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Emission Measuring Instruments for Petrol &amp; Diesel Engines</td>
<td>1 No each</td>
</tr>
<tr>
<td>10</td>
<td>Piezo-electric pick up, Charge Amplifier, Angle Encoder and PC</td>
<td>1 set</td>
</tr>
</tbody>
</table>

OBJECTIVES:
- To train the structures in identifying the fault and rectification.

STUDY EXPERIMENTS:
1. Tools and instruments required for maintenance
2. Safety aspects with respect to man, machine and tools
3. General procedures for servicing and maintenance schedule
4. Wheel Alignment procedure
LIST OF EXPERIMENTS:
1. Minor and major tune up of gasoline and diesel engines
2. Calibration of Fuel pump
3. Engine fault diagnosis using scan tool
4. Fault diagnosis and service of transmission system
5. Fault diagnosis and service of driveline system
6. Fault diagnosis and service of braking system
7. Fault diagnosis and service of suspension system
8. Fault diagnosis and service of steering system
9. Fault diagnosis and service of Electrical system like battery, starting system, charging system, lighting system etc
10. Fault diagnosis and service of vehicle air conditioning system
11. Practice the following:
   i. Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel play.
   ii. Air bleeding from hydraulic brakes, air bleeding of diesel fuel system.
   iii. Wheel bearings tightening and adjustment.
   iv. Adjustment of head lights beam.
   v. Removal and fitting of tire and tube.

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to identify the faults and knowledge on maintenance

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>NAME OF THE EQUIPMENT</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engine Analyzer</td>
<td>1 No.</td>
</tr>
<tr>
<td>2</td>
<td>Cylinder compression pressure gauge</td>
<td>1 No.</td>
</tr>
<tr>
<td>3</td>
<td>Vacuum gauge</td>
<td>1 No.</td>
</tr>
<tr>
<td>4</td>
<td>Spark plug cleaner and tester</td>
<td>1 No.</td>
</tr>
<tr>
<td>5</td>
<td>Cam angle and rpm tester</td>
<td>1 No.</td>
</tr>
<tr>
<td>6</td>
<td>Tachometer</td>
<td>1 No.</td>
</tr>
<tr>
<td>7</td>
<td>Wheel alignment apparatus</td>
<td>1 No.</td>
</tr>
<tr>
<td>8</td>
<td>Gas welding equipment</td>
<td>1 No.</td>
</tr>
<tr>
<td>9</td>
<td>Tyre remover</td>
<td>1 No.</td>
</tr>
<tr>
<td>10</td>
<td>Bearing puller</td>
<td>1 No.</td>
</tr>
<tr>
<td>11</td>
<td>Head light alignment gauge</td>
<td>1 No.</td>
</tr>
<tr>
<td>12</td>
<td>Service manuals of petrol, diesel engines</td>
<td>1 No: each</td>
</tr>
<tr>
<td>13</td>
<td>Cylinder reboring machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>14</td>
<td>Valve grinding machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>15</td>
<td>Valve lapping machine</td>
<td>1 No.</td>
</tr>
<tr>
<td>16</td>
<td>Fuel injection calibration test bench with nozzle tester</td>
<td>1 No.</td>
</tr>
<tr>
<td>17</td>
<td>HRD tester, Clamp on meter, Hydrometer</td>
<td>1 No: each</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- The main objective of this course is to impart knowledge in the construction of vehicle, aerodynamic, concept, paneling of passenger car body trim. At the end of the course the student will be well versed in the design and construction of external body of the vehicles.

UNIT I CAR BODY DETAILS 10

UNIT II BUS BODY DETAILS 9
Types of bus body: based on capacity, distance traveled and based on construction. – Bus body lay out for various types, Types of metal sections used – Regulations – Constructional details: Conventional and integral. driver seat design- Safety aspect of bus body.

UNIT III COMMERCIAL VEHICLE DETAILS 8
Types of commercial vehicle bodies - Light commercial vehicle body. Construction details of commercial vehicle body - Flat platform body, Trailer, Tipper body and Tanker body – Dimensions of driver’s seat in relation to controls – Drivers cab design - Regulations.

UNIT IV VEHICLE AERODYNAMICS 9
Objectives, Vehicle drag and types. Various types of forces and moments. Effects of forces and moments. Side wind effects on forces and moments. Various body optimization techniques for minimum drag. Wind tunnels – Principle of operation, Types. Wind tunnel testing such as: Flow visualization techniques, Airflow management test – measurement of various forces and moments by using wind tunnel.

UNIT V BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR 9

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of the course, students will
- Know about different aspects of car body and bus body, types, commercial vehicle.
- Role of various aerodynamic forces and moments, measuring instruments
- Know about the material used in body building, tools used, body repairs.

TEXT BOOKS:

REFERENCES:
AT6811 PROJECT WORK

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.

GE6075 PROFESSIONAL ETHICS IN ENGINEERING

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

UNIT I HUMAN VALUES

UNIT II ENGINEERING ETHICS

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

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS
UNIT V  GLOBAL ISSUES
Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors –
Moral Leadership – Code of Conduct – Corporate Social Responsibility

TOTAL: 45 PERIODS

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

TEXT BOOKS:
1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi,
2003.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India,
New Delhi, 2004.

REFERENCES:
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts
and Cases”, Cengage Learning, 2009
4. Edmund G Seebauer and Robert L Barry, “Fundametals of Ethics for Scientists and
Engineers”, Oxford University Press, Oxford, 2001
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal

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

AT6001  AUTOMOTIVE AIR-CONDITIONING

OBJECTIVES
• At the end of the course, the students will be able to understand the components of the
automotive air-conditioning and their functions and the latest developments in this field.

UNIT I  AUTOMOTIVE AIRCONDITIONING FUNDAMENTALS
Purposes of Heating, Ventilation and Air Conditioning – Environmental Concerns – Ozone layer
depletion – Location of air conditioning components in a car – Schematic layout of a vehicle
refrigeration system. Psychrometry – Basic terminology and Psychrometric mixtures – Psychrometric
Chart – Related problems

UNIT II  AUTOMOTIVE COOLING AND HEATING SYSTEM
Vehicle Refrigeration System and related problems - Fixed thermostatic and Orifice tube system-
Variable displacement thermostatic and Orifice tube system - Vehicle air conditioning operation
Types of compressor- Compressor Clutches- Compressor Clutch electrical circuit- Compressor lubrication- Condensers- Evaporators- Expansion devices- Evaporator temperature and pressure controls- receiver-drier- Accumulators- refrigerant hoses, Connections and other assemblies- Heating system

UNIT III AIR-CONDITIONING CONTROLS, DELIVERY SYSTEM AND REFRIGERANTS 9
Types of Control devices- Preventing Compressor damage- Preventing damage to other systems-Maintaining driveability- Preventing Overheating
Ram air ventilation- Air delivery Components- Control devices- Vacuum Controls
Containers – Handling refrigerants – Discharging, Charging & Leak detection – Refrigeration system diagnosis – Diagnostic procedure – Ambient conditions affecting system pressures.

UNIT IV AUTOMATIC TEMPERATURE CONTROL 9
Different types of sensors and actuators used in automatic temperature control- Fixed and variable displacement temperature control- Semi Automatic- Controller design for Fixed and variable displacement type air conditioning system

UNIT V SYSTEM SERVICING AND TESTING 9
Special tools for servicing vehicle air conditioning – Diagnosing components and air conditioning systems- Diagnosing cooling system- Air delivery system- Automatic temperature Control system diagnosis and service

TOTAL : 45 PERIODS

OUTCOMES
• Upon the completion of the course, the student should understand the basic of vehicle air-conditioning system, its components, working principle, control mechanism, service etc.

TEXT BOOKS:

REFERENCES:

AT6002 ALTERNATIVE FUELS AND ENERGY SYSTEMS  L T P C 3 0 0 3

OBJECTIVES:
• To know about the types of alternative fuels and energy sources for IC engines.

UNIT I ALCOHOLS AS FUELS 9
Introduction to alternative fuels. - Need for alternative fuels - Availability of different alternative fuels for SI and CI engines. Alcohols as fuels. Production methods of alcohols. Properties of alcohols as

UNIT II VEGE TABLE OILS AS FUELS 9

UNIT III HYDROGEN AS ENGINE FUEL 9

UNIT IV BIOGAS, NATURAL GAS AND LPG AS FUELS 9
Production methods of Biogas, Natural gas and LPG. Properties studies. CO₂ and H₂S scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines.

UNIT V ELECTRIC, HYBRID AND FUEL CELL VEHICLES 9

TOTAL : 45 PERIODS

OUTCOMES:
• On completion of the course, the student will understand the various alternative fuels available, its properties, performance characteristics, combustion characteristics, emission characteristics, engine modifications required etc.,

TEXT BOOK:

REFERENCES:
3. Transactions of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.).
OBJECTIVES:
• knowledge in basic of vibration and noise
• Understanding the effect of noise an human comfort and environment
• Knowing the methods of vibration and noise measurement.

UNIT I FUNDAMENTALS OF ACOUSTICS AND NOISE, VIBRATION 8

UNIT II EFFECTS OF NOISE, BLAST, VIBRATION, AND SHOCK ON PEOPLE 7

UNIT III TRANSPORTATION NOISE AND VIBRATION—SOURCES, PREDICTION, AND CONTROL 10

UNIT IV INTERIOR TRANSPORTATION NOISE AND VIBRATION SOURCES - PREDICTION AND CONTROL 10
Introduction to Interior Transportation Noise and Vibration Sources, Automobile, Bus, and Truck Interior Noise and Vibration Prediction and Control, Noise and Vibration in Off-Road Vehicle Interiors-Prediction and Control,

UNIT V NOISE AND VIBRATION TRANSDUCERS, ANALYSIS EQUIPMENT, SIGNAL PROCESSING, AND MEASURING TECHNIQUES 10

OUTCOMES:
• At the end of the course, the student will understand the sources, effects, prediction, control techniques, measurement techniques of noise, vibration pertain to an automobile.

TEXT BOOKS:

REFERENCES:

AT6004 ADVANCE THEORY OF IC ENGINES

OBJECTIVES:
• Knowledge in usage of software for simulating the performance of IC engines
• Acquiring ability to simulate the various types combustion processes of IC engines.
• Knowledge in performance simulation of IC engines.

UNIT I

COMBUSTION OF FUELS

UNIT II

ENGINE CYCLE ANALYSIS
Ideal air, fuel air cycle and actual cycle analysis. Progressive combustion analysis in SI engines. Parametric studies on work output, efficiency and other engine performance.

UNIT III

COMBUSTION MODELLING

UNIT IV

NON-CONVENTIONAL IC ENGINES

UNIT V

COMBUSTION ANALYSIS IN IC ENGINES
Photographic studies of combustion processes – Analysis of Pressure crank angle diagrams in SI and CI engines. Knock study for Pressure crank angle histories. Apparent heat release rate and Wiebe’s law analysis for combustion. Calculation of Ignition delay and combustion duration. – Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

OUTCOMES:
• At the end of the course, the student can able to model and simulate the engine cycle, perform combustion analysis, instruments used in measurement, recent developments in the IC engines.
TEXT BOOKS:

REFERENCES:

AT6005 METROLOGY AND INSTRUMENTATION

OBJECTIVES:
- Knowledge in usage of software to measure parameters like speed, position, velocity, pressure, force, torque, temperature etc

UNIT I INTRODUCTION TO MEASUREMENTS AND SENSORS

UNIT II VARIABLE RESISTANCE AND INDUCTANCE SENSORS
Principle of operation- Construction details- Characteristics and applications of resistive potentiometer- Strain gauges- Resistive thermometers- Thermistors- Piezoresistive sensors Inductive potentiometer- Variable reluctance transducers- EL pick up and LVDT

UNIT III VARIABLE AND OTHER SPECIAL SENSORS
Variable air gap type, variable area type and variable permittivity type- capacitor microphone Piezoelectric, Magnetostriuctive, Hall Effect, semiconductor sensor- digital transducers-Humidity Sensor. Rain sensor, climatic condition sensor, solar, light sensor, antiglare sensor.

UNIT IV AUTOMOTIVE PRESSURE AND FORCE/TORQUE SENSOR
Pressure Sensor:
Typical automotive applications- Thick film pressure sensor- Semiconductor pressure sensor- Integrated silicon intake-manifold pressure sensor-Integrated silicon combustion-pressure sensor- Piezo electric sensor-High pressure sensor with metal diaphragm.

Force/Torque Sensor:
Typical automotive applications- Magneto elastic bearing-pin sensor- Magneto elastic tension/compressive-force sensor according to the cross-ductor principle – Basic principle of torque measurement –Stress and Angle measuring torque sensor
UNIT V AUTOMOTIVE POSITION AND RPM/VELOCITY SENSORS


Temperature Sensors:- Typical automotive applications - Sintered-Ceramic resistors - Thin film resistors - Thick film resistors - Monocrystalline silicon semiconductor resistor - Thermopile sensors


Introduction to MEMs

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of the course, the students will aware the various instruments that are available to measure parameters like speed, position, velocity, pressure, force, torque, temperature etc.

TEXT BOOKS:

REFERENCES:

AT6006 MANUFACTURING OF AUTOMOTIVE COMPONENTS

<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 impart knowledge on basic principle and production methods of automotive components.

UNIT I CASTED ENGINE COMPONENTS

Material selection and Manufacturing methods for Piston, Piston rings, Cylinder block, wet and dry liners, Engine head, Oil pan, Carburetors. Thermal barrier coating of Engine head and valves.

UNIT II FORGED ENGINE COMPONENTS

Material selection and Manufacturing methods for Crank shaft, Connecting rod, Cam shaft, valve, Piston pin, Push rod, Rocker arm, tappets, spark plug.

UNIT III TRANSMISSION SYSTEM

UNIT IV VEHICLE CHASSIS 8

UNIT V RECENT DEVELOPMENTS 10

OUTCOMES
• Upon completion of this course the student can able to use the basic principle and production methods of automotive components

TEXT BOOK:

REFERENCES:
2. Newton and steels, the motor vehicle, ELBS, 1990

ME6006 DESIGN OF JIGS, FIXTURES AND PRESS TOOLS L T P C
3 0 0 3

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

UNIT I LOCATING AND CLAMPING PRINCIPLES: 8

UNIT II JIGS AND FIXTURES 10
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES 10
UNIT IV  BENDING AND DRAWING DIES  10

UNIT V  OTHER FORMING TECHNIQUES  7
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Single minute exchange of dies – Poka Yoke.

TOTAL: 45 PERIODS

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

OUTCOMES:
• Upon completion of this course, the students can able to design jigs, fixtures and press tools.

TEXT BOOKS:

REFERENCES:
5. ASTME Fundamentals of Tool Design Prentice Hall of India.

ME6010  ROBOTICS  L T P C  3 0 0 3

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

UNIT I  FUNDAMENTALS OF ROBOT  6
Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions-Need for Robots-Different Applications.

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

UNIT III SENSORS AND MACHINE VISION 12

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING 13
Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS 5
RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

TEXT BOOKS:

REFERENCES:
AT6007 NEW GENERATION AND HYBRID VEHICLES

OBJECTIVES:
- To illustrate the new generation vehicles and their operation and controls

UNIT I INTRODUCTION
Electric and hybrid vehicles, flexible fuel vehicles (FFV), solar powered vehicles, magnetic track vehicles, fuel cells vehicles.

UNIT II POWER SYSTRM AND NEW GENERATION VEHICLES
Hybrid Vehicle engines, Stratified charge engines, learn burn engines, low heat rejection engines, hydrogen engines, HCCI engine, VCR engine, surface ignition engines, VVTI engines. High energy and power density batteries, fuel cells, solar panels, flexible fuel systems.

UNIT III VEHICLE OPERATION AND CONTROL
Computer Control for pollution and noise control and for fuel economy – Transducers and actuators - Information technology for receiving proper information and operation of the vehicle like optimum speed and direction.

UNIT IV VEHICLE AUTOMATED TRACKS
Preparation and maintenance of proper road network - National highway network with automated roads and vehicles - Satellite control of vehicle operation for safe and fast travel, GPS.

UNIT V SUSPENSION, BRAKES, AERODYNAMICS AND SAFETY
Air suspension – Closed loop suspension, compensated suspension, anti skid braking system, retarders, regenerative braking, safety gauge air backs- crash resistance. Aerodynamics for modern vehicles, safety systems, materials and standards.

TOTAL: 45 PERIODS

OUTCOMES:
- Upon completion of this course the student will familiar in the recent development pertain to energy system, vehicle operation, newer vehicle, recent technologies in the area of suspension systems, brakes, aerodynamics etc

TEXT BOOKS:

REFERENCES
1. Light weight electric for hybrid vehicle design.
2. Advance hybrid vehicle power transmission, SAE.

AT6008 COMPUTER SIMULATION OF IC ENGINES

OBJECTIVES:
- To impart knowledge in simulating IC engine processes. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. At the end of the course the students will have command over simulation of IC engine process.
UNIT I  INTRODUCTION

UNIT II  COMBUSTION AND STOICHIOMETRY
Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction - combustion equation for hydrocarbon fuels. Calculation of minimum air required for combustion, excess air supplied and stoichiometric air required for complete combustion. Conversion of volumetric analysis to mass analysis.

UNIT III  ADIABATIC FLAME TEMPERATURE
Introduction, complete combustion in C-H-N-O systems, constant volume adiabatic combustion, constant pressure adiabatic combustion, calculation of adiabatic flame temperature, isentropic changes of state. SI Engine simulation with air as working medium, deviation between actual and ideal cycle.

UNIT IV  SI ENGINE SIMULATION WITH ADIABATIC COMBUSTION
Introduction, Engine details, temperature drop due to fuel vaporization, full throttle operation, work output and efficiency calculation, part-throttle operation, engine performance at part throttle, super charged operation, SI Engines simulation with progressive combustion. Wiebe’s law combustion analysis.

UNIT V  SI ENGINE SIMULATION WITH GAS EXCHANGE PROCESS
Introduction, gas exchange process, Heat transfer process, friction calculations, compression of simulated values, validation of the computer code, engine performance simulation, pressure crank angle diagram, brake power, brake thermal efficiency, effect of speed on performance.

TOTAL : 45 PERIODS

OUTCOMES:
• The student will be familiar with the basics of simulation, combustion process, SI Engine modeling and simulation process

TEXTBOOKS:

REFERENCES:
OBJECTIVES:

- To understand the fundamentals of composite material strength and its mechanical behavior
- Understanding the analysis of fiber reinforced Laminate design for different combinations of plies with different orientations of the fiber.
- Thermo-mechanical behavior and study of residual stresses in Laminates during processing.
- Implementation of Classical Laminate Theory (CLT) to study and analysis for residual stresses in an isotropic layered structure such as electronic chips.

UNIT I  INTRODUCTION, LAMINA CONSTITUTIVE EQUATIONS & MANUFACTURING  12

UNIT II  FLAT PLATE LAMINATE CONSTITUTE EQUATIONS  10

UNIT III  LAMINA STRENGTH ANALYSIS  5

UNIT IV  THERMAL ANALYSIS  8

UNIT V  ANALYSIS OF LAMINATED FLAT PLATES  10

OUTCOMES:

- Upon completion of this course, the students can able to analyse the fiber reinforced Laminate for optimum design
- Apply classical laminate theory to study and analyse the residual stresses in Laminate.

TEXT BOOKS:
REFERENCES:

AT6009 AUTOMOTIVE AERODYNAMICS

OBJECTIVES:
• At the end of the course, the students will be able to apply basic principles of aerodynamics for the design of vehicle body.

UNIT I INTRODUCTION
Scope, historical developments, fundamental of fluid mechanics, flow phenomenon related to vehicles, external and internal flow problem, resistance to vehicle motion, performance, fuel consumption and performance potential of vehicle aerodynamics.

UNIT II AERODYNAMIC DRAG OF CARS
Cars as a bluff body, flow field around car, drag force, types of drag force, analysis of aerodynamic drag, drag coefficient of cars, strategies for aerodynamic development, low drag profiles.

UNIT III SHAPE OPTIMIZATION OF CARS
Front end modification, front and rear wind shield angle, boat tailing, hatch back, fast back and square back, dust flow patterns at the rear, effects of gap configuration, effect of fasteners. Case studies on modern vehicles.

UNIT IV VEHICLE HANDLING
The origin of forces and moments on a vehicle, lateral stability problems, methods to calculate forces and moments – vehicle dynamics under side winds, the effects of forces and moments, characteristics of forces and moments, dirt accumulation on the vehicle, wind noise, drag reduction in commercial vehicles and racing cars.

UNIT V WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS
Introduction, principle of wind tunnel technology, limitation of simulation, stress with scale models, full scale wind tunnels, measurement techniques, equipment and transducers, road testing methods, numerical methods. CFD analysis.

TOTAL : 45 PERIODS

OUTCOMES:
• Upon completion of this course, the students will understand the fundamentals of aerodynamics, vehicle body optimisation, measuring aerodynamics forces etc.

TEXT BOOK:
REFERENCES:

AT6010 OFF ROAD VEHICLES  

OBJECTIVES:
• At the end of the course, the students will be able to understand the various Off road vehicle and their systems and features

UNIT I  CLASSIFICATION AND REQUIREMENTS OF OFF ROAD VEHICLES  6
Construction layout, capacity and applications. Power Plants, Chassis and Transmission, Multiaxle vehicles.

UNIT II  EARTH MOVING MACHINES  10
Earthmovers like dumpers, loaders - single bucket, Multi bucket and rotary types - bulldozers, excavators, backhoe loaders, scrapers, drag and self powered types, Bush cutters, stumpers, tree dozer, rippers etc. – Power and capacity of earth moving machines.

UNITY III  SCRAPPERS, GRADERS, SHOVELS AND DITCHERS  10

UNIT IV  FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES  8
Power take off, special implements. Special features and constructional details of tankers, gun carriers and transport vehicles.

UNIT V  VEHICLE SYSTEMS, FEATURES  11

TOTAL: 45 PERIODS

OUTCOMES:
• At the end of the course, the students will understand the types, special features, design methodology, working principle, application of various off – road vehicles.

TEXT BOOKS:

REFERENCES:

AT6011 AUTOMOTIVE SAFETY L T P C
3 0 0 3

OBJECTIVES:
- At the end, the students will have good exposure to automotive safety aspects including the understanding of the various safety equipments.

UNIT I  INTRODUCTION
Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.

UNIT II  SAFETY CONCEPTS
Active safety: driving safety, conditional safety, perceptibility safety, operating safety, passive safety: exterior safety, interior safety, deformation behaviour of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT III  SAFETY EQUIPMENTS
Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT IV  COLLISION WARNING AND AVOIDANCE
Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT V  COMFORT AND CONVENIENCE SYSTEM
Steering and mirror adjustment, central locking system, Garage door opening system, tyre pressure control system, rain sensor system, environment information system

TOTAL: 45 PERIODS

OUTCOMES:
- The student will be familiar in various systems that enhances vehicle safety, passenger comfort, recent technologies in automobile field etc.,

TEXT BOOKS

REFERENCES:
OBJECTIVES:
- To make the students understand the various auxiliary systems used in automobiles and their functions.

UNIT I  CARBURETION  10
Properties of air-petrol mixtures, Air fuel ratio requirements or SI Engines working of a simple fixed venturi and constant vacuum carburetor, design of elementary carburetor, Chokes, Effects of altitude on carburetion, Carburetor for 2–stroke and 4-stroke engines, carburetor systems for emission control.

UNIT II  GASOLINE INJECTION AND IGNITION SYSTEMS  9

UNIT III  DIESEL FUEL INJECTION  9
Factors influencing fuel spray atomization, penetration and dispersion of diesel and heavy oils and their properties, rate and duration of injection, fuel line hydraulics, fuel pump, injectors, CRDI systems and its merits and demerits.

UNIT IV  MANIFOLDS AND MIXTURE DISTRIBUTION  9
Intake system components, Discharge coefficient, Pressure drop, Air filter, Intake manifold, Connecting pipe, Exhaust system components, Exhaust manifold and exhaust pipe, Spark arresters, Waste heat recovery, Exhaust mufflers, Type of mufflers, exhaust manifold expansion.

UNIT V  LUBRICATION AND COOLING SYSTEMS  9
Lubricants, lubricating systems, Lubrication of piston rings, bearings, oil consumption, Oil cooling. Heat transfer coefficients, liquid and air cooled engines, coolants, additives and lubricity improvers, concept of adiabatic engines.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of the course, the student will be familiar with the auxiliary system, its roles, functionality, construction, working principle etc.

TEXT BOOKS:
1. Ramalingam, K.K, "Internal Combustion Engine", Scitech Publication (India)

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 and
- To develop rudimentary ability to respond to their surroundings with potential disaster response in areas where they live, with due sensitivity.

UNIT I INTRODUCTION TO DISASTERS

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

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR)

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other 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, Scenarios in the Indian context, Disaster damage assessment and management.
TEXTBOOK:

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

AT6013 TRANSPORT MANAGEMENT

OBJECTIVES:
• The students are able to manage a transport fleet and their related activities for minimizing operational cost.

UNIT I INTRODUCTION
Personnel management; objectives and functions of personnel management, psychology, sociology and their relevance to organization, personality problems. Selection process: job description, employment tests, interviewing, introduction to training objectives, advantages, methods of training, training procedure, psychological tests.

UNIT II TRANSPORT SYSTEMS
Introduction to various transport systems. Advantages of motor transport. Principal function of administrative, traffic, secretarial and engineering divisions. chain of responsibility, forms of ownership by state, municipality, public body and private undertakings.

UNIT III SCHEDULING AND FARE STRUCTURE
Principal features of operating costs for transport vehicles with examples of estimating the costs. Fare structure and method of drawing up of a fare table. Various types of fare collecting methods. Basic factors of bus scheduling. Problems on bus scheduling.

UNIT IV MOTOR VEHICLE ACT
Traffic signs, fitness certificate, registration requirements, permit insurance, constructional regulations, description of vehicle-tankers, tippers, delivery vans, recovery vans, Power wagons and fire fighting vehicles. Spread over, running time, test for competence to drive.

UNIT V MAINTENANCE
Preventive maintenance system in transport industry, tyre maintenance procedures. Causes for uneven tyre wear; remedies, maintenance procedure for better fuel economy, Design of bus depot layout.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will
• Know about different aspects related to transport system and management.
• Features of scheduling, fixing the fares
• Know about the motor vehicle act and maintenance aspects of transport.

TEXT BOOKS:

REFERENCES:
1. Government Motor Vehicle Act, Publication on latest act to be used as on date

MG6071 ENTERPRENEURSHIP 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

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:
1. Khanka. S.S, "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi,
REFERENCES:

ME6015 OPERATIONS RESEARCH

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

UNIT I LINEAR MODELS

UNIT II TRANSPORTATION MODELS AND NETWORK MODELS

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

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

UNIT V DECISION MODELS

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

TEXT BOOK:
REFERENCES:

GE6757 TOTAL QUALITY MANAGEMENT

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

TOTAL: 45 PERIODS

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

TEXT BOOK:
REFERENCES:

GE6084 HUMAN RIGHTS L T P C
3 0 0 3

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

TOTAL : 45 PERIODS

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

REFERENCES: