The vision of the Department of Automobile Engineering is:

“To be a premier department in Automobile engineering and reach the highest academic level in the field of Automobile Engineering by imparting knowledge, continuously enhancing Research & Development activities, supporting industries through consultancy programme and providing the nation with high quality engineers”

The mission of the Department of Automobile engineering is:

1. To prepare students excel in their chosen professions by offering high quality education in automobile engineering with fundamental knowledge, interdisciplinary problem-solving skills and confidence required.

2. To provide supportive and diverse environment that encourage students to achieve the best of their abilities to be innovators or job providers.

3. To maintain constant and active partnership with industries for technology development and transfer through consultancy projects.
PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

Students will

i. Excel in their professional career in automobile industry.
ii. Exhibit research with highest professional and ethical standards.
iii. Acquire knowledge in basics of automobile engineering to apply in growth of the industry.
iv. Showcase professionalism, team work in their chosen profession and
v. Update themselves to recent trends, technologies and industrial scenarios by
   pursuing lifelong learning.

PROGRAMME OUTCOMES (POs)

After completion of their Under Graduate Program in Automobile Engineering, the graduates will

demonstrate ability to:

<table>
<thead>
<tr>
<th>PO</th>
<th>Graduate Attribute</th>
<th>Programme Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engineering knowledge</td>
<td>express strong basics skills in Mathematics, Science and Engineering.</td>
</tr>
<tr>
<td>2</td>
<td>Problem analysis</td>
<td>design and conduct Experiments, as well as to analyze and interpret data.</td>
</tr>
<tr>
<td>3</td>
<td>Design/development of solutions</td>
<td>design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and Safety, manufacturability and sustainability.</td>
</tr>
<tr>
<td>4</td>
<td>Conduct investigations of complex problems</td>
<td>acquire the capability to identify, formulate and solve complex engineering problems related to Automobile Engineering</td>
</tr>
<tr>
<td>5</td>
<td>Modern tool usage</td>
<td>become familiar with modern engineering tools and analyze the problems within the domains of Automobile Engineering as the members of multidisciplinary teams.</td>
</tr>
<tr>
<td>6</td>
<td>The engineer and society</td>
<td>understand and work for the impact of development of Automobile engineering on global, economic environment and societal context.</td>
</tr>
<tr>
<td>7</td>
<td>Environment and sustainability</td>
<td>design a system, component or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.</td>
</tr>
<tr>
<td>8</td>
<td>Ethics</td>
<td>understand the professional and ethical responsibility with reference to their career in the field of Automobile Engineering</td>
</tr>
<tr>
<td>9</td>
<td>Individual and team work</td>
<td>work as team player or individual in solving their assigned task.</td>
</tr>
<tr>
<td>10</td>
<td>Communication</td>
<td>communicate effectively both in verbal non-verbal forms.</td>
</tr>
<tr>
<td>11</td>
<td>Project management and finance</td>
<td>understand engineering and management principles to apply for (his/her) own work and team. Manage projects in multidisciplinary environments with financial concise.</td>
</tr>
<tr>
<td>12</td>
<td>Life-long learning</td>
<td>pursue higher studies and do research in inter and multidisciplinary fields for continuous learning lifestyle.</td>
</tr>
</tbody>
</table>
### MAPPING OF PEOS WITH POS

<table>
<thead>
<tr>
<th>Programme Educational Objectives</th>
<th>Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
</tr>
<tr>
<td>i.</td>
<td>✔</td>
</tr>
<tr>
<td>ii.</td>
<td>✔</td>
</tr>
<tr>
<td>iii.</td>
<td>✔</td>
</tr>
<tr>
<td>iv.</td>
<td>✔</td>
</tr>
<tr>
<td>v.</td>
<td>✔</td>
</tr>
</tbody>
</table>
### Mapping of Course Outcome and Programme Outcome

<table>
<thead>
<tr>
<th>YEAR 1</th>
<th>Semester 1</th>
<th>Course Name</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Technical English</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Mathematics - I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Physics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Chemistry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Graphics</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Basic Sciences Laboratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Workshop Practices Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Mathematics - II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problem Solving and Python Programming</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Basics of Electrical and Electronics Engineering</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engineering Mechanics</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Materials Science</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Problem Solving and Python Programming Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electrical and Electronics Engineering Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject</td>
<td>Programme Outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
<td>PO3</td>
<td>PO4</td>
<td>PO5</td>
<td>PO6</td>
<td>PO7</td>
<td>PO8</td>
<td>PO9</td>
<td>PO10</td>
<td>PO11</td>
<td>PO12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transform Techniques and Partial Differential Equations</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education, Technology and Society</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing Processes</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermodynamics and Thermal Engineering</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanics of Solids</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automotive Engines</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical Sciences Laboratory</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing Technology Laboratory</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Human Relations at Work</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Environmental Sciences</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automotive Chassis</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle Body Engineering</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fluid Mechanics for Automotive applications</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kinematics and Dynamics of Machines</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle Components Laboratory</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fuels and Lubricants Laboratory</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subject</td>
<td>Programme Outcome</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------</td>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
<td>PO3</td>
<td>PO4</td>
<td>PO5</td>
<td>PO6</td>
<td>PO7</td>
<td>PO8</td>
<td>PO9</td>
<td>PO10</td>
<td>PO11</td>
<td>PO12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Values and Ethics</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engineering Design</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automotive Electrical and Electronics Systems</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automotive Transmission</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automotive Electrical and Electronics Laboratory</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vehicle Testing Laboratory</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automotive Pollution and Control</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamics of Ground Vehicles</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric and Hybrid Vehicles</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Engine Testing and Emission Measurement Laboratory</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design of Vehicle Components</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IC Engine Process Modelling</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Aided Vehicle Components Design Laboratory</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project I</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project II</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PROFESSIONAL ELECTIVES COURSES</td>
<td>Subject</td>
<td>PO1</td>
<td>PO2</td>
<td>PO3</td>
<td>PO4</td>
<td>PO5</td>
<td>PO6</td>
<td>PO7</td>
<td>PO8</td>
<td>PO9</td>
<td>PO10</td>
<td>PO11</td>
<td>PO12</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>---------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td><strong>PROFESSIONAL ELECTIVE I</strong></td>
<td>Engine Management Systems</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measurement System</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Theory of Fuels and Lubricants</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Transport Management</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PROFESSIONAL ELECTIVE II</strong></td>
<td>Automotive Safety</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Entrepreneurship Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Finite Element Techniques</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Principles of Control Systems</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PROFESSIONAL ELECTIVE III</strong></td>
<td>Combustion Thermodynamics and Heat Transfer</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydraulic and Pneumatic Systems</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Special Purpose Vehicles</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vehicle Control Systems</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PROFESSIONAL ELECTIVE IV</strong></td>
<td>Noise, Vibration and Harshness</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufacturing of Automotive Components</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Non Traditional Machining Techniques</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Road Vehicle Aerodynamics</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PROFESSIONAL ELECTIVE V</strong></td>
<td>Alternative and Advanced Fuels for IC Engines</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computational Techniques for Fluid Dynamics</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total Quality Management</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>New Product Development</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>PROFESSIONAL ELECTIVE VI</strong></td>
<td>Advanced Theory of IC Engines</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Automotive Materials</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Two and Three Wheeler Technology</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PROFESSIONAL ELECTIVE VII</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>--------------------------</td>
<td>------------</td>
<td>------------</td>
<td>------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Vehicle Maintenance</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Automotive Instrumentation and Testing</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Introduction to Operations research</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Renewable Sources of Energy</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Vehicle Air-Conditioning</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SL. NO.</td>
<td>COURSE CODE</td>
<td>COURSE TITLE</td>
<td>CATEGORY</td>
<td>PERIODS PER WEEK</td>
<td>TOTAL CONTACT PERIODS</td>
<td>CREDITS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>--------------------------------</td>
<td>----------</td>
<td>------------------</td>
<td>------------------------</td>
<td>---------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS5151</td>
<td>Technical English</td>
<td>HSMC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>MA5158</td>
<td>Engineering Mathematics - I</td>
<td>BSC</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>PH5151</td>
<td>Engineering Physics</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>CY5151</td>
<td>Engineering Chemistry</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>GE5151</td>
<td>Engineering Graphics</td>
<td>ESC</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>BS5161</td>
<td>Basic Sciences Laboratory</td>
<td>BSC</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE5162</td>
<td>Workshop Practices Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td>14</td>
<td>1</td>
<td>12</td>
<td>27</td>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>HS5251</td>
<td>Professional Communication</td>
<td>HSMC</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>MA5252</td>
<td>Engineering Mathematics - II</td>
<td>BSC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>GE5153</td>
<td>Problem Solving and Python Programming</td>
<td>ESC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>EE5251</td>
<td>Basics of Electrical and Electronics Engineering</td>
<td>ESC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>GE5152</td>
<td>Engineering Mechanics</td>
<td>ESC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>PH5251</td>
<td>Materials Science</td>
<td>BSC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>GE5161</td>
<td>Problem Solving and Python Programming Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>EE5261</td>
<td>Electrical and Electronics Engineering Laboratory</td>
<td>ESC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>19</td>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>
### SEMESTER III

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MA5355</td>
<td>Transform Techniques and Partial Differential Equations</td>
<td>BSC</td>
<td>3 1 0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>ME5251</td>
<td>Manufacturing Processes</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AU5351</td>
<td>Thermodynamics and Thermal Engineering</td>
<td>PCC</td>
<td>3 1 0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>AU5352</td>
<td>Mechanics of Solids</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>AU5301</td>
<td>Automotive Engines</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>AU5361</td>
<td>Mechanical Sciences Laboratory</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>ME5461</td>
<td>Manufacturing Technology Laboratory</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>18 2 8</td>
<td>28</td>
<td>24</td>
</tr>
</tbody>
</table>

### SEMESTER IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>GE5251</td>
<td>Environmental Sciences</td>
<td>BSC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>AU5401</td>
<td>Automotive Chassis</td>
<td>PCC</td>
<td>4 0 0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>AU5402</td>
<td>Vehicle Body Engineering</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AU5403</td>
<td>Fluid Mechanics for Automotive applications</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>PR5451</td>
<td>Kinematics and Dynamics of Machines</td>
<td>PCC</td>
<td>3 1 0</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Audit Course – I*</td>
<td>AC</td>
<td>3 0 0</td>
<td>3</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>AU5411</td>
<td>Vehicle Components Laboratory</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>AU5412</td>
<td>Fuels and Lubricants Laboratory</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>22 1 8</td>
<td>31</td>
<td>24</td>
</tr>
</tbody>
</table>

*Audit Course is optional.
### SEMESTER V

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>1.</td>
<td>GE5552</td>
<td>Engineering Management</td>
<td>HSMC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>AU5501</td>
<td>Engineering Design</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>AU5511</td>
<td>Automotive Electrical and Electronics Systems</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>AU5502</td>
<td>Automotive Transmission</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective I</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Audit Course – II*</td>
<td>AC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>7.</td>
<td>AU5511</td>
<td>Automotive Electrical and Electronics Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>AU5512</td>
<td>Vehicle Testing Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>AU5513</td>
<td>Industrial Training/Internship**</td>
<td>EEC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

*Audit Course is optional.

** The students will undergo industrial training / Internship during previous vacation

### SEMESTER VI

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>1.</td>
<td>AU5601</td>
<td>Automotive Pollution and Control</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>AU5602</td>
<td>Dynamics of Ground Vehicles</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>AU5651</td>
<td>Electric and Hybrid Vehicles</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Professional Elective II</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective III</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Professional Elective IV</td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>Open Elective I</td>
<td>OEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>8.</td>
<td>AU5611</td>
<td>Engine Testing and Emission Measurement Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>
### SEMESTER VII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AU5701</td>
<td>Design of Vehicle Components</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>AU5702</td>
<td>IC engine Process Modeling</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Professional Elective V</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Professional Elective VI</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective VII</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Open Elective II</td>
<td>OEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>AU5711</td>
<td>Computer Aided Vehicle Components</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>AU5712</td>
<td>Project I</td>
<td>EEC</td>
<td>0 0 6</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>15 0 10</td>
<td>25</td>
<td>23</td>
</tr>
</tbody>
</table>

### SEMESTER VIII

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AU5811</td>
<td>Project II</td>
<td>EEC</td>
<td>0 0 16</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>0 0 16</td>
<td>16</td>
<td>8</td>
</tr>
</tbody>
</table>

TOTAL NO. OF CREDITS: 168
### PROFESSIONAL ELECTIVES COURSES
### SEMESTER V, ELECTIVE – I

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>Periods Per week</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AU5001</td>
<td>Engine Management Systems</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>AU5002</td>
<td>Measurement System</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AU5003</td>
<td>Theory of Fuels and Lubricants</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AU5004</td>
<td>Transport Management</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VI, ELECTIVE – II

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>Periods Per week</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AU5005</td>
<td>Automotive Safety</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>ME5075</td>
<td>Entrepreneurship Development</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AU5006</td>
<td>Finite Element Techniques</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AU5007</td>
<td>Principles of Control Systems</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VI, ELECTIVE – III

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>Periods Per week</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AU5008</td>
<td>Combustion Thermodynamics and Heat Transfer</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>AU5009</td>
<td>Hydraulic and Pneumatic Systems</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AU5010</td>
<td>Special Purpose Vehicles</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AU5072</td>
<td>Vehicle Control Systems</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
### SEMESTER VI, ELECTIVE – IV

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEG</th>
<th>Periods Per week</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L    T  P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AU5011</td>
<td>Noise, Vibration and Harshness</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>AU5012</td>
<td>Manufacturing of Automotive Components</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AU5013</td>
<td>Non Traditional Machining Techniques</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AU5014</td>
<td>Road Vehicle Aerodynamics</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VII, ELECTIVE – V

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEG</th>
<th>Periods Per week</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L    T  P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AU5015</td>
<td>Alternative and Advanced Fuels for IC engines.</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>ME5072</td>
<td>Computational Techniques for Fluid Dynamics</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>GE5451</td>
<td>Total Quality Management</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AU5016</td>
<td>New Product Development</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

### SEMESTER VII, ELECTIVE – VI

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEG</th>
<th>Periods Per week</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L    T  P</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AU5017</td>
<td>Advanced Theory of IC Engines</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>AU5018</td>
<td>Automotive Materials</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AU5019</td>
<td>Two and Three Wheeler Technology</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AU5020</td>
<td>Vehicle Maintenance</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>SL. NO.</td>
<td>COURSE CODE</td>
<td>COURSE TITLE</td>
<td>CATEG ORY</td>
<td>Periods Per week</td>
<td>TOTAL CONTACT PERIODS</td>
<td>CREDITS</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>-----------</td>
<td>------------------</td>
<td>-----------------------</td>
<td>---------</td>
</tr>
<tr>
<td>1.</td>
<td>AU5071</td>
<td>Automotive Instrumentation and Testing</td>
<td>PEC</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>AU5021</td>
<td>Introduction to Operations Research</td>
<td>PEC</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AU5022</td>
<td>Renewable Sources of Energy</td>
<td>PEC</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AU5023</td>
<td>Vehicle Air-Conditioning</td>
<td>PEC</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>
OBJECTIVES
- To build lexical competency and accuracy that will help learners to use language effectively.
- To learn various reading strategies that will enable learners to comprehend the different modes of reading materials of varied levels of complexity.
- To comprehend the linguistic aspects of various rhetorical structures and functions of Technical English and use them effectively in writing.

UNIT I INTRODUCING ONESELF
Theory:
Reading: Descriptive passages (From Newspapers / Magazines) – Writing: Writing a coherent paragraph (Native Place, School Life) – Grammar: Simple present tense, Present continuous tense – Vocabulary development: One word substitution.

UNIT II DIALOGUE WRITING
Theory:
Reading: Reading a print interview (Comprehension and inference questions) - Writing: Writing a checklist - Dialogue writing – Grammar: Simple past tense – Question formation (Wh-Questions, ‘Yes’ or ‘No’ Questions, Tag Questions) – Vocabulary Development: Lexical items relevant to the theme of the given unit.

UNIT III FORMAL LETTER WRITING
Theory:

UNIT IV WRITING LETTERS OF COMPLAINT
Theory:

UNIT V WRITING DEFINITIONS AND PRODUCT DESCRIPTION
Theory:

TOTAL : 45 PERIODS

LEARNING OUTCOMES:
On completion of the course, the students will be able to:
- Use appropriate language structures and lexical items in authentic contexts.
- Read both general and technical texts and comprehend their denotative and connotative meanings.
- Write different kinds of formal documents with grammatical and lexical appropriacy.

Assessment Pattern
- Two written internal assessments to test learner’s progress in grammar, vocabulary, reading and writing skills.
- End Semester exam to be tested in two parts: Theory exam for three hours and listening
and speaking skills for two hours.

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

L T P C 3 1 0 4

COURSE OBJECTIVES:

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

UNIT I MATRICES


UNIT II DIFFERENTIAL CALCULUS


UNIT III FUNCTIONS OF SEVERAL VARIABLES


UNIT IV INTEGRAL CALCULUS

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT V MULTIPLE INTEGRALS


TOTAL :60 PERIODS

COURSE OUTCOMES:

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

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

TEXT BOOKS:


REFERENCES:

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

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

UNIT I MECHANICS 9

UNIT II ELECTROMAGNETIC WAVES 9
Gauss’s law – Faraday’s law - Ampere’s law - The Maxwell’s equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium-vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9
UNIT IV  BASIC QUANTUM MECHANICS  9
Photons and light waves - Electrons and matter waves - The Schrodinger equation (Time
dependent and time independent forms) - meaning of wave function - Normalization - Particle in a
infinite potential well - Normalization, probabilities and the correspondence principle.

UNIT V  APPLIED QUANTUM MECHANICS  9
The harmonic oscillator - Barrier penetration and quantum tunneling - Tunneling microscope -
Resonant diode - Finite potential wells - particle in a three dimensional box - Bloch’s theorem for
particles in a periodic potential, Kronig-Penney model and origin of energy bands.

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

TEXT BOOKS
3. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-
Verlag, 2012.

REFERENCES

CY5151  ENGINEERING CHEMISTRY  3 0 0 3
(COMMON TO ALL BRANCHES)
COURSE OBJECTIVES:
• To introduce the basic concepts of polymers, their properties and some of the important
applications.
• To impart knowledge on the basic principles and preparatory methods of nanomaterials.
• To facilitate the understanding of the laws of photochemistry, photoprocesses and
instrumentation & applications of spectroscopic techniques.
• To familiarize the operating principles and applications of energy conversion, its processes
and storage devices.
• To inculcate sound understanding of water quality parameters and water treatment
techniques.

UNIT I  POLYMER CHEMISTRY  9
Introduction: Functionality-degree of polymerization. Classification of polymers- natural and
synthetic, thermoplastic and thermosetting. Types and mechanism of polymerization: addition (free
radical, cationic, anionic and living); condensation and copolymerization. Properties of polymers:
Tg, tactility, molecular weight-weight average, number average and polydispersity index.
Techniques of polymerization: Bulk, emulsion, solution and suspension. Structure, Properties and
uses of: PE, PVC, PC, PTFE, PP, Nylon 6, Nylon 66, Bakelite, Epoxy; Conducting polymers – polyaniline and polypyrrole.

UNIT II  NANOCHEMISTRY

UNIT III PHOTOCHEMISTRY AND SPECTROSCOPY

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

UNIT V WATER TECHNOLOGY

TOTAL: 45 PERIODS

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

TEXT BOOKS:

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

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

UNIT I  PLANE CURVES AND FREE HANDSKETCHING
14
Basic Geometrical constructions, Curves used in engineering practices-Conics – Construction of ellipse, parabola and hyperbola by different methods – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views of objects

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES
15
Orthographic projection- principles-Principle planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III  PROJECTION OF SOLIDS
15
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.

UNIT IV  PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES
15
Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones. Development of lateral surfaces of solids with cut-outs and holes.

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

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

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

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

**TEXT BOOKS:**

**REFERENCES:**

**Publication of Bureau of Indian Standards:**

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

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>5</td>
<td>0.9</td>
<td>0.9</td>
</tr>
</tbody>
</table>

**BS5161**
**BASIC SCIENCES LABORATORY**
(Common to all branches of B.E. / B.Tech Programmes)

**PHYSICS LABORATORY: (Any Seven Experiments)**

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

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

TOTAL: 30 PERIODS

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

CHEMISTRY LABORATORY: (Minimum of 8 experiments to be conducted)

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

LIST OF EXPERIMENTS:
1. Estimation of HCl using Na₂CO₃ as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
12. Pseudo first order kinetics-ester hydrolysis.
14. Phase change in a solid.

TOTAL: 30 PERIODS

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

TEXT BOOKS:

GE5162 WORKSHOP PRACTICES LABORATORY
(Common to all Branches of B.E. / B.Tech. Programmes) 0 0 4 2

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

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

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES

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

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

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

PART II ELECTRICAL ENGINEERING PRACTICES

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

Wiring Study:
   a) Studying an Iron-Box wiring.
   b) Studying a Fan Regulator wiring.
   c) Studying an Emergency Lamp wiring.

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

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

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

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

SHEET METAL WORK:
   a) Making of a square tray

FOUNDRY WORK:
   a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES 15

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

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

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

TOTAL = 60 PERIODS

COURSE OUTCOMES: Upon completion of this course, the students will be able to:
1. Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
2. Wire various electrical joints in common household electrical wire work.
3. Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assembly of common household equipments; Make a tray out of metal sheet using sheet metal work.

4. Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>2</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>3</td>
<td>0.6</td>
<td>0.3</td>
</tr>
<tr>
<td>4</td>
<td>0.6</td>
<td>0.3</td>
</tr>
</tbody>
</table>

**OBJECTIVES**

- To improve the relevant language skills necessary for professional communication.
- To develop linguistic and strategic competence in workplace context.
- To enhance language proficiency and thereby the employability of budding engineers and technologists.

**UNIT I TECHNICAL COMMUNICATION** 12

Listening: Listening to Telephone Conversations (Intent of the Speaker and Note Taking Exercises) – Speaking: Role Play Exercises Based on Workplace Contexts, Introducing Oneself – Reading: Reading the Interview of an Achiever and Completing Exercises (Skimming, Scanning and Predicting) – Writing: Writing a Short Biography of an Achiever Based on Given Hints – Grammar: Asking and Answering Questions, Punctuation in Writing, Prepositional Phrases – Vocabulary Development: Use of Adjectives.

**UNIT II SUMMARY WRITING** 12


**UNIT III PROCESS DESCRIPTION** 12


**UNIT IV REPORT WRITING** 12


**UNIT V WRITING JOB APPLICATIONS** 12

Listening: Listening to a Job Interview and Completing Gap-Filling Exercises – Speaking: Mock Interview, Telephone Interviews – Reading: Reading a Job Interview, SOP, Company Profile and Completing Comprehension Exercises – Writing: Job Applications and Resumes And Sops-

TOTAL : 60 PERIODS

LEARNING OUTCOMES
On completion of the course, the students will be able to:
1. Read and comprehend technical texts effortlessly.
2. Write reports of a technical kind.
3. Speak with confidence in interviews and thereby gain employability

TEXTBOOK

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

MA5252
ENGINEERING MATHEMATICS – II
(Common to all branches of B.E / B.Tech. Programmes in II Semester)

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

UNIT I \ VECTOR CALCULUS
12

UNIT II \ ANALYTIC FUNCTION
12
Analytic functions – Necessary and sufficient conditions for analyticity - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions - Bilinear transformation $w = c + z$, $az$, $1/z$, $z^2$.

UNIT III \ COMPLEX INTEGRATION
12

UNIT IV \ DIFFERENTIAL EQUATIONS
12
Method of variation of parameters – Method of undetermined coefficients – Homogenous equations of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.
UNIT V LAPLACE TRANSFORMS


TOTAL : 60 PERIODS

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

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

TEXT BOOKS:

REFERENCES:

GE5153 PROBLEM SOLVING AND PYTHON PROGRAMMING

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

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

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

UNIT II  CONDITIONALS AND FUNCTIONS

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

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

UNIT III  SIMPLE DATA STRUCTURES IN PYTHON

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

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

UNIT IV  STRINGS, DICTIONARIES, MODULES

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

**SUGGESTED EVALUATION METHODS:**
- Tutorials on the above activities.

**UNIT V  FILE HANDLING AND EXCEPTION HANDLING**

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

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

**SUGGESTED EVALUATION METHODS:**
- Tutorials on the above activities.
- Case Studies.

**COURSE OUTCOMES:**

On completion of the course, students will be able to:
- **CO1:** Develop algorithmic solutions to simple computational problems.
- **CO2:** Develop and execute simple Python programs.
- **CO3:** Write simple Python programs for solving problems.
- **CO4:** Decompose a Python program into functions.
- **CO5:** Represent compound data using Python lists, tuples, dictionaries etc.
- **CO6:** Read and write data from/to files in Python programs.

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

**TEXT BOOKS:**

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

UNIT I BASIC CIRCUITS AND DOMESTIC WIRING

UNIT II THREE PHASE CIRCUITS AND MAGNETIC CIRCUITS

UNIT III ELECTRICAL MACHINES

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

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

COURSE OUTCOMES:
- To be able to understand the concepts related with electrical and magnetic circuits.
- Capable of understanding the operating principle of AC and DC machines.
- To be able to understand the working principle of electron devices and the operation of digital circuits.

TEXT BOOKS:

REFERENCES:

GE5152 ENGINEERING MECHANICS

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

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

UNIT I STATICS OF PARTICLES

UNIT II EQUILIBRIUM OF RIGID BODIES

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

UNIT IV FRICTION

UNIT V DYNAMICS OF PARTICLES
Kinematics - Rectilinear Motion and Curvilinear Motion of Particles. Kinetics- Newton’s Second Law of Motion -Equations of Motions, Dynamic Equilibrium, Energy and Momentum Methods -

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

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

TEXT BOOKS:

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>3</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>4</td>
<td>0.9</td>
<td>0.6</td>
</tr>
<tr>
<td>5</td>
<td>0.9</td>
<td>0.6</td>
</tr>
</tbody>
</table>
COURSE OBJECTIVES:

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

UNIT I CRYSTALLOGRAPHY


UNIT II MECHANICAL PROPERTIES


UNIT III PHASE DIAGRAMS

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

UNIT IV FERROUS AND NONFERROUS ALLOYS


UNIT V CERAMICS, COMPOSITES AND NANO MATERIALS


TOTAL: 45 PERIODS
Upon completion of this course, the students will
- Understand the basics of crystallography and its importance in materials properties
- Understand the significance of dislocations, strengthening mechanisms, and tensile, creep, hardness and fracture behavior of materials
- Gain knowledge on binary phase diagrams, and also will be able to determine the phase composition and phase amount.
- Understand about the Fe-C system and various microstructures in it, and also about various ferrous and non-ferrous alloys.
- Get adequate understanding on the preparation, properties and applications of ceramics, composites and nanomaterials.

REFERENCES
TEXT-CUM-REFERENCE BOOKS

1. **Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu** (Published by: International Institute of Tamil Studies.)
2. **Whaling** - Tamil Society (Dr.K.K.Pillay) (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
3. Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
4. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
5. **Porunai Civilization** (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
UNIT IV AGRICULTURE AND IRRIGATION TECHNOLOGY

Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

UNIT V SCIENTIFIC TAMIL & TAMIL COMPUTING


TOTAL : 15 PERIODS

TEXT-CUM-REFERENCE BOOKS

1. நவளியீடு மக்களும் பணபாடும் மக்கள் (மாசுலியியிக்: நவளியீடு மக்களும் பணபாடும் மக்கள்)
2. கணிதத் தமிழ் முனைவர் இலைசுதரம். (விகடைப் பிரசுரம்)
3. சங்ககால திறந்தியல் கொகரிகம் (நதால்லியல் நவளியீடு)
4. ஜெல்லாதது அரசியல் தொக்கியில். (தகர் சிறுமி தாள்நியன்)
5. Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6. Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies).
7. Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8. The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9. Keeladi - ‘Sangam City Civilization on the banks of river Vaigai’ (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10. Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11. Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)

GE5161 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

COURSE OBJECTIVES:

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

EXPERIMENTS:

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:
On completion of the course, students will be able to:
CO1: Develop algorithmic solutions to simple computational problems
CO2: Develop and execute simple Python programs.
CO3: Structure simple Python programs for solving problems.
CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python data structures.
CO6: Apply Python features in developing software applications.

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

EE5261 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

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

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

TOTAL: 60 PERIODS

COURSE OUTCOMES:
1. To become familiar with the basic circuit components and know how to connect them to make a real electrical circuit;
2. Ability to perform speed characteristic of different electrical machines
3. Ability to use logic gates and Flip flops
MA5355  TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS  L T P C  3 1 0 4

COURSE OBJECTIVES:
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes;
- To introduce Fourier series analysis which is central to many applications in engineering;
- To develop the analytic solutions for partial differential equations used in engineering by Fourier series;
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic;
- To develop Z-transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems.

UNIT I  PARTIAL DIFFERENTIAL EQUATIONS  12
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Lagrange’s Linear equation – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous partial differential equations.

UNIT II  FOURIER SERIES  12
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

UNIT III  APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION  12

UNIT IV  FOURIER TRANSFORM  12

UNIT V  Z– TRANSFORM AND DIFFERENCE EQUATIONS  12

TOTAL : 60 PERIODS

COURSE OUTCOMES :
At the end of the course, students will be able to
- Solve partial differential equations which arise in application problems.
- Analyze the functions as an infinite series involving sine and cosine functions.
- Obtain the solutions of the partial differential equations using Fourier series.
- Obtain Fourier transforms for the functions which are needed for solving application problems.
- Manipulate discrete data sequences using Z transform techniques.

TEXT BOOKS:

REFERENCES:

ME5251 MANUFACTURING PROCESSES

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

UNIT I METAL CASTING PROCESSES 9

UNIT II METAL JOINING PROCESSES 9

UNIT III BULK DEFORMATION PROCESSES 9

UNIT IV SHEET METAL PROCESSES 9
UNIT V  MANUFACTURE OF PLASTIC COMPONENTS


TOTAL  = 45 PERIODS

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

TEXT BOOKS:

REFERENCES:

UNIT II AIR STANDARD CYCLES AND COMPRESSORS 12
Cycle, Carnot cycle, Otto, Diesel, Dual combustion and Brayton cycles. Air standard efficiency. Mean effective pressure. Comparison of cycles, Efficiency versus compression ratio, For the same compression ratio and the same heat input Compressors. Classifications of compressors, Single stage and multi stage, Effect of intercooler in multi stage compressor, Perfect and imperfect intercooler, work done by the compressor, Reciprocating, Rotary, Axial, Vane compressors.

UNIT III STEAM AND JET PROPULSION 12
Formation of steam and its thermodynamic properties, p-v, p-T, T-s, h-s diagrams. p-v-T surface
Properties of steam, Dryness fraction, Quality of steam by steam tables and Mollier chart – Rankine cycle, Work done, Steam rate – Steam Nozzles, Types of nozzles, Friction in nozzles - Simple jet propulsion system – Thrust rocket motor – Specific impulse.

UNIT IV REFRIGERATION AND AIR-CONDITIONING 12
Principles of refrigeration, Vapour compression – Types of VCR system with respect to condition of vapour, Problems, Vapour absorption types, comparison - Co-efficient of performance (COP), Properties of refrigerants – Basic Principle, Summer, winter and Year round Air conditioning.

UNIT V HEAT AND MASS TRANSFER 12

TOTAL: 45 PERIODS

(Use of standard Steam tables with mollier chart and Refrigerant tables are permitted)

COURSE OUTCOMES:
1. Will demonstrate understanding of the nature of the thermodynamic processes for pure substances of ideal gases
2. Will interpret First Law of Thermodynamics and its application to systems and control volumes
3. Will solve any flow specific problem in an engineering approach based on basic concepts and logic sequences.
4. Will compare and contrast between various types of refrigeration cycles
5. Will get exposed to the basics and modes of heat transfer

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
The objective of this course is
1. To know about how a solid (materials, structures) behaves when it is exposed to forces and deformations.
2. To apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force deformation, and stress-strain relationships to the solid and structural mechanics problems
3. To analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments
4. To have physical insight into distribution of stresses and strains in structural members
5. To identify the biaxial stresses in acting in a body or an element.

UNIT I   STRESS - STRAIN, AXIAL LOADING
Stress and strain, elastic limit, Hooke's law, factor of safety, shear stress, shear strain, relationship between elastic constants. Stresses in stepped bars, uniformly varying sections, composite bars due to axial force. Lateral strain, Poisson's ratio, volumetric strain, changes in dimensions and volume. Thermal stresses and impact loading.

UNIT II   STRESSES IN BEAMS
Beam – Definition, types of end supports, types of beam, types of loading. Shear force diagram and bending moment diagram for cantilever, simply supported and overhanging beams under point load, UDL, UVL and moments. Euler beam theory - Bending equation, section modulus, Bending stress in beams – Shear stress in beams.

UNIT III   DEFLECTION OF BEAMS AND COLUMNS

UNIT IV   TORSION AND SPRINGS
Theory of torsion and assumptions - torsion equation, polar modulus, stresses in solid and hollow circular shafts, power transmitted by a shaft, shafts in series and parallel, deflection in shafts fixed at the both ends. Springs – types, Deflection expression for closed coiled helical spring – Stress in springs - design of springs.

UNIT V   BIAXIAL STRESS
Principal stresses, normal and tangential stresses, maximum shear stress - analytical and graphical method. Stresses in combined loading. Thin walled cylinder under internal pressure – changes in dimensions – volume. spherical shells subjected to internal pressure – deformation in spherical shells – Lame’s theory.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students are expected to
i. Know about how a solid (materials, structures) behaves when it is exposed to forces and deformations.
ii. Apply the fundamental concepts of principle of superposition, equilibrium, compatibility, force-deformation, and stress-strain relationships to the solid and structural mechanics problems

iii. Analyze determinate and indeterminate bars, beams, to determine axial forces, torques, shear forces, and bending moments

iv. Have physical insight into distribution of stresses and strains in structural members

v. Identify the biaxial stresses in acting in a body or an element.

TEXT BOOKS:

REFERENCES:

AU5301 AUTOMOTIVE ENGINES L T P C 3 0 0 3

COURSE OBJECTIVES:

i. To impart knowledge on basics of automotive SI and CI engines consisting of types, construction, working

ii. To Understand the actual engine working principle and its thermochemistry of fuel-air mixtures

iii. To learn the properties of gasoline and diesel fuel and combustion process involved in diesel engines

iv. To solve basic design problems of various operating parameters of the engine

v. To analyze the performance and pollution characteristics of SAI and CI engine and learn modern developments in IC engine

UNIT I ENGINE FUNDAMENTALS

UNIT II INDUCTION AND IGNITION SYSTEM
Carburettors- requirements - working principles, types, different circuits – compensation and maximum power devices- Requirements and objective of injection system – types of injection - Jerk and distributor type pumps, Unit injector, common rail direct injection -. Electronic fuel injection – Study on injection pressure waves, Injection timing, Injection lag. Types of injection
nozzle, Nozzle tests. Spray characteristics. Split and Multiple injection. Mechanical and pneumatic governors. Ignition system- function and types- Ignition control mechanism for speed and load-
Electronic ignition system

UNIT III FUEL PROPERTIES AND COMBUSTION OF FUELS 9

UNIT IV ENGINE COOLING, LUBRICATING SYSTEMS AND SUPERCHARGING, TURBOCHARGING 9

UNIT V ENGINE HEAT TRANSFER, TESTING AND RECENT DEVELOPMENTS 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, Student can able to,

i. Define engine glossaries, identify various components of SI and CI engines and its sub-systems Ignition, cooling and lubrication

ii. Understand the actual engine working principle and its thermochemistry of fuel-air mixtures

iii. Understand basic knowledge on SI and CI engine combustion and its related parameters

iv. Student can able to apply their knowledge in analyzing the engine performance and pollution characteristics.

v. Exposed to gain knowledge on recent developments of prime sources

TEXT BOOKS

REFERENCES
2. Heldt, P.M., High Speed Combustion Engines, Oxford IBH Publishing Co., Calcutta,

AU5361 MECHANICAL SCIENCES LABORATORY

COURSE OBJECTIVES
i. To Understand the Various physical characterization and mechanical properties of materials.
ii. To Examine the Various testing methods of mechanical properties.
iii. To Evaluate the Basics of internal combustion engine and its performance characteristics.
iv. To Measure the Performance characteristics of pumps.
v. To Evaluate the flash and fire point of various fuels which may be used as an alternative fuel in IC engine.

LIST OF EXPERIMENTS
1. Tension Test
2. Torsion Test
3. Testing of springs
4. Impact test i) Izod, ii) Charpy
5. Hardness test i) Vickers, ii) Brinell, iii) Rockwell, iv) Shore
6. Deflection of Beams
7. Performance test on a 4 stroke diesel engine
8. Mass Moment of inertia of connecting rods
9. Valve timing of a 4 stroke engine
11. Determination of kinematic and dynamic viscosity of given oil blend
12. Determination of flash point and fire point of given fuel sample

TOTAL: 60 PERIODS

COURSE OUTCOMES
i. Students can able to perceive,
ii. Understand the Various physical characterization and mechanical properties of materials.
iii. Examine the Various testing methods of mechanical properties.
iv. Evaluate the Basics of internal combustion engine and its performance characteristics.
v. Measure the Performance characteristics of pumps.
vi. Evaluate the flash and fire point of various fuels which may be used as an alternative fuel in IC engine.

ME5461 MANUFACTURING TECHNOLOGY LABORATORY

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

LIST OF EXPERIMENTS

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

TOTAL = 60 PERIODS

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

1. Select appropriate tools, equipments and machines to complete a given job.
2. Perform various welding process using GMAW.
3. Perform various machining process such as rolling, drawing, turning, shaping, drilling, milling.
5. Analyze the defects in the cast and machined components.

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

GE5251 ENVIRONMENTAL SCIENCES

COURSE OBJECTIVES:

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

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

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

UNIT III NATURAL RESOURCES
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land 47 degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT
From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment protection act – Air (Prevention and Control of

UNIT V HUMAN POPULATION AND THE ENVIRONMENT


TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

TEXT BOOKS:


REFERENCES:


COURSE OBJECTIVES:

i. To understand the basic knowledge about various vehicle frames, front axles, steering systems and understand the conditions for true rolling motion of wheels during steering.
ii. To recognize the construction and working principle of drive line, final drive and differential systems

iii. To review the knowledge about the constructional feature of rear axle, wheels and tyres.

iv. To evaluate the working principles of both conventional and independent suspension system.

v. To demonstrate working principle of braking system used in automobile.

UNIT I
INTRODUCTION, FRAME, STEERING SYSTEM
Types of Chassis layout, with reference to Power Plant location and drive, various types of frames, Loads acting on vehicle frame, Constructional details and materials for frames, Testing of frames, Types of Front Axles and Stub Axles, Front Wheel Geometry, Condition for True Rolling Motion of Wheels during Steering, Ackerman's and Davis Steering Mechanisms, Steering Error Curve, Steering Linkages, Different Types of Steering Gears, Slip Angle, Over–Steer and Under–Steer, Reversible and Irreversible Steering, EPAS.

UNIT II
PROPELLER SHAFT AND FINAL DRIVE

UNIT III
AXLES AND TYRES
Construction and Design of Drive Axles, Types of Loads acting on drive axles, Full – Floating, Three–Quarter Floating and Semi–Floating Axles, Axle Housings and Types – Lift axle, Dead axle, Types and Constructional Details of Different Types of Wheels and Rims, Different Types of Tyres and their constructional details.

UNIT IV
SUSPENSION SYSTEM

UNIT V
BRAKING SYSTEM

TOTAL = 60 PERIODS

COURSE OUTCOMES
At the end of this course the student will be able to
i. Identify the different types of frame and chassis used in Automotive.
ii. Relate different types of drive lines and drives used in Automotive.
iii. Acquire knowledge about different types of front axle and rear axles used in motor vehicles.
iv. Examine the working principle of conventional and independent suspension systems.
v. Apply knowledge on working principles of brake and its subsystems.

TEXT BOOKS:
1. Kirpal Singh, Automobile Engineering, Standard Publisher, New Delhi, 2017

REFERENCES:

AU5402 VEHICLE BODY ENGINEERING

COURSE OBJECTIVES:
Impart knowledge in the construction of
i. car body
ii. bus body and commercial vehicle details
iii. Vehicle aerodynamics and body materials

UNIT I CAR BODY DETAILS

UNIT II BUS BODY DETAILS
Types of bus body: based on capacity, distance travelled and based on construction. – Bus body lay out, floor height, engine location, entrance and exit location. Types of metal sections used – Regulations – Constructional details: Conventional and integral.

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

UNIT IV VEHICLE AERODYNAMICS
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 balance.

UNIT V BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Upon completion of the course, students will acquire knowledge on
i. Different aspects of car body,
ii. bus body and commercial vehicle bodies.
iii. Role of various aerodynamic forces and moments, measuring instruments in vehicle body design.
iv. Material used in body building,
v. Tools used in body repairs and command over vehicle body engineering applications.
TEXT BOOKS:

REFERENCES:

AU5403 FLUID MECHANICS FOR AUTOMOTIVE APPLICATIONS  L T P C  3 0 0 3

COURSE OBJECTIVES:

i. To learn the basics of fluid statics and dynamics
ii. To solve numerical related to equations of fluid motion
iii. To solve numerical related to flow measurement in pipes
iv. To get expose to dimensional analysis and model studies
v. To investigate hydraulic machinery used in vehicles

UNIT I BASIC CONCEPTS
Classification of fluids and their properties – Measurement of pressure and viscosity – Fluid statics and force on submerged bodies – Stability of floating bodies.

UNIT II EQUATIONS OF FLUID FLOW
Kinematics – Motion of a fluid particle – Fluid deformation – Navier Stokes equation and Euler’s equation – Basic laws of fluid motion in integral form and differential form - Linear momentum equation.

UNIT III INCOMPRESSIBLE INVISCID AND VISCOUS FLOWS

UNIT IV DIMENSIONAL ANALYSIS AND MODEL STUDIES

UNIT V HYDRAULIC MACHINERY FOR VEHICLE APPLICATIONS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
On completion of the course,

i. students will be familiar with all basic concepts of fluids statics
ii. summarize the concepts of flow governing equations
iii. generate solutions to complex pipe flow problems
iv. Interpret the results of dimensional analysis
v. expose to the applications of fluid machinery in vehicles

TEXT BOOKS:

REFERENCES:

COURSE OBJECTIVES:
- To impart knowledge on various types of mechanisms and synthesis.
- To impart skills and analyze the position, velocity and acceleration of mechanisms.
- To understand the effects of friction in motion in transmission and machine components.
- To familiarize higher pairs like cams and gears.
- To study the undesirable effects of unbalances resulting from prescribed motions in mechanisms.

UNIT I MECHANISMS 9+3

UNIT II FRICTION 9+3
Types of friction – friction in screw and nut – screw jack – pivot, collar and thrust bearings – plate and cone clutch – belt (Flat and V) and rope drives – creep in belts – open and crossed belt drives – Ratio of tensions – Effect of centrifugal and initial tensions – condition for maximum power transmission.

UNIT III GEAR AND CAMS 9+3

UNIT IV VIBRATION 9+3

UNIT V BALANCING 9+3
Static and dynamic balancing – single and several masses in different planes – primary and secondary balancing of reciprocating masses – Balancing of single and multi-cylinder engines – Governors and Gyroscopic effects.

TOTAL: 60 PERIODS

COURSE OUTCOMES:
At the end of the course, students will be able to:

CO1: Apply the kinematics and dynamics of machinery in design and analysis of engineering problems.
CO2: Demonstrate the ability to synthesize and analysis mechanisms
CO3: Design and analyze cam and their motion.
CO4: Select the gears and gear trains for their applications.
CO5: Examine the concept of free, forced and damped vibrations.

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
<th>PO13</th>
</tr>
</thead>
<tbody>
<tr>
<td>√</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>√</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>√</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>✔</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>✔</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

TEXT BOOKS:

REFERENCES:

AU5411

VEHICLE COMPONENTS LABORATORY

COURSE OBJECTIVES:
i. To assemble and disassemble the parts of an IC engine.
ii. To identify the various component of an IC engine.
iii. To identify the various components in transmission systems of an automobile.
iv. To assemble and disassemble the various components of transmission system.
v. To study all the functions of automobile components

LIST OF EXPERIMENTS
1. To assemble and disassemble 1000CC engine
2. To assemble and disassemble Bus engine
3. To assemble and disassemble V8 engine
4. To assemble and disassemble CRDI engine
5. To assemble and disassemble MPFI engine
6. To assemble and disassemble Single plate, Diaphragm Clutch.
7. To assemble and disassemble Constant mesh, Sliding mesh gear box
8. To assemble and disassemble Transfer case
9. To assemble and disassemble Differential, Rear axle
10. To assemble and disassemble Front axle.
11. To Study different chassis layouts
12. To Study braking system
13. To Study Steering system
14. To Study Suspension system

TOTAL: 60 PERIODS

COURSE OUTCOMES:

i. Dismantle and Assemble the automobile chassis and Engine components
ii. Identify & differentiate components of SI & CI engines
iii. Understand working of braking, steering, clutch, transmission, Suspension systems.
iv. Differentiate various subsystems of two, three & Four wheeler vehicles
v. Develop skills in Dismantling and assembling of chassis components.
vi. Correct minor repairs and trouble shoots the breakdowns

COURSE OBJECTIVES:

i. To impart basic knowledge on properties testing procedure for fuels and Lubricants.

LIST OF EXPERIMENTS:

1. To determine the viscosity of lubrication oil by Redwood Viscometer.
2. To determine the Viscosity Index of lubricating oil by Saybolt Viscometer
3. To find out the Flash and Fire points of given sample of fuel.
4. To find out the Flash and Fire points of given sample of lubricants.
5. To determine the Cloud and pour point of fuel sample.
6. To draw a curve by performing ASME distillation test of fuels (gasoline / diesel).
7. To determine the Carbon residue on given sample of lubrication oil.
8. To determine the Calorific value of liquid fuel by using bomb calorimeter.
9. To find out the consistency of grease using Penetration test.
10. To find out the Density test of different fuels

TOTAL PERIODS: 60

COURSE OUTCOMES:

i. Student would have basic understanding of various testing methods adopted to assess quality of fuels and lubricants like
   a. Viscosity
   b. Importance of flash, fire point
   c. Cloud and pour point
   d. Calorific value
   e. Density

GE5552        ENGINEERING MANAGEMENT

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

1. Explaining basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations.
2. Applying various functions of management in professional organization.
3. Applying organizational theory in professional organization.
4. Applying the principles of productivity and operations management in professional organization.
5. Applying modern concepts and marketing in management in professional organization.

UNIT I  INTRODUCTION TO MANAGEMENT
Definition and functions of Management - Approaches to the study of Management – Mintzberg’s Ten Managerial Roles – Principles of Taylor; Fayol; Weber; Parker – Forms of Organization: Sole Proprietorship; Partnership; Company (Private and Public); Cooperative – Public Sector Vs Corporate Organization – Business Environment: Economic; Social; Political; Legal – Trade Union: Definition; Functions; Pros and cons.

UNIT II  FUNCTIONS OF MANAGEMENT
Planning: Characteristics; Nature; Importance; Steps; Limitation – Organizing: Features; Process; Principles; Types – Departmentalization: Functional – Divisional (Product; Customer; Geographic) – Staffing: Systems Approach; Recruiting and Selection Process – Directing (Leading): Traits; Style; Managerial Grid (Blake-Mounton, Reddin) – Communication: Purpose; Model; Barriers – Controlling: Types; Audit (External, Internal, Merits) – Decision Making: Elements; Characteristics; Process; Classification – Controlling techniques.

UNIT III  ORGANIZATION THEORY
Human Resource Development (HRD): Goals – Organizational Conflict: Positive Aspects; Individual; Role; Interpersonal; Intra Group; Inter Group; Conflict Management – Need and Motivation Theories: Maslow’s Hierarchy of Needs Theory; Herzberg’s Motivation-Hygiene Theory; McClelland’s Needs Theory of Motivation – Change Management: Concept of Change; Lewin’s Process of Change Model; Sources of Resistance; Overcoming Resistance; Guidelines to managing Conflict.

UNIT IV  PRODUCTIVITY AND OPERATIONS MANAGEMENT
Productivity: Concept; Measurements; Affecting Factors; Methods to Improve – Operations Management Tools: (Simple problems in) Transportation Model (Balanced); Assignment Model (Hungarian); Network Model (Shortest path); Critical Path Method; Decision Trees.

UNIT V  MODERN CONCEPTS AND MARKETING MANAGEMENT
Concept, features, merits and demerits of: SWOT Analysis; Business Process Re-engineering (BPR); Supply Chain Management (SCM) – Marketing: Concept; Functions; Importance; Segmentation; Mix; Problems of Marketing in Small Enterprise; Competitive Analysis and Advantage – E-marketing.

TOTAL = 45 PERIODS

COURSE OUTCOMES:
Upon completion of this course, the students will be able to:
1. Explain basic concepts of management; approaches to management; contributors to management studies; various forms of business organization and trade unions function in professional organizations.
2. Apply various functions of management in professional organization.
3. Apply organizational theory in professional organization.
4. Apply the principles of productivity and operations management in professional organization.
5. Apply modern concepts and marketing in management in professional organization.

TEXT BOOKS:

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>0.9</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>0.6</td>
</tr>
</tbody>
</table>

AU5501  
ENGINEERING DESIGN  
L T P C  
3 0 0 3  

COURSE OBJECTIVES:  
i. To understand the various steps involved in the Design Process  
ii. To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.  
iii. To learn the use of standard practices in design.  
iv. To understand the techniques used for fastening the machine parts  
v. To discriminate the basis on which the components have to be designed.  
(Use of P S G Design Data Book is permitted)

UNIT I  
FUNDAMENTAL CONCEPTS IN DESIGN  
Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties – Machine part: simple stresses – Torsional and bending stress – variable stresses – Preferred numbers, fits and tolerances – Fatigue failure

UNIT II  
DESIGN OF SHAFTS AND SPRINGS  
Design of solid and hollow shafts based on strength, rigidity and critical speed – Keys, keyways and splines Spring material- Types – Design of closed coiled helical springs and leaf springs. Design of lever

UNIT III  
DESIGN OF JOINTS  

UNIT IV  
DESIGN OF FLYWHEEL AND BEARINGS  

UNIT V  
DESIGN OF GEARS  

TOTAL: 45 PERIODS
COURSE OUTCOMES:
The students will be able to
i. Demonstrate knowledge on designing machine elements to withstand the loads and deformations.
ii. Approach a design problem successfully, and take decisions whenever needed.
iii. Apply their knowledge in new product development.
iv. Demonstrate their skill in developing modern joining techniques for future electric vehicles
v. Interpret the design of components and create new methods with considering the impact on environment

TEXT BOOKS:

REFERENCES:

AU5551 AUTOMOTIVE ELECTRICAL AND ELECTRONICS SYSTEMS

COURSE OBJECTIVES:
1. To define the glossary related to vehicle electrical and electronic system.
2. To understand the need for starter batteries, starter motor and alternator in the vehicle.
3. To differentiate the conventional and modern vehicle architecture and the data transfer among the different electronic control unit using different communication protocols.
4. To list common types of sensor and actuators used in vehicles.
5. To understand networking in vehicles

UNIT I INTRODUCTION AND AUTOMOTIVE BATTERIES
Introduction - Overview of vehicle electrical systems- Electrical circuits - Electrical power supply in conventional vehicle- Dimensioning of wires- Circuit diagrams and symbols - Electromagnetic Compatibility and interference suppression. Batteries – Battery design – Method of operation – Lead acid battery construction – Battery ratings and testing- Maintenance -free batteries – Battery – Substitute, versions, special cases

UNIT II STARTING AND CHARGING SYSTEM
Alternators – Generation of electrical energy in vehicle- physical principles- Alternator and voltage regulations versions – power losses – characteristics curve- Alternator operation in the vehicle- Alternator circuitry. Starter Motors – Development and Starting requirements in the IC engine-starter motor design – Starter motor design variations – starter motor control and power circuits
UNIT III  IGNITION, LIGHTING AND AUXILLARY SYSTEM  9

UNIT IV  AUTOMOTIVE ELECTRONICS AND SENSORS AND ACTUATORS  9

UNIT V  VEHICLE NETWORKING  9
Data transfer between automotive Electronics systems - Basic principles of networking- Network topology- Network organization- OSI reference model- Control mechanisms - communication protocols in embedded systems- -Vehicle Communication Protocols – Cross-system functions - Requirements for bus systems- Classification of bus systems- Applications in the vehicle - Coupling of networks- Examples of networked Vehicles - Bus system- CAN, LIN, Flexray – MOST etc.

COURSE OUTCOMES:
1. Define the glossary related to vehicle electrical and electronic system
2. Understand the need for starter batteries, starter motor and alternator in the vehicle.
3. Differentiate the conventional and modern vehicle architecture and the data transfer among the different electronic control unit using different communication protocols
4. List common types of sensor and actuators used in vehicles.
5. Understand networking in vehicles.

TOTAL:45 PERIODS

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
To impart knowledge in
i. Detailed concept, construction and principle of mechanical transmission components,
ii. Hydrodynamic devices, hydrostatic devices, automatic transmission system
iii. Electric drive used in road vehicles.

UNIT I CLUTCH
Requirement of transmission system, Types of transmission system, Requirement of Clutches – Functions-Types of clutches, construction and operation of Single plate, multi plate and Diaphragm spring clutches. Centrifugal clutch, Electronic clutch.

UNIT II GEAR BOX
Purpose of gear box. Construction and working principle of sliding, constant and synchromesh gear boxes, Automatic manual transmission. Introduction to epicycle gear trains, Numerical examples on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & power and acceleration. Determination of gear ratios for different vehicle applications.

UNIT III HYDRODYNAMIC TRANSMISSION

UNIT IV HYDROSTATIC DRIVE

UNIT V AUTOMATIC TRANSMISSION AND ELECTRIC DRIVE

COURSE OUTCOMES:
Upon completion of the course, students will Acquire knowledge in the
i. Clutch
ii. Gear box
iii. Hydrodynamic
iv. Hydrostatic devices
v. Electric drives.

TEXT BOOKS:

REFERENCES:

AU5511 AUTOMOTIVE ELECTRICAL AND ELECTRONICS LABORATORY L T P C 0 0 4 2

COURSE OBJECTIVES:

i. To understand the working principle of Electrical circuits in automobile.
ii. To evaluate the working principle of Battery, and starter motor.
iii. To understand the working principle of auxiliary systems used in automobiles.
iv. To understand the use of sensors in an automobile.
v. To develop a programing knowledge on Microprocessor

LIST OF EXPERIMENTS:

Electrical System

1. Layout of an Automotive Electrical System – Study
2. Testing of Battery – Hydrometer, Load test, Individual Cell voltage test, Jump Start
5. Study of Voltage regulator, solenoids, Horn and wiper mechanism.
6. Study of Vehicle lighting system
7. Study of an Ignition system

Electronic System

1. Visualization of Engine Sensor Signals and fault Diagnosis using OBD Kit
2. Interface of Seven segment display
3. Interfacing of ADC for a sensor and Interfacing of DAC for an actuator
4. Interface circuit like amplifier, filter, Multiplexer and De Multiplexer
5. Basic microprocessor programming like arithmetic and Logic operation, code conversion,
6. waveform generation, look up table etc.
7. Study of Aurdino Programming
8. EPROM Programming
9. Study of Virtual Instrumentation and Communication Protocols (CAN, LIN, MOST etc.)
   Mini – Project

TOTAL: 60 PERIODS

COURSE OUTCOMES:

1. Understand the working principle of Electrical circuits in automobile.
2. Evaluate the working principle of Battery, and starter motor.
3. Understand the working principle of auxiliary systems used in automobiles.
4. Understand the use of sensors in an automobile.
5. Develop a programing knowledge on Microprocessor

AU5512 VEHICLE TESTING LABORATORY L T P C 0 0 2 1
COURSE OBJECTIVES:
  i. To impart the knowledge on maintenance of vehicle and subsystems.

LIST OF EXPERIMENTS:
Study on layout of automotive service station.
Tightening and adjustment of wheel bearing.
Adjustment of pedal play in clutch, brake, hand brake lever and steering wheel orientation.
Wheel alignment in four wheelers.
Minor and major tune up of gasoline and diesel engines.
Calibration of Fuel injection pump
Fault diagnosis and service of Electrical system like battery, starting system, charging system, lighting system.
Removal and fitting of tyre.
Engine fault diagnosis using scan tool
Air bleeding from hydraulic brakes, air bleeding of diesel fuel system
Tinkering and painting of passenger car door.
Performance test on chassis dynamometer.

TOTAL: 30 PERIODS

COURSE OUTCOME:
  i. End of the course student would have deep practical knowledge on maintenance and testing.

AU5601 AUTOMOTIVE POLLUTION AND CONTROL  

COURSE OBJECTIVES:
  i. To discuss the harmful effects of major pollutants on living beings and the environment
  ii. To analyse the formation of major pollutants like UBHC, CO, NOx, particulate matter and smoke.
  iii. To design various control techniques to reduce pollutants in combustion
  iv. To determine the various after treatment process to minimize emissions
  v. To demonstrate the various devices used to measure pollutants and discuss the Emission standards followed in various nations

UNIT I EMISSION FROM AUTOMOBILES

UNIT II EMISSION FROM SPARK IGNITION ENGINE AND ITS CONTROL  
Emmission formation in SI Engines- Carbon monoxide- Unburned hydrocarbon, NOx, Smoke — Effects of design and operating variables on emission formation – controlling of pollutants - Catalytic converters — Charcoal Canister — Positive Crank case ventilation system, Secondary air injection, thermal reactor, Laser Assisted Combustion.

UNIT III EMISSION FROM COMPRESSION IGNITION ENGINE AND ITS CONTROL  
Formation of White, Blue, and Black Smokes, NOx, soot, sulphur particulate and Intermediate Compounds – Physical and Chemical delay — Significance Effect of Operating variables on Emission formation — Fumigation, EGR, HCCI, Particulate Traps, SCR — Cetane number Effect.

UNIT IV NOISE POLLUTION FROM AUTOMOBILES

UNIT V TEST PROCEDURES AND EMISSION MEASUREMENTS
Constant Volume Sampling I and 3 (CVSI &CVS3) Systems- Sampling Procedures — Chassis dyno - Seven mode and thirteen mode cycles for Emission Sampling — Sampling problems — Emission analysers —NDIR, FID, Chemiluminescent, Smoke meters, Dilution Tunnel, SHED Test, Sound level meters.

COURSE OUTCOMES:
By the end of this course, students will be able to
i. Differentiate the various emissions formed in IC engines
ii. Analyze the effects of pollution on human health and environment
iii. Design the control techniques for minimizing emissions
iv. Categorize the emission norms
v. Identify suitable methods to reduce the noise emissions.

TEXT BOOKS:

REFERENCES:

AU5602 DYNAMICS OF GROUND VEHICLES

COURSE OBJECTIVES:

UNIT I CONCEPT OF VIBRATION

UNIT II TYRES
UNIT III VERTICAL DYNAMICS

UNIT IV LONGITUDINAL DYNAMICS AND CONTROL

UNIT V LATERAL DYNAMICS

COURSE OUTCOMES:
At the end of the courses, the students can able to
i. Develop physical and mathematical models to predict the dynamic response of vehicles
ii. Apply vehicle design performance criteria and how to use the criteria to evaluate vehicle dynamic response
iii. Use dynamic analyses in the design of vehicles.
iv. Understand the principle behind the lateral dynamics.
v. Evaluate the longitudinal dynamics and control in an automobile

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
The course should enable the students to:

i. General aspects of Electric and Hybrid Vehicles (EHV), including architectures, modeling, sizing, sub system design and hybrid vehicle control.

ii. Understand about vehicle dynamics,

iii. Design the required energy storage devices,

iv. Select the suitable electric propulsion systems and

v. Understand of hybrid electric vehicles.

UNIT I NEED FOR ALTERNATIVE SYSTEM

Need for hybrid and electric vehicles – main components and working principles of a hybrid and electric vehicles. Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles. Case study on specification of electric and hybrid vehicles.

UNIT II DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES


UNIT III ENERGY SOURCES


UNIT IV MOTORS AND CONTROLLERS

Types of Motors, Characteristic of DC motors, AC single phase and 3-phase motor, PM motors, Switched reluctance motors, Motor Drives and speed controllers, Torque Vectoring, Regenerative Braking. Rectifiers, Inverters, DC/DC converters.

UNIT V SUBSYSTEMS OF HYBRID AND ELECTRIC VEHICLES


TOTAL: 45 PERIODS

COURSE OUTCOMES:
The students able to understand

i. Electric and hybrid vehicle operation and architectures

ii. Design of hybrid and electric vehicles.

iii. Energy requirement for vehicles.

iv. Vehicle characteristics, operating modes, and performance parameters of the vehicle

v. Different subsystems of hybrid and electric vehicles

TEXT BOOKS:


REFERENCES:


COURSE OBJECTIVES:
The main objective of this course is to
i. Impart knowledge in automotive Emission measurement and methods of testing engines.
ii. The detailed measuring techniques of pollutants like UBHC, CO, NOx, CO$^2$ and smoke for both SI and CI engines will be taught and compared with the emission standards.
iii. The knowledge about the instruments used for measurement of pollutants, engine performance and combustion parameters are to be explained with live example.
iv. At the end of the course the students will have knowledge about methods to test the engine and emission.

LIST OF EXPERIMENTS:
1. Study and use of IC engine testing Dynamometers.
2. Study and use of Pressure pickups, charge amplifier, storage oscilloscope and signal analyzers used for IC engine testing.
3. Performance study on petrol engine.
4. Performance study on diesel engine.
5. Determine the Frictional power on petrol engines.
7. Study of NDIR Gas Analyzer and FID.
8. Study of Chemiluminescent NOx analyser.
10. Diesel smoke measurement.

COURSE OUTCOMES:
By the end of this course, students will be able to
i. Understand the various emission measuring instruments
ii. Understand the various engine testing instruments
iii. Understand the procedure to measure the emission
iv. Understand the procedure for measuring the engine performance and combustion parameters
v. Understand the emission norms

TEXT BOOKS:

REFERENCES:

AU5701 DESIGN OF VEHICLE COMPONENTS

COURSE OBJECTIVES:

i. To understand the various steps involved in the design of automotive components
ii. To show their knowledge in designing engine components.
iii. To complete design exercise and arrive at important dimensions of chassis components.
iv. To learn the use of standard practices in design.
v. To determine the dimensions of front and rear axles

(Use of P S G Design Data Book is permitted)

UNIT I DESIGN OF CYLINDER, PISTON AND CONNECTING ROD 10
Choice of material for cylinder and piston, design of cylinder, design of piston, piston pin, piston rings and piston assembly. Material for connecting rod, design of connecting rod assembly. Case study on piston for car.

UNIT II DESIGN OF CRANK SHAFT AND VALVES 9

UNIT III DESIGN OF CLUTCHES AND GEARS 10

UNIT IV DESIGN OF VEHICLE FRAME AND SUSPENSION 6
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. Case study on development of frame for ATV

UNIT V DESIGN OF FRONT AND REAR AXLE 10

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The students will be able to

i. Analyse the stress and strain imparted on automotive components
ii. Compute the design and find the dimension of the vehicle components.
iii. Identify optimal design solutions to real-world problems in compliance with industry standards.
iv. Demonstrate the design skill by creating new design strategy with the application of the knowledge.
v. Interpret the modern system in vehicle and would help in developing the system with less impact to the environment.
TEXT BOOKS:

REFERENCES:

AU5702 IC ENGINE PROCESS MODELING L T P C
3 0 0 3

COURSE OBJECTIVES:

i. To impart knowledge on simulation of IC engine components.

ii. To understand the principle behind the stoichiometric ratio and adiabatic flame temperature.

iii. To develop a model on simulation of SI engine models.

iv. To understand the concept of gas exchange process in SI engine.

v. To impart knowledge on simulation of CI engine.

UNIT I INTRODUCTION TO SIMULATION

UNIT II STOICHIOMETRY AND ADIABATIC FLAME TEMPERATURE
Reactive processes, Heat of reaction, measurement of URP, measurement of HRP. Introduction -combustion equation for hydrocarbon fuels. Calculation of minimum air, excess air and stoichiometric air required for combustion. 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.

UNIT III SI ENGINE SIMULATION
SI Engine simulation with air as working medium, deviation between actual and ideal cycle. Fuel air cycle analysis - 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. Models for mass burnt fraction.

UNIT IV 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.

UNIT V CI ENGINE SIMULATION 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course the student will be able to
i. Acquire knowledge on simulation of IC engine components.
ii. Understand the principle behind the stoichiometric ratio and adiabatic flame temperature.
iii. Develop a model on simulation of SI engine models.
iv. Understand the concept of gas exchange process in SI engine.
v. Acquire knowledge on simulation of CI engine.

TEXT BOOKS:

REFERENCES:

AU5711 COMPUTER AIDED VEHICLE COMPONENTS DESIGN LABORATORY L T P C 3 0 0 3

COURSE OBJECTIVES:
i. To familiarise the students to use modelling software for modelling engine components
ii. To design chassis components with dimensions and strength requirements.
iii. To learn the use of standard practices in modelling of components.
iv. The use of modelling software to control the quality of the final engineered product.
v. To visualize the complete assembly of the various system.

LIST OF ENGINE DESIGN EXPERIMENTS
1. Design and modelling of piston, piston pin and piston rings.
2. Design modelling of the connecting rod assembly.
3. Design of crankshaft, balancing weight calculations and modelling of the crankshaft assembly.
4. Design and modelling of flywheel
5. Design and modelling of the inlet and exhaust valves.
6. Design and modelling of cam and camshaft.
7. Design and modelling of combustion chamber.

LIST OF CHASSIS DESIGN EXPERIMENTS
1. Design and modelling of frame
2. Design and modelling of clutch assembly.
3. Design and modelling of constant mesh gearbox
4. Design and modelling of sliding mesh gearbox
5. Design and modelling of propeller shaft with universal joint.
6. Design and modelling of rear axle

TOTAL: 60 PERIODS

COURSE OUTCOMES:
Students will be able to visualize the automotive components with the help of modeling software.

i. make the modifications instantly if required at the initial stage itself

ii. Demonstrate the knowledge on designing components to withstand the loads and deformations.

iii. synthesize, analyze and document the design of the various components

iv. demonstrate the ability to use engineering techniques for developing vehicle components with industry standards

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

<table>
<thead>
<tr>
<th>S.NO</th>
<th>NAME OF THE EQUIPMENT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>COMPUTER NODES</td>
<td>30</td>
</tr>
<tr>
<td>2</td>
<td>MODELLING SOFTWARE</td>
<td>30 LICENCES</td>
</tr>
</tbody>
</table>

AU5001 ENGINE MANAGEMENT SYSTEMS

COURSE OBJECTIVES:
The objective of the course is to make the student to

i. Analyze the need and role of components used in an engine management system.

ii. Apply the function of various sensors and actuators in an engine.

iii. Categorize the different available ignition system.

iv. Design of injection system for SI and CI engines

v. Distinguish various engine control algorithm used during engine operation.

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS 9
Components for electronic engine management system, open and closed loop control strategies, PID control, Look up tables, introduction to modern control strategies like Fuzzy logic and adaptive control. Switches, active resistors, Transistors, Current mirrors/amplifiers, Voltage and current references, Comparator, Multiplier. Amplifier, filters, A/D and D/A converters.

UNIT II SENSORS AND ACTUATORS 9
Working principles, construction and location of sensors to measure speed, load, air flow, temperature, pressure, lambda, throttle position, knock, etc. Working principles, construction and location of actuators viz. Solenoid, relay, stepper motor etc. Design constraints.

UNIT III SI ENGINE MANAGEMENT 9
Layout, types and working of SI engine management systems (K, KE, Mono Jetronic, L, LH, Motronic). GDI. Development of ignition system – Transistor assisted, Contactless, Distributor less, CDI, Ignition Map, Knock control. Flowcharts for combined fuel injection and ignition control. Introduction to LASER Ignition system.

UNIT IV CI ENGINE MANAGEMENT 9

72

UNIT V DIGITAL ENGINE CONTROL SYSTEM

TOTAL : 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the student should able to
i. differentiate between the mechanical and electronic engine management working
ii. apply the function, construction and operation of various sensors and actuators
iii. categorize different ignition and injection systems,
iv. design different injection systems
v. apply various engine control algorithm used during engine operation.

TEXT BOOKS:

REFERENCES:

AU5002 MEASUREMENT SYSTEM

COURSE OBJECTIVES:

i. To understand the different degree of accuracy obtained from different types of instruments
ii. To understand the process of reducing uncertainties in measurements
iii. To identify the various instruments used for linear and angular measurements
iv. To interpret the working of pressure force and torque measurement devices
v. To brief the measurement of flow and temperature using various instruments.

UNIT I SCIENCE OF MEASUREMENT

UNIT II LINEAR AND ANGULAR MEASUREMENT
Linear measuring instruments: Vernier, micrometer, interval measurement, Slip gauges and classification, interferometer, optical flats, limit gauges – Comparators: Mechanical, pneumatic and electrical types, applications. Angular measurements: -Sine bar, optical bevel protractor, angle Decker–Taper measurements, coordinate measuring machine (CMM), Blue Line Scanner.
UNIT III  FORM MEASUREMENT  8

UNIT IV  PRESSURE, FORCE AND TORQUE MEASUREMENT  11
Bourdon tube, diaphragm, bellows and pressure capsules: Transducers used in pressure measurement – potentiometer, strain gauges, LVDT, piezo electric and piezo resistive transducers. Low pressure measurement – Mc leod gauge, Pirani gauge, thermal conductivity type pressure measurement. Force measuring devices – Balances, platform scales, weigh bridges, load cells, proving ring. Torque measurement – prony brake, rope brake and fan type brakes. Dynamometers – types.

UNIT V  MEASUREMENT OF TEMPERATURE AND FLOW  10

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The Students will be able to
i. Demonstrate their knowledge about different measurement method and devices used in industries.
ii. Design measuring equipment’s for the measurement of pressure force, temperature and flow.
iii. Generate new ideas in designing measuring instruments for automotive application.
iv. Demonstrate their learned skill to develop new system that would help in keeping the environment sustainable.
v. Have the ability to handle and interpret measurement data, to estimate measurement uncertainties

TEXT BOOKS:

REFERENCES:

AU5003  THEORY OF FUELS AND LUBRICANTS  L T P C 3 0 0 3

COURSE OBJECTIVES:
  i. To understand the basic of refinery of fuels and lubricants
  ii. Properties of fuels and lubricants for the design and operation of the I.C engines.
  iii. Testing knowledge on fuel properties
UNIT I  REFINERY OF FUELS AND LUBRICANTS
Introduction to Structure of petroleum, refining Process-Distillation, cracking processes, Catalytic reforming, alkylation, isomerisation and polymerization, finishing process- 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
Properties and testing of fuels- 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. Test on used lubricants. Biofuel-properties and testing.

UNIT V  FUEL RATING

TOTAL: 45 PERIODS

COURSE OUTCOMES:
Student would have basic understanding and analysis of
i. Various refinery processes
ii. Theory of lubricants
iii. Properties and testing of fuels
iv. Fuel ratings
v. Additive mechanisms

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
The students are able
i. To understand transport management and fleet organisation.
ii. To learn about various transport systems and their advantages
iii. To understand scheduling and fare structure.
iv. To learn the need and requirement of documentation and certification.
v. To learn the importance of transport management.

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.

COURSE OUTCOMES:
Upon completion of the course, students will be able to
i. Understand transport management and fleet organisation.
ii. Learn about various transport systems and their advantages
iii. Understand scheduling and fare structure.
iv. Learn the need and requirement of documentation and certification.
v. Learn the importance of transport management.

TEXT BOOKS:

REFERENCE BOOKS:
1. Government Motor Vehicle Act, Publication on latest act to be used as on date
i. Know about the basics about the vehicle.
ii. Understand the safety aspects in the vehicle.
iii. Know and understand the various safety aspects.
iv. To get the knowledge in sensors provided in the vehicle to avoid the crash and to detect the defects in the vehicle.
v. To know about the comfort and convenience system.

UNIT I
INTRODUCTION
Automotive safety: Introduction, Types. Active safety: driving safety, conditional safety, Perceptibility safety, operating safety. Passive safety: exterior safety, interior safety. NCAP

UNIT II
PASSIVE SAFETY CONCEPTS

UNIT III
PASSIVE SAFETY EQUIPMENTS AND CONVENIENCE SYSTEM
Seat belt, Seat belt tightener system and importance, collapsible steering column. Air bags and its activation. Designing aspects of automotive bumpers and materials for bumpers. Adaptive front lighting, central locking system, Tire pressure control system, rain sensor system with automated wiper system.

UNIT IV
ACTIVE SAFETY
Antilock braking system, Stability Control. Adaptive cruise control, Lane Keep Assist System, Collision warning, avoidance system, Blind Spot Detection system, Driver alertness detection System. ADAS, DAT.

UNIT V
VEHICLE INTEGRATION AND NAVIGATION SYSTEM

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The students should be able to:

i. Understand the concept of crumble zone and can calculate the amount of energy absorbed and transferred during a crash.
ii. Design and validate the vehicle structure with respect to crash worthiness
iii. Know the various types of safety aspects such as active and passive safety, the active safety components and the working passive safety components such as air bags, seatbelts
iv. Design a bumper with respect to safety.
v. Know about various object detection system and working of various comfort, convenience system and environment information system.

TEXT BOOKS:

REFERENCES:
1. ARAI Safety standards
COURSE OBJECTIVES: The main learning objective of this course is to prepare the students for:

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

UNIT I  ENTREPRENEURSHIP

UNIT II  MOTIVATION

UNIT III  BUSINESS

UNIT IV  FINANCING AND ACCOUNTING

UNIT V  SUPPORT TO ENTREPRENEURS

TOTAL = 45 PERIODS

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

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

TEXT BOOKS:

REFERENCES:

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

AU5006 FINITE ELEMENT TECHNIQUES L T P C 3 0 0 3

COURSE OBJECTIVES:
i. To Understand and perform engineering analysis of structural members using FEM.
ii. To evaluate and interpret FEA analysis results for design and evaluation purposes
iii. To understand the computer codes for FEM Elements.
iv. To derive the characteristics equation of Iso parametric elements.
v. To Imply knowledge towards Modal analysis in a vibrating element analytically.

UNIT I INTRODUCTION

UNIT II DISCRETE ELEMENTS

UNIT III CONTINUUM ELEMENTS
Plane stress, Plane strain and axisymmetric problems, constant and linear strain, triangular elements, stiffness matrix, axisymmetric load vector. Computer codes for CST and LST elements.
UNIT IV ISOPARAMETRIC ELEMENTS
Definitions, Shape function for 4, 8 and 9 nodal quadrilateral elements, Stiffness matrix and consistent load vector.

UNIT V MODAL ANALYSIS

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course, the students can able to
i. Understand and perform engineering analysis of structural members using FEM.
ii. Demonstrate the ability to evaluate and interpret FEA analysis results for design and evaluation purposes
iii. Develop computer codes for FEM Elements.
iv. Derive the characteristics equation of Iso parametric elements.
v. Apply knowledge towards Modal analysis in a vibrating element analytically.

TEXT BOOKS:

REFERENCES:

AU5007 PRINCIPLES OF CONTROL SYSTEMS L T P C 3 0 0 3

COURSE OBJECTIVES:
1. To understand the methods of representation of system and their transfer function models
2. To provide adequate knowledge in the time response of systems and steady state error analysis
3. To give basic knowledge in obtaining the open loop and closed loop frequency responses of systems
4. To understand the concept of stability of control system and methods of stability analysis
5. To study the three way of designing compensators for a control system

UNIT I SYSTEM AND THEIR REPRESENTATION
Basic elements in control systems-Open loop and Closed loop system-Feedback characteristics-Effects of feedback-mathematical modeling of physical systems:- mechanical, Thermal, hydraulic and Pneumatic systems-Transfer function- AC and DC servomotor- Block diagram reduction techniques- signal flow graph- control system components – computer simulation.
UNIT II \hspace{1cm} TIME RESPONSE ANALYSIS \hspace{1cm} 9
Time response- Types of test inputs- First and second order responses- Error coefficient-Generalized error series- Steady state error- Time domain specifications- Problems related to automotive domain- Computer simulation.

UNIT III \hspace{1cm} FREQUENCY RESPONSE ANALYSIS \hspace{1cm} 12
Frequency response- Frequency domain specifications-Bode plot-Polar plot- Determination of phase margin and gain margin- Constant M and N circles-Nichols chart- Determination of closed loop responses from open loop response- Problems related to automotive domain Computer simulation.

UNIT IV \hspace{1cm} STABILITY OF CONTROL SYSTEM \hspace{1cm} 6

UNIT V \hspace{1cm} CONTROL SYSTEM DESIGN \hspace{1cm} 9

TOTAL: 45 PERIODS

COURSE OUTCOMES:

i. To understand the methods of representation of system and their transfer function models
ii. To provide adequate knowledge in the time response of systems and steady state error analysis
iii. To give basic knowledge in obtaining the open loop and closed loop frequency responses of systems
iv. To understand the concept of stability of control system and methods of stability analysis
v. To study the three way of designing compensators for a control system

TEXT BOOKS:

REFERENCES:
1. Dorf Bishop, “Modern Control System”, Prentice Hall,2004

AU5008 \hspace{1cm} COMBUSTION THERMODYNAMICS AND HEAT TRANSFER \hspace{1cm} L T P C \hspace{1cm} 3 0 0 3

COURSE OBJECTIVES:

i. To understand the principle of combustion in thermodynamics.
ii. To identify the kinetics behind the chemical reaction of combustion of fuels.
iii. To progress an idea to understand the properties of flame inside a combustion chamber.
iv. To understand the principle of conduction, convection and radiation in IC engines.
v. To understand the concept of cylinder pressure measurement.

UNIT I THERMODYNAMICS OF COMBUSTION
Premixed and diffusion combustion process in IC engines. First and Second Law of Thermodynamics applied to combustion - combustion Stoichiometry - chemical equilibrium, spray formation and droplet combustion.

UNIT II CHEMICAL KINETICS OF COMBUSTION

UNIT III FLAMES
Laminar premixed – flame speed correlations - quenching, flammability, and ignition, flame stabilization, laminar diffusion flames, turbulent premixed flames - Reynolds and Damkohler numbers and their significance.

UNIT IV HEAT TRANSFER IN IC ENGINES

UNIT V EXPERIMENTS IN IC ENGINES
Cylinder pressure measurement. Rate of heat release calculation – hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course the student will be able to
i. Understand the principle of combustion in thermodynamics.
ii. Identify the kinetics behind the chemical reaction of combustion of fuels.
iii. Understand the properties of flame inside a combustion chamber.
iv. Understand the principle of conduction, convection and radiation in IC engines.
v. Understand the concept of cylinder pressure measurement.

TEXT BOOKS:

REFERENCES:

AU5009 HYDRAULIC AND PNEUMATICS SYSTEMS
COURSE OBJECTIVES:
1. To understand the basics of hydraulic and pneumatic systems
ii. To examine the working of hydraulic power drives  
iii. To apply knowledge on fluid power elements  
iv. To design hydraulic and pneumatic systems.  
v. To evaluate the concept of programming in PLC circuits.

UNIT I INTRODUCTION TO FLUID POWER  
Introduction to fluid power control- Hydraulic and pneumatics- Selection criteria, application of fluid power, application of pascal's law, equation, Transmission and multiplication of force pressure losses- fluids, selection and properties- ISO symbols.

UNIT II FLUID POWER DRIVES  
Fluid power drives- Pumps- working principle and construction details of gear, vane and piston pumps, hydraulic motor, Hydrostatic transmission drives and characteristics - Hydraulic Supply Components- Pneumatic power supply- Compressor, air distribution, air motors. Case study related to automotive application.

UNIT III FLUID POWER ELEMENTS  

UNIT IV HYDRAULIC AND PNEUMATIC CIRCUITS DESIGN  

UNIT V ELECTRO PNEUMATICS AND PLC CIRCUITS  
Use of electrical timers, switches, solenoid, relay, proximity sensors etc. Electro pneumatic sequencing Ladder diagram- PLC: – elements, function and selection- PLC programming- Ladder and different programming methods- Sequencing circuits. Case study related to automotive application.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course the student will be able to:  
i. Understand the basics of hydraulic and pneumatic systems  
ii. Examine the working of hydraulic power drives  
iii. Apply knowledge on fluid power elements  
iv. Design hydraulic and pneumatic systems.  
v. Evaluate the concept of programming in PLC circuits.

TEXT BOOKS:  

REFERENCES:  
COURSE OBJECTIVES:

i. To enhance the knowledge of the students about the various equipment's used in earth moving, applications.

ii. To understand the construction and working of the vehicle for constructional application

iii. To describe the working nature of farm equipment's based on their application.

iv. To discriminate the various industrial vehicles based on the purpose.

v. To acquire the knowledge on the functioning of military vehicle.

UNIT I  EARTH MOVING EQUIPMENTS
Construction layout, capacity and applications of dumpers, articulated haulers, front-end loaders, backhoe loaders, bulldozers, scrapers, motor graders, skid steer loaders, excavator, hydraulic shovels, bucket conveyors, surface miners – highwall Miners. Selection criteria of prime mover for dumpers.

UNIT II  CONSTRUCTIONAL EQUIPMENTS
Construction layout, capacity and applications of cranes – types, Articulated Trucks, concrete ready mixer, trenchers, Asphalt Pavers, road reclaimers, Compactors – types, draglines, drillers, borewell machine.

UNIT III  FARM EQUIPMENTS
Classification of tractors – Main components of tractor. Working attachment of tractors – Auxiliary equipment— Top lifting harvesters. General description, working, specification and functions paddy harvesting machines, Sugarcane harvesting, feller bunchers, forest machines.

UNIT IV  INDUSTRIAL VEHICLES
Constructional features, capacity and working of fork lifts, Utility vehicles, towing vehicles, man-lift chassis, scissor lift trucks, material handlers, reclaimers, Street sweepers.

UNIT V  MILITARY AND COMBAT VEHICLES
Special features and constructional details of Main Battle tank, gun carriers, transport vehicles, Armoured vehicle-launched bridge, amphibious bridging vehicle, communication vehicles.

COURSE OUTCOMES:
The students will be able to

i. Demonstrate their understanding about the operation of the various special purpose vehicle

ii. Understand the construction layout of earth moving equipment's.

iii. Have the ability to apply the knowledge to design a new concept for construction application.

iv. Demonstrate their skill in developing modern techniques for future farming vehicles

v. Distinguish the various military vehicle and infer their particular technology.

TEXT BOOKS:

REFERENCES:
1. B. Geleman and M. Moskovic, Farm tractors, MIR publishers, Moscow.
AU5072 VEHICLE CONTROL SYSTEMS

COURSE OBJECTIVES:

i. To understand the basics of control system used in automobiles
ii. To recognize the electronically controlled system used in driving mechanics.
iii. To understand the working principle of driver modelling and power train control systems.
iv. To identify the control system used in hybrid and electrical vehicles.
v. To illustrate the need of automated transport systems.

UNIT I INTRODUCTION TO VEHICLE CONTROL SYSTEM
Trends, overview and examples of vehicle control system- Sensors, actuators and controller modules- Vehicle communication Network- System Engineering- V-diagram- Algorithm Development - Steps in vehicle control system design- Degree of freedom for vehicle control- selection of controlled, manipulated, measured disturbance variables- classification of the variables in various automotive systems like engines, suspension, braking, air conditioning – General types of vehicle controller configurations- Feedback, Inferential, Feed-Forward, Ratio control.

UNIT II CONTROL SCHEMES, CRUISE AND HEADWAY CONTROL

UNIT III DRIVER MODELING AND POWERTRAIN CONTROL SYSTEMS

UNIT IV CONTROL OF HYBRID AND FUEL CELL VEHICLES
Series-Parallel- Split Hybrid Configurations- Hybrid Vehicle Control Hierarchy- Control Concepts of Series Hybrids- Equivalent Consumption minimization strategy- control concepts for split hybrid modelling of fuel cell systems- fuel stack model- control of fuel cell system.

UNIT V HUMAN FACTORS AND INTELLIGENT TRANSPORT SYSTEM
Human factors in vehicle automation- cross over model principle- Risk- Homeostatic Theory- Driving simulators- percentage of road departure Advanced traffic management system- Advanced traveller information system- commercial vehicle operation- Advanced vehicle control system- Preventing collisions- Longitudinal motion control and platoons- Site specific information-comparison of longitudinal control approaches- String stability- Automated steering and lateral control – Lane sensing- automated lane change and follow control.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

85
At the end of the course the student will be able to:

i. Understand the basics of control system used in automobiles
ii. Recognize the electronically controlled system used in driving mechanics.
iii. Understand the working principle of driver modelling and power train control systems.
iv. Identify the control system used in hybrid and electrical vehicles.
v. Illustrate the need of automated transport systems.

TEXT BOOKS:

REFERENCES:

AU5011 NOISE, VIBRATION AND HARSHNESS L T P C
3 0 0 3

COURSE OBJECTIVES:
The course should enable the students to:

i. Understand the various types of vibration with damping and without damping.
ii. Understand the Various types of noise and its measurement and analysis techniques.
iii. Understand the various sources of noise from automobiles.
iv. Understand the various noise controlling techniques.
v. Understand the various noise from mechanical components and its suppressing techniques.

UNIT I FUNDAMENTALS OF ACOUSTICS AND NOISE, VIBRATION

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

UNIT III ENGINE NOISE AND VIBRATION—SOURCES, PREDICTION, AND CONTROL
UNIT IV  TRANSPORTATION NOISE AND VIBRATION SOURCES—PREDICTION AND CONTROL


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


COURSE OUTCOMES:
The students should be able to understand:

i. Classification of vibration of free, forced, Undamped, damped, linear, nonlinear Vibration Response of damped and Undamped systems under harmonic force, analysis of single degree and two degree of freedom systems, torsional vibration, Determination of natural frequencies.


iii. Vibration isolation by tuned absorbers, untuned viscous dampers. Damping treatments, application dynamic forces generated by IC engines, engine isolation, Crank shaft damping. Modal analysis of the mass elastic model shock absorbers.

iv. The application of engineering techniques, tools, for measurement methods in order to learn to control and solve complex Vehicle vibrations behaviour /as well as performance problems.


TEXT BOOKS:

REFERENCES:

TOTAL: 45 PERIODS
UNIT I CASTING 10

UNIT II MACHINING 10
Special consideration of machining of various components such as flywheel, piston rings, bearing bushes, and liners, permanent mould casting of piston.

UNIT III FORGING AND EXTRUSION PROCESS 10

UNIT IV POWDER METALLURGY AND PROCESSING OF PLASTICS 6

UNIT V RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS 10
Powder injection molding - Production of aluminium MMC liners for engine blocks - Plasma spray coated engine blocks and valves - Recent developments in auto body panel forming –Squeeze Casting of pistons - aluminium composite brake rotors. Sinter diffusion bonded idler sprocket – gas injection molding of window channel – cast con process for auto parts.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
By the end of this course, students will be able to
i. Identify the methods to manufacture the vehicle components
ii. Analyze the requirements of each component and material
iii. Differentiate between the casting and forming process
iv. Design the process for manufacturing vehicle components
v. Understand the advanced techniques used for manufacturing Automobile components
TEXT BOOKS:

REFERENCES:
2. High Velocity "Forming of Metals", ASTME, prentice Hall of India (P) Ltd., New Delhi, 1990
   HMT handbook

AU5013 NON TRADITIONAL MACHINING TECHNIQUES L T P C
3 0 0 3

COURSE OBJECTIVES:
At the end of this course the students are expected to
i. To understand the principles behind mechanical energy based processes.
ii. To learn the working principle of chemical and electro chemical processes.
iii. To study ultrasonic machining principles, equipment used, process parameters and applications.
iv. To study electrical discharge machining principles, equipment used, process parameters and applications.
v. To study laser beam machining, electron beam machining and electro chemical machining principles, equipment used, process parameters and applications.

UNIT I INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES 9
Introduction to non-traditional machining processes, need for non-traditional machining, classification of non-traditional machining processes, their applications, advantages, limitations. Abrasive jet machining, abrasive water jet machining, ultrasonic machining their working principles, equipment, effect of process parameters, applications, advantages and limitations.

UNIT II CHEMICAL AND ELECTRO CHEMICAL ENERGY BASED PROCESSES 9
Chemical machining, electro-chemical machining, electro-chemical honing, electro-chemical grinding, electro-chemical deburring their working principles, equipment, effect of process parameters, applications, advantages and limitations.

UNIT III THERMO-ELECTRIC ENERGY BASED PROCESSES 9
Electric discharge machining, wire electric discharge machining, laser beam machining, plasma arc machining, electron beam machining, ion beam machining their working principles, equipment, effect of process parameters, applications, advantages and limitations.

UNIT IV ADVANCED NANO FINISHING PROCESSES 9
Abrasive flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological finishing, magneto rheological abrasive flow finishing their working principles, equipment, effect of process parameters, applications, advantages and limitations.

UNIT V RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES 9
Recent developments in non-traditional machining processes, their working principles, equipment, effect of process parameters, applications, advantages and limitations. Comparison of non-traditional machining processes.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of this course the students are expected to
i. Understand the differences between conventional machining and unconventional machining
ii. Understand the principles of unconventional machining, transfer medium used, mechanism involved, equipment used.
iii. Understand the principles of abrasive jet machining, water jet machining, electrical discharge machining principles, equipment used, process parameters and applications.
iv. Understand the principles of laser beam machining, electron beam machining and electrochemical machining principles, equipment used, process parameters and applications.
v. Understand the principle behind the mechanical energy-based machining.

TEXT BOOKS:

REFERENCES:

AU5014 ROAD VEHICLE AERODYNAMICS

COURSE OBJECTIVES:
i. To learn the basics of fluid mechanics on vehicle motion.
ii. To expose to the shape optimization techniques followed in passenger car industry.
iii. To relate the influence of rolling resistance and air resistance of various commercial vehicles upon drag force.
iv. To interpret the relation between motorcycle shape and coefficient of drag.
v. To give insight to wind tunnel and road testing techniques practiced in industry.

UNIT I SCOPE OF ROAD VEHICLE AERODYNAMICS

UNIT II AIR RESISTANCE ON PASSENGER CARS

UNIT III AERODYNAMIC DRAG ON COMMERCIAL VEHICLES
UNIT IV: MOTORCYCLE AERODYNAMICS

UNIT V: WIND TUNNELS, MEASUREMENT AND TEST TECHNIQUES

TOTAL: 45 PERIODS

COURSE OUTCOMES:
1. Knowledge upon the forces & moments influencing drag.
2. Solve exercises related to fuel economy & drag.
3. Appraise upon the techniques of shape based optimization practiced in industry.
4. Awareness about the influence of rider position in motorcycle aerodynamics.
5. Expose to fundamentals of Experimental testing.

TEXT BOOKS:

REFERENCES:
1. R.H.Barnard - “Road vehicle aerodynamic design, An Introduction” , Mechaero publications, Third edition, 2010

AU5015 ALTERNATIVE AND ADVANCED FUELS FOR IC ENGINES

COURSE OBJECTIVES:
1. To acquire complete knowledge on availability of possible alternate fuels and their properties to use as fuel in CI and SI engines.
2. To develop knowledge all, the possible way of using alcohols as a fuel IN IC engines.
3. To understand the challenges and difficulties in using vegetable oil as an alternative fuel in internal combustion engines.
4. To identify the uses of hydrogen as fuel in IC engines as an alternative for fossil fuels.
5. To understand the usefulness of natural acquiring gases towards IC engines.

UNIT I: ALTERNATIVE FUELS, PROPERTIES AND TESTING METHODS OF FUELS
Need for alternative fuels. World and Indian energy scenario on alternative fuels. Production technologies for biofuels for internal combustion engines- Pyrolysis, gasification, digestion.

UNIT II: ALCOHOLS AS FUELS

UNIT III       VEGETABLE OILS AS FUELS
Various vegetable oils and their important properties. Different methods of using vegetable oils engines – Blending, preheating Transesterification and emulsification of Vegetable oils - Performance in engines – Performance, Emission and Combustion Characteristics in diesel engines. Role of Nano fluids, additives and cetane improvers for performance improvement of vegetable oils as fuel.

UNIT IV       HYDROGEN AS ENGINE FUEL

UNIT V       BIOGAS, LPG AND NATURAL GAS AS FUELS
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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The end of the course the student will be able to
i. Acquire complete knowledge on availability of possible alternate fuels and their properties to use as fuel in CI and SI engines.
ii. Develop knowledge in all the possible ways of using alcohols as a fuel in IC engines.
iii. Understand the challenges and difficulties in using vegetable oil as an alternative fuel in internal combustion engines.
iv. Identify the uses of hydrogen as fuel in IC engines as an alternative for fossil fuels.
v. Understand the usefulness of natural acquiring gases towards IC engines.

TEXT BOOKS:

REFERENCES
4. Technical papers of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogas etc.)

ME5072       COMPUTATIONAL TECHNIQUES FOR FLUID DYNAMICS
92
COURSE OBJECTIVES:
The main learning objective of this course is to prepare the students for:

1. Applying the fundamentals of CFD, and developing case specific governing equations.
2. Performing finite difference and finite volume based analysis for steady and transient diffusion problems.
3. Implementing various mathematical schemes under finite volume method for convention diffusion.
4. Solving complex problems in the field of fluid flow and heat transfer with the support of high speed computers.
5. Applying the various discretization methods, solution procedure and the concept of turbulence modeling.

UNIT I  GOVERNING EQUATIONS AND BOUNDARY CONDITIONS  9

UNIT II  FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION  9

UNIT III  FINITE VOLUME METHOD FOR CONVECTION DIFFUSION  9
Steady one-dimensional convection and diffusion – Central, upwind differencing schemes, properties of discretization schemes, Hybrid, Power-law, QUICK Schemes, Conservativeness, Boundedness, Transportiveness.

UNIT IV  FLOW FIELD ANALYSIS  9
Stream function and vorticity, Representation of the pressure gradient term, Staggered grid – Momentum equations, Pressure and Velocity corrections – Pressure Correction equation, SIMPLE algorithm and its variants – PISO Algorithms.

UNIT V  TURBULENCE MODELS AND MESH GENERATION  9
Turbulence models, mixing length model, Two equation (k-Ɛ) models – High and low Reynolds number models, Mesh Generation and refinement Techniques-software tools.

TOTAL = 45 PERIODS

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

1. Apply the fundamentals of CFD, and develop case specific governing equations.
2. Perform finite difference and finite volume based analysis for steady and transient diffusion problems.
3. Implement various mathematical schemes under finite volume method for convention diffusion.
4. Solve complex problems in the field of fluid flow and heat transfer with the support of high speed computers.
5. Apply the various discretization methods, solution procedure and the concept of turbulence modeling.

TEXT BOOKS:

REFERENCES:

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

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

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

UNIT I INTRODUCTION

UNIT II TQM PRINCIPLES

UNIT III TQM TOOLS & TECHNIQUES I

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

UNIT V QUALITY MANAGEMENT SYSTEM

COURSE OUTCOMES:
CO1: Ability to apply TQM concepts in a selected enterprise.
CO2: Ability to apply TQM principles in a selected enterprise.
CO3: Ability to understand Six Sigma and apply Traditional tools, New tools, Benchmarking and FMEA.

CO4: Ability to understand Taguchi's Quality Loss Function, Performance Measures and apply QFD, TPM, COQ and BPR.

CO5: Ability to apply QMS and EMS in any organization.

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

**TEXT BOOK:**

**REFERENCES:**

**NEW PRODUCT DEVELOPMENT**

**COURSE OBJECTIVES:**
1. To introduce the importance of product design
2. To understand the needs of a customer towards a product
3. To initiate the idea of creativeness on product
4. To understand the decision-making concepts.
5. To design a product based on cost frame and need of the customer.

**UNIT I  INTRODUCTION**
9
Need for developing products – the importance of engineering design – types of design – the design process – relevance of product lifecycle issues in design – designing to codes and standards- societal considerations in engineering design – generic product development process – various phases of product development-planning for products – establishing markets- market segments- relevance of market research.

**UNIT II  CUSTOMER NEEDS**
9

**UNIT III  CREATIVE THINKING**
9
UNIT IV DECISION MAKING AND PRODUCT ARCHITECTURE


UNIT V DESIGN AND COST ANALYSIS


COURSE OUTCOMES:

i. Introduce the importance of product design
ii. Understand the needs of a customer towards a product
iii. Initiate the idea of creativeness on product
iv. Understand the decision-making concepts.
v. Design a product based on cost frame and need of the customer.

TEXT BOOKS:


REFERENCES:


AU5017 ADVANCED THEORY OF IC ENGINES

COURSE OBJECTIVES:

i. To impart knowledge in modern trends and developments in internal combustion engines.
ii. To understand the air standard cycles of an internal combustion engine.
iii. To acquire complete knowledge in engine modelling and combustion analysis of internal combustion engines.
iv. To develop knowledge in non-conventional engines and their operation in detail.
v. To examine the processes involved in internal combustion 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  ADVANCED CONCEPTS IN IC ENGINES  9

UNIT IV  NON CONVENTIONAL IC ENGINES  9

UNIT V  COMBUSTION ANALYSIS IN IC ENGINES  9
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.  
TOTAL: 45 PERIODS

COURSE OUTCOMES:
At the end of the course the student will be able to
i. Acquire knowledge in modern trends and developments in internal combustion engines.
ii. Examine the air standard cycles of an internal combustion engine.
iii. Evaluate engine modeling and combustion analysis of internal combustion engines.
iv. Employ the non-conventional engines and their operation.
v. Understand the processes involved in internal combustion engines.

TEXT BOOKS:

REFERENCES:

AU5018  AUTOMOTIVE MATERIALS  L T P C
3 0 0 3

COURSE OBJECTIVES:
i. Knowledge on properties of engineering materials
ii. To select suitable materials for design
iii. Materials selection criteria for engine and transmission systems
iv. Different materials used for automotive structures.
v. Different electronic materials for automotive applications
UNIT I ENGINEERING MATERIALS AND THEIR PROPERTIES
Classes of engineering materials - the evolution of engineering materials, Definition of materials properties, displaying material properties using materials selection charts, Forces for change in materials selection and design, Materials and the environment-selection of materials for automotive applications.

UNIT II BASIS OF MATERIAL SELECTION

UNIT III MATERIALS FOR ENGINES AND TRANSMISSION SYSTEMS
Materials selection for IC engines: Piston, piston rings, cylinder, Engine block, Connecting rod, Crank shaft, Fly wheels, Gear box, Gears, Splines, Clutches.

UNIT IV MATERIALS FOR AUTOMOTIVE STRUCTURES
Materials selection for bearings, leaf springs, chassis & frames, Bumper, shock absorbers, wind screens, panels, brake shoes, Disc, wheels, differentials, damping and antifriction fluids, Tires and tubes.

UNIT V ELECTRONIC MATERIALS FOR AUTOMOTIVE APPLICATIONS

COURSE OUTCOMES:
The student will be able to:
   i. Gain knowledge on different class of materials and their applications
   ii. Understand the Selection criteria for various components and importance.
   iii. Understand different materials used for automotive engines and transmission.
   iv. Select proper material for Automobile applications
   v. Understand different materials used for sensors in a vehicle

TEXT BOOKS:

REFERENCES:
COURSE OBJECTIVES:
The objective of this course is to make the students to
i. design the power unit
ii. analyse different frames used in two wheelers
iii. apply the design aspects of transmission system
iv. analyse the suspension system used in two wheelers.
v. design three wheelers for different application

UNIT I POWER UNIT

UNIT II CHASSIS AND SUB – SYSTEMS

UNIT III TRANSMISSION SYSTEM
Pre-unit, gearbox and final drive. Design of clutch. Types of clutches and gear boxes. CVT. Gear change mechanism. Belt, chain and shaft drive. Freewheeling devices, starting systems.

UNIT IV TYPES OF MOTORCYCLES AND ALL TERRAIN VEHICLLESS

UNIT V INTRODUCTION TO THREE-WHEELERS
Autorickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission, wheel types, wheel mountings attachment, tyre types. Brake systems.

COURSE OUTCOMES:
On successful completion of this course students will be able to:
i. design the power unit used in two wheelers
ii. analyse different frames used in two wheelers
iii. analyse the transmission system
iv. analyse the suspension system used in two wheelers.
v. design three wheelers for different application

TEXT BOOK:

REFERENCES:
1. K. K. Ramalingam, Two Wheelers, Scitech publications, Chennai
3. Motorcycle mechanics, By George Lear,1977
COURSE OBJECTIVES:
To import knowledge on:
   i. Maintenance procedure
   ii. Engine and subsystem maintenance
   iii. Transmission system maintenance

UNIT I  MAINTENANCE, WORKSHOP PRACTICES, SAFETY AND TOOLS  9

UNIT II  ENGINE AND SUBSYSTEM MAINTENANCE  9
Engine service- Dismantling of Engine components - Engine tuning - 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  9
Clutch- general checks, adjustment and service- Dismantling, identifying, checking and reassembling transmission, transaxle- road testing- Removing and replacing propeller shaft, servicing of universal 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  9

UNIT V  AUTO ELECTRICAL, AIR CONDITIONING AND VEHICLE BODY MAINTENANCE  9
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

COURSE OUTCOMES:
Upon the completion of the course student can able to understand:
   i. The importance of maintenance
   ii. sub systems of engine
   iii. Transmission
   iv. Electric system
   v. Body repair

TEXT BOOKS:

REFERENCES:
ii. Vehicle Service Manuals from different manufacturers
iii. William Crouse, Donald Anglin Automotive Mechanics

AU5071 AUTOMOTIVE INSTRUMENTATION AND TESTING  L  T  P  C
3 0 0 3

COURSE OBJECTIVES:
i. To provide theoretical and applicative knowledge in automobile test instrumentation.
ii. To identify the various instruments for measuring force, torque, pressure, temperature, fluid flow, velocity and rotational speed.
iii. To enhance the knowledge of students regarding the experimental methods followed in industries.
iv. To familiarize the students on standard test codes.
v. To impart skills on the testing procedure followed for evaluating brake, engine and vehicle.

UNIT I  MECHANICAL MEASUREMENT  9
Introduction to measurements – Construction, principle, working of Instruments for measuring force, torque, pressure, temperature, fluid flow, velocity, rotational speed.

UNIT II  VIBRATION AND BODY TEST  9
Vibration measurement instrument – accelerometer and signal conditioning. Dynamic simulation sled testing, methodology, vehicle acceleration measurement and documentation. Dolly roll over test, dolly role over fixture, photographic / video coverage. Vehicle roof strength test – Door system crush test – wind tunnel tests.

UNIT III  CRASH AND BRAKE TEST  9
Crash tests – standards – road hazard impact test for wheel and tyre assemblies, test procedures, failure and performance criteria. Bumpers - types of tests, pendulum test, fixed collision barrier test, procedure, performance criteria. Air and hydraulic brake test, air brake actuator, valves test, performance requirements.

UNIT IV  ENGINE EXPERIMENTAL TECHNIQUES  9
I.S Code for Engine testing – Instruments for performance testing of engine, Instrumentation for measuring noise, vibration in cylinder, different types of engine tests are performed within the industry.

UNIT V  VEHICLE EXPERIMENTAL TECHNIQUES  9
Laboratory tests - test tracks - Endurance Tests - Dynamic cornering fatigue, dynamic radial fatigue tests – procedure, bending moment and radial load calculations.

TOTAL: 45 PERIODS

COURSE OUTCOMES:
The students will be able to
i. Demonstrate the understanding of engine testing procedures.
ii. Develop a measurement strategy for temperature, pressure, mass flow, velocity.
iii. Understand sensors and instrumentation, and to analyse and interpret test data.
iv. Develop new system that would help in keeping the environment sustainable.
v. Demonstrate the understanding of brake testing procedures

TEXT BOOKS:

REFERENCES:

AU5021 INTRODUCTION TO OPERATIONS RESEARCH

COURSE OBJECTIVES:
i. To introduce the concepts in optimization of resources for manufacturing and service-based industries.
ii. To introduce students to use quantities methods and techniques for effective decision-making; model formulation and applications that are used in solving business decision problems.
iii. Enlighten the students with the various optimization techniques to understand and apply in industrial operations.
iv. To introduce the concepts in optimization of resources for manufacturing and service-based industries.

UNIT I LINEAR PROGRAMMING PROBLEMS
OR-Definition - Phases - models, LP problems formulation – Graphical solution, GLPP, Standard and Canonical forms of LPP- simplex methods- Big M, Two phase methods, Alternate optimal solutions, Duality in LP.

UNIT II TRANSPORTATION
Transportation problems- Basic feasible solution, Optimal solution By MODI method, Balanced and Unbalanced TP, Degeneracy, Production problems. Assignment problems – Hungarian method Traveling salesman problems - Sequencing models- Johnson algorithm, n job 2 machines, n job 3 machines and n job m machines.

UNIT III INVENTORY CONTROL
Types of inventory- Inventory cost - EOQ - Deterministic inventory problems – Purchase and Production models with and without shortages-EOQ with price breaks - Stochastic inventory problems - Multi product problems - Systems of inventory control (P and Q Systems) - Determination of buffer stock and re-order levels -Selective inventory control techniques (ABC, VED, SDE, etc.)

UNIT IV QUEUING THEORY
UNIT V  PROJECT MANAGEMENT AND REPLACEMENT MODELS  9

Project management: Network logic – Ford-Fulkerson’s rule - AON diagram - CPM and PERT techniques, Critical path and float calculations Replacement models - types of failures – Gradual failures-replacement of items: Efficiency deteriorates with time, sudden failures- individual and group replacement policies.

COURSE OUTCOMES:

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

i. Recognize the importance and value of Operations Research and mathematical modelling in solving practical problems in industry;

ii. Formulate a managerial decision problem into a mathematical model;

iii. Understand Operations Research models and apply them to real-life problems;

iv. Understand and apply the operations research techniques in industrial operations.

v. Introduce the concepts in optimization of resources for manufacturing and service-based industries.

TOTAL: 45 PERIODS

TEXT BOOKS:


REFERENCES:


AU5022  RENEWABLE SOURCES OF ENERGY  L T P C

COURSE OBJECTIVES:

The objective of the courses is to develop in-depth knowledge for the following:

i. Various renewable energy resources available at a location and assessments of its potential, using tools and techniques.

ii. Solar energy radiation, its interactions, measurement and estimation.


iv. Site selection for wind turbines, wind systems, measurements and instruments.

v. Geothermal, wave, tidal and OTEC resources, site selection.

UNIT I  INTRODUCTION TO RENEWABLE ENERGY SOURCES  9

World energy usage - reserves for world energy resources. Principles of renewable energy - renewable energy resources and their importance. Conventional and non-conventional fuels.
Review of possible renewable energy resources. Scientific principles, technical implications, and social implications.

UNIT II  SOLAR ENERGY

UNIT III  BIOMASS AND BIOENERGY

UNIT IV  WIND ENERGY

UNIT V  OTHER RENEWABLE ENERGIES

TOTAL: 45 PERIODS

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

i. Know the importance of renewable energy sources utilization and various renewable energy technologies.
ii. Describe the use of solar energy and the various components used in the energy production with respect to applications like - heating, cooling, desalination, power generation, drying, cooking etc.
iii. Understand the concept of Biomass energy resources and their classification, types of biogas Plants- applications
iv. Appreciate the need of Wind Energy and the various components used in energy generation and know the classifications.
v. Acquire the knowledge of wave power, tidal power and geothermal principles and applications.

TEXT BOOKS:

REFERENCES:
AU5023 VEHICLE AIR-CONDITIONING  

L T P C  
3 0 0 3  

COURSE OBJECTIVES:
   i. To solve the simple problems related to psychrometry and refrigerant.
   ii. To understand the operation of the individual components of the A/System, sensors, actuators and electronic control.
   iii. To understand the range of techniques that can be used in diagnosing
   iv. To identify faults which affect system performance.
   v. To provide adequate knowledge in safe working practice. Understanding the correct procedures for A/C service and repair.

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
Types of Control devices- Preventing Compressor damage- Preventing damage to other systems- Maintaining drive ability- 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
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
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

COURSE OUTCOMES:
At the end of the course the student will be able to
i. Solve the simple problems related to psychrometry and refrigerant
ii. Understand the operation of the individual components of the A/System, sensors, actuators and electronic control
iii. Understand the range of techniques that can be used in diagnosing
iv. Identify faults which affect system performance
v. Provide adequate knowledge in safe working practice. Understanding the correct procedures for A/C service and repair

TEXT BOOKS:

REFERENCES:

AD5091 CONSTITUTION OF INDIA L T P C 3 0 0 0

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

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

UNIT II CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES

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

UNIT IV EMERGENCY PROVISIONS

UNIT V LOCAL ADMINISTRATION

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

TOTAL: 45 PERIODS

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

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

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

AD5092 VALUE EDUCATION  L T P C 3 0 0 0

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

UNIT I INTRODUCTION TO VALUE EDUCATION 9
Values and self-development –Social values and individual attitudes, Work ethics, Indian vision of humanism, Moral and non-moral valuation, Standards and principles, Value judgements

UNIT II IMPORTANCE OF VALUES 9
Importance of cultivation of values, Sense of duty, Devotion, Self-reliance, Confidence, Concentration, Truthfulness, Cleanliness. Honesty, Humanity, Power of faith, National Unity, Patriotism, Love for nature, Discipline

UNIT III INFLUENCE OF VALUE EDUCATION 9
Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking, Integrity and discipline, Punctuality, Love and Kindness, Avoid fault Thinking, Free from anger, Dignity of labour, Universal brotherhood and religious tolerance, True friendship Happiness Vs suffering, love for truth.

UNIT IV REINCARNATION THROUGH VALUE EDUCATION 9

UNIT V VALUE EDUCATION IN SOCIAL EMPOWERMENT 9
Equality, Non violence, Humility, Role of Women, All religions and same message, Mind your Mind, Self-control, Honesty, Studying effectively

TOTAL: 45 PERIODS

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

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

REFERENCES:
support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.

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

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

TOTAL: 45 PERIODS

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

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

REFERENCES:

COURSE OBJECTIVES:
- Develop healthy mind in a healthy body thus improving social health also improve efficiency
- Invent Do’s and Don’ts in life through Yam
- Categorize Do’s and Don’ts in life through Niyam
- Develop a healthy mind and body through Yog Asans
- Invent breathing techniques through Pranayam

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

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

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

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

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

TOTAL: 45 PERIODS

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

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

REFERENCES:
1. "Rajayoga or conquering the Internal Nature" by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata
2. ‘Yogic Asanas for Group Training-Part-I’: Janardan Swami Yogabhyasi Mandal, Nagpur

AD5095 PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

COURSE OBJECTIVES:
- Develop basic personality skills holistically
- Develop deep personality skills holistically to achieve happy goals
- Rewrite the responsibilities
- Reframe a person with stable mind, pleasing personality and determination
- Discover wisdom in students

UNIT I    NEETISATKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - I
UNIT II NEETISATAKAM-HOLISTIC DEVELOPMENT OF PERSONALITY - II
Verses- 52,53,59 (don't's) - Verses- 71,73,75,78 (do's)

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

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

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

TOTAL: 45 PERIODS

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

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

REFERENCES:
1. Gopinath,Rashtriya Sanskrit Sansthanam P, Bhartrihari’s ThreeSatakam , Niti-sringar-vairagya, New Delhi,2010
2. Swami Swarupananda , Srimad Bhagavad Gita, Advaita Ashram,Publication Department, Kolkata, 2016

AD5097 ESSENCE OF INDIAN KNOWLEDGE TRADITION 3 0 0 0

COURSE OBJECTIVES
The course will introduce the students to
- get a knowledge about Indian Culture
- Know Indian Languages and Literature religion and philosophy and the fine arts in India
- Explore the Science and Scientists of Ancient, Medieval and Modern India
- Understand education systems in India

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

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

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

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

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

TOTAL: 45 PERIODS

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

REFERENCES:
5. Satya Prakash, “Founders of Sciences in Ancient India”, Vijay Kumar Publisher, 1989

AD5098 SANGA TAMIL LITERATURE APPRECIATION L T P C
3 0 0 0

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

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

UNIT II  ‘AGATHINAI’ AND ‘PURATHINAI’
9

UNIT III  ‘ATTRUPPADAI’.
9

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

UNIT V  ‘PATHITRUPATHTHU’
Pathitrupaththu in ‘Etuthogai’ – Pathitrupaththu’s Parables – Tamil dynasty: Valor, Administration, Charity in Pathitrupaththu - Message to Society from Pathitrupaththu.

TOTAL (L: 45) = 45 PERIODS

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

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>P</th>
<th>PS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.9</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.9</td>
<td></td>
</tr>
</tbody>
</table>

HSMC– ELECTIVES – HUMANITIES I (ODD SEMESTER)

HU5171  LANGUAGE AND COMMUNICATION  L  T  P  C
COURSE DESCRIPTION
This course offers an introduction to language and communication. The primary goal of this course is to familiarize students with key ideas related to communication using language as well as nonverbal means. Ideas related to the use of language and the underlying power structures are also examined. The course also examines the role of media in communication and in the dissemination of ideas as well as opinions.

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

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

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

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

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

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

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

TOTAL : 45 PERIODS

TEXT BOOKS:

HU5172 VALUES AND ETHICS

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

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

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

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

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

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

TOTAL: 45 PERIODS

OUTCOMES:
CO1: Able to understand definition and classification of values.
CO2: Able to understand purusartha.
CO3: Able to understand sarvodaya idea.
CO4: Able to understand sustenance of life.
CO5: Able to understand views of hierarchy of values.
TEXT BOOKS:
2. Little, William, : An Introduction of Ethics (Allied Publisher, Indian Reprint 1955)

HU5173  HUMAN RELATIONS AT WORK  L T P C
3  0  0  3

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

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

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

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

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

UNIT V  DEVELOPING CAREER THRUST

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to
CO1: Understand the importance of self-management.
CO2: Know how to deal with people to develop teamwork.
CO3: Know the importance of staying healthy.
CO4: Know how to manage stress and personal problems.
CO5: Develop the personal qualities essential for career growth.
TEXT BOOK:

REFERENCES:

HU5174 PSYCHOLOGICAL PROCESSES L T P C 3 0 0 3

COURSE DESCRIPTION
Psychological Processes course is designed for students to be aware of the basic principles of psychology for the better understanding of people's psyche and behaviour around them. This course enables learners to use the optimal use of different forms of thinking skills and thereby results in effective communication in diverse situations. Every unit of the syllabus highlights the psychological process of people, the most powerful and constructive use of perceptions.

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

UNIT I INTRODUCTION

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

UNIT III COGNITION & AFFECT
UNIT IV THINKING, PROBLEM-SOLVING & DECISION MAKING


UNIT V PERSONALITY & INTELLIGENCE

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

REFERENCES
Understand the various apps of technology apps and use them to access, generate and present information effectively.

Apply technology based resources and other media formats equitably, ethically and legally.

Integrate their technical education for betterment of society as well as their personal life.

UNIT I INDIAN EDUCATION SYSTEM
Gurukul to ICT education – Teacher as facilitator – Macaulay’s Minutes – English medium vs Regional medium – Importance of Education in Modern India - Challenges in Education

UNIT II LEARNING THEORIES

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

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

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

Total: 45 Periods

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

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

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

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

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

UNIT I    KNOWLEDGE


UNIT II    ORIGIN


UNIT III    WORD


UNIT IV    KNOWLEDGE AS POWER/OPPRESSION


UNIT V    SELF KNOWLEDGE/BRAHMAN


TOTAL : 45 PERIODS

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

REFERENCES:
7. Bacon, Francis: Power as Knowledge

HU5177 APPLICATIONS OF PSYCHOLOGY IN EVERYDAY LIFE L T P Č 3 0 0 3

UNIT I INTRODUCTION Nature and fields.
UNIT II PSYCHOLOGY IN INDUSTRIES AND ORGANIZATIONS Job analysis; fatigue and accidents; consumer behavior.
UNIT III PSYCHOLOGY AND MENTAL HEALTH Abnormality, symptoms and causes psychological disorders
UNIT IV PSYCHOLOGY AND COUNSELING Need of Counseling, Counselor and the Counsellee, Counseling Process, Areas of Counseling.
UNIT V PSYCHOLOGY AND SOCIAL BEHAVIOUR Group, group dynamics, teambuilding, Prejudice and stereotypes; Effective Communication, conflict and negotiation.

TOTAL: 45 PERIODS

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

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

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

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

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

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

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

UNIT III: Gender Development Issues
- Identifying Gender Issues
OBJECTIVES:
- Gender Sensitive Language
- Gender, Governance and Sustainable Development
- Gender and Human Rights
- Gender and Mainstreaming

Texts:
2. Tell Us Marx (Poem, Mallika Sengupta, Translated by Sanjukta Dasgupta)

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

Texts:
1. Lights Out (Play, Manjula Padmanabhan)
2. Lights Out (Video of play enacted)

UNIT V: Gender and Culture
- Gender and Film
- Gender, Media and Advertisement

Texts:
1. Mahanagar (Movie: Satyajit Ray)
2. Beti Bachao Beti Padhao Advertisements

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

ASSESSMENT AND GRADING:
Discussion & Classroom Participation: 20%
Project/Assignment: 30%
End Term Exam: 50%
UNIT I  HUMAN LIFE, ITS AIM AND SIGNIFICANCE
The concept of a successful life, happy life and a meaningful life, Ethical and decision making capability and its development: Meaning of Ethical dilemma, sharing real life experiences.

UNIT II  CREATIVE AND LEADERSHIP ABILITY AND THEIR DEVELOPMENT
Intellectual, Emotional, Creative, Ethico - spiritual development, Aesthetic sense, Self-dependency, Activeness, Development of positive attitude.

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

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

UNIT V  DILEMMA BETWEEN MATERIALISTIC DEVELOPMENT AND HUMAN WELFARE

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

TOTAL:45 PERIODS

UNIT I  THE LEGAL SYSTEM: SOURCES OF LAW AND THE COURT STRUCTURE  9
Enacted law -Acts of Parliament are of primary legislation, Common Law or Case law- Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courtiers. (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court) Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration.
UNIT II  LAWS
Basic principles of contract law, sale of goods law, laws relating to industrial pollution, accident, environmental protection, health and safety at work, patent law, constitutional law: the supreme law of the land, Information technology law and cyber crimes.

UNIT III  BUSINESS ORGANISATIONS
Sole traders (Business has no separate identity from you, all business property belongs to you).


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

UNIT V  CASE STUDIES
Important legal disputes and judicial litigations

TOTAL: 45 PERIODS

HU5274  FILM APPRECIATION

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

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

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

UNIT II  EVOLUTION OF FILM

UNIT III  FILMS ACROSS THE WORLD

UNIT IV  INDIAN FILMS
UNIT V INTERPRETING FILMS

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

TOTAL: 45 PERIODS

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

- Recognize types of films, their impact on society and their roles in our lives.
- Have an understanding of the concepts of storytelling, Mise en Scene, and other elements of film making.
- Interpret the underlying messages in the movies.

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

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

Internal (100 % weightage)
- Assignment 1: Write a movie review with critical analysis (20 marks).
- Assignment 2: Write a script for a scene taken from a short story / novella (20 marks).
- Presentation: Students choose any one topic related to films and present it to the audience. (25 marks)
- Group discussion: Students discuss in groups on the various aspects of movies and its impact on society. (25 marks)
- Blog entry: Making weekly blog posts in Class Blog on the topics related to the course posted by the instructor and commenting on others’ posts. (10 marks)

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

HU5275 FUNDAMENTALS OF LANGUAGE AND LINGUISTICS

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

UNIT I   LANGUAGE AND LINGUISTICS: AN OVERVIEW

UNIT II  MORPHOLOGY - WORDS OF LANGUAGE

UNIT III  SYNTAX- THE SENTENCE PATTERNS OF LANGUAGE AND SEMANTICS-THE MEANING OF LANGUAGE

UNIT IV  PHONETICS – THE SOUNDS OF LANGUAGE

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

TOTAL : 45 PERIODS

TEACHING METHODS:
Lectures, discussion.

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

REFERENCES:

HU5276  UNDERSTANDING SOCIETY AND CULTURE THROUGH LITERATURE

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

UNIT I   INTRODUCTION
Why study literature? Tracing the origin – pictures. Tokens as precursors of writing. Movement from three dimensions to two dimensions- Pictography. From visual to oral -Logography. Reading out literature to young children- Edmund J Farrell.
UNIT II       READING CULTURE
Reading culture through language, signs and consumables- Roland Barthes. Culture through poems- Nissim Ezekiel’s ‘The night of the Scorpion’ . ‘Nothing’s Changed’- Tatamkhulu Afrika- Apartheid. Ruskin Bond- 'Night train at Deoli’- How real life is different from movies.

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

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

UNIT V       RETURNING TO PICTURES

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

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