PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):
I. Students will excel in their professional career in automobile industry and research with highest professional and ethical standards to their activities by acquiring knowledge in basic engineering, mathematics, science and automobile engineering.
II. Students will exhibit professionalism, teamwork in their chosen profession and adapt to current trends, technologies and industrial scenarios by pursuing lifelong learning.

PROGRAMME OUTCOMES (POs):
1. Graduate will demonstrate strong basics in mathematics, science and Engineering
2. Graduate will demonstrate the ability to design and conduct Experiments, as well as to analyze and interpret data.
3. Graduate will demonstrate the ability to 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.
4. Graduate will become familiar with modern Engineering tools and analyse the problems within the domains of Automobile Engineering as the members of multidisciplinary teams.
5. Graduate will acquire the capability to identify, formulate and solve complex engineering problems related to Automobile Engineering
6. Graduate will demonstrate and understanding of professional and ethical responsibility with reference to their career in the field of Automobile Engineering
7. Graduate will be able to communicate effectively both in verbal non-verbal forms
8. Graduate will be trained towards developing the impact of development of Automobile engineering on global, economic environment and societal context
9. Graduate will be capable of understanding the value for life-long learning
10. Graduate will demonstrate knowledge of contemporary issues focusing on the necessary to develop new material, design, and engineering practice in the field of Automobile Engineering
11. Graduate will demonstrate the ability to use the techniques, skills and Modern engineering tools necessary for engineering practice in the field of Automobile Engineering
12. Graduate will have a firm scientific, technological and communication base that helps them either to find a desire placement or to become an Entrepreneur and explore their knowledge in their field.
13. Graduate will be capable of doing higher studies and research in inter and multidisciplinary areas.
## CORRELATION BETWEEN POs AND PEOs

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Educational Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>PEO I</td>
</tr>
<tr>
<td>1.</td>
<td>Graduate will demonstrate strong basics in mathematics, science and Engineering</td>
<td>✓</td>
</tr>
<tr>
<td>2.</td>
<td>Graduate will demonstrate the ability to design and conduct Experiments, as well as to analyze and interpret data.</td>
<td>✓</td>
</tr>
<tr>
<td>3.</td>
<td>Graduate will demonstrate the ability to 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>
<td>✓</td>
</tr>
<tr>
<td>4.</td>
<td>Graduate will become familiar with modern Engineering tools and analyse the problems within the domains of Automobile Engineering as the members of multidisciplinary teams.</td>
<td>✓</td>
</tr>
<tr>
<td>5.</td>
<td>Graduate will acquire the capability to identify, formulate and solve complex engineering problems related to Automobile Engineering.</td>
<td>✓</td>
</tr>
<tr>
<td>6.</td>
<td>Graduate will demonstrate and understanding of professional and ethical responsibility with reference to their career in the field of Automobile Engineering.</td>
<td>✓</td>
</tr>
<tr>
<td>7.</td>
<td>Graduate will be able to communicate effectively both in verbal and nonverbal forms.</td>
<td>✓</td>
</tr>
<tr>
<td>8.</td>
<td>Graduate will be trained towards development of Automobile engineering environment and societal context.</td>
<td>✓</td>
</tr>
<tr>
<td>9.</td>
<td>Graduate will be capable of understanding the value for life-long learning.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Graduate will demonstrate knowledge of contemporary issues focusing on the necessary to develop new material, design, and engineering practice in the field of Automobile Engineering.</td>
<td>✓</td>
</tr>
<tr>
<td>11.</td>
<td>Graduate will demonstrate the ability to use the techniques, skills and Modern engineering tools necessary for engineering practice in the field of Automobile Engineering.</td>
<td>✓</td>
</tr>
<tr>
<td>12.</td>
<td>Graduate will have a firm scientific, technological and communication base that helps them either to find a desire placement or to become an Entrepreneur and explore their knowledge in their field.</td>
<td>✓</td>
</tr>
<tr>
<td>13.</td>
<td>Graduate will be capable of doing higher studies and research in inter and multi-disciplinary areas.</td>
<td>✓</td>
</tr>
<tr>
<td>Year</td>
<td>Semester</td>
<td>Courses</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>Automotive Chassis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automotive Engines and Subsystems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automotive Transmission</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advanced Numerical Methods</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Elective I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Elective II</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Engine and Chassis Laboratory</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Engine Management Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automotive Pollution and Control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Electric and Hybrid Vehicles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vehicle Dynamics</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Elective III</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Elective IV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automotive Electrical and Electronics Laboratory</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Chassis Management Systems</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Elective V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Elective VI</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Computer Aided Vehicle Design Laboratory</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Project Work Phase I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project Work Phase II</td>
</tr>
</tbody>
</table>
### ANNA UNIVERSITY, CHENNAI
### AFFILIATED INSTITUTIONS
### REGULATIONS - 2017
### M.E. AUTOMOBILE ENGINEERING
### CHOICE BASED CREDIT SYSTEM
### I TO IV SEMESTERS CURRICULUM AND SYLLABUS

#### SEMESTER I

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AM5101</td>
<td>Automotive Chassis</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>AM5102</td>
<td>Automotive Engines and Subsystems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AM5103</td>
<td>Automotive Transmission</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>MA5153</td>
<td>Advanced Numerical Methods</td>
<td>FC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective I</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Professional Elective II</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>AM5111</td>
<td>Engine and Chassis Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<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>26</td>
<td>18</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<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>
</tr>
</tbody>
</table>

#### SEMESTER II

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AM5201</td>
<td>Engine Management Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>AM5202</td>
<td>Automotive Pollution and Control</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AM5203</td>
<td>Electric and Hybrid Vehicles</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AM5204</td>
<td>Vehicle Dynamics</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Professional Elective III</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Professional Elective IV</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>AM5211</td>
<td>Automotive Electrical and Electronics Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>AM5212</td>
<td>Technical Seminar - I</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>24</td>
<td>18</td>
<td>6</td>
<td>21</td>
</tr>
</tbody>
</table>

### CATEGORY
- **PC**: Theory
- **PE**: Practical
- **EEC**: Laboratory
- **C**: Contact Periods

### TOTAL CONTACT PERIODS
- **L**: Lecture
- **T**: Tutorial
- **P**: Practical
- **C**: Contact Periods

### TOTAL CONTACT PERIODS
- **L**: Lecture
- **T**: Tutorial
- **P**: Practical
- **C**: Contact Periods
**SEMESTER III**

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AM5301</td>
<td>Chassis Management Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Professional Elective V</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Professional Elective VI</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>AM5311</td>
<td>Computer Aided Vehicle Design Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>AM5312</td>
<td>Technical Seminar - II</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>AM5313</td>
<td>Project Work Phase I</td>
<td>EEC</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>27</td>
<td>9</td>
<td>0</td>
<td>18</td>
<td>18</td>
</tr>
</tbody>
</table>

**SEMESTER IV**

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>AM5411</td>
<td>Project Work Phase II</td>
<td>EEC</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>

TOTAL CREDITS TO BE EARNED FOR THE AWARD OF DEGREE = 73
### FOUNDATION COURSES (FC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MA5153</td>
<td>Advanced Numerical Methods</td>
<td>FC</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

### PROFESSIONAL CORE (PC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AM5101</td>
<td>Automotive Chassis</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>AM5102</td>
<td>Automotive Engines and Subsystems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>AM5103</td>
<td>Automotive Transmission</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>AM5111</td>
<td>Engine and Chassis Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>AM5201</td>
<td>Engine Management Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>AM5202</td>
<td>Automotive Pollution and Control</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>AM5203</td>
<td>Electric and Hybrid Vehicles</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>AM5204</td>
<td>Vehicle Dynamics</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>AM5211</td>
<td>Automotive Electrical and Electronics Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>AM5301</td>
<td>Chassis Management Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td>AM5311</td>
<td>Computer Aided Vehicle Design Laboratory</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>
## SEMESTER I (Elective I & II)

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AM5001</td>
<td>Advanced Thermodynamics for Automobile Engineers</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AM5002</td>
<td>Alternative Fuels</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AM5003</td>
<td>Hydraulic and Pneumatic Systems</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AM5004</td>
<td>IC Engine process Modeling</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AM5005</td>
<td>Production of Automobile Components</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AM5006</td>
<td>Theory of Fuels and Lubricants</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>AM5007</td>
<td>Vehicle Design and Data Characteristics</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>EY5151</td>
<td>Fluid Mechanics and Heat Transfer</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

## SEMESTER II (Elective III & IV)

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AM5008</td>
<td>Automotive Air Conditioning Systems</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AM5009</td>
<td>Combustion Thermodynamics and Heat</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AM5010</td>
<td>Vehicle Body Engineering</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AM5011</td>
<td>Finite Element Methods in Automobile Engineering</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AM5012</td>
<td>Simulation of Vehicle systems</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AM5013</td>
<td>Two and Three Wheelers</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>TE5071</td>
<td>Computational Fluid Dynamics for Thermal Systems</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>AM5014</td>
<td>Automotive Electrical Technology</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

## SEMESTER III (Elective V & VI)

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AM5015</td>
<td>Automotive Aerodynamics</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AM5016</td>
<td>Automotive Safety</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AM5017</td>
<td>Instrumentation and Experimental Techniques</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AM5018</td>
<td>Special Types of Vehicles</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AM5019</td>
<td>Vehicle Maintenance</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AM5020</td>
<td>Transport Management</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>MF5072</td>
<td>Research Methodology</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>AM5021</td>
<td>Automotive Testing and Certification</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
## EMPLOYABILITY ENHANCEMENT COURSES (EEC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>AM5212</td>
<td>Technical Seminar - I</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>AM5312</td>
<td>Technical Seminar - II</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>AM5313</td>
<td>Project Work Phase I</td>
<td>EEC</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>4.</td>
<td>AM5411</td>
<td>Project Work Phase II</td>
<td>EEC</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- Study of the Constructional details and Theory of important drive line, Structural, Steering, Braking and Suspension Systems of Automobiles. Problem–Solving in Steering Mechanism, Propeller Shaft, Braking and Suspension Systems are to be done.

UNIT I  LAYOUT, FRAME, FRONT AXLE AND STEERING SYSTEM  13

UNIT II  DRIVE LINE, FINAL DRIVE AND DIFFERENTIAL  12

UNIT III  REAR AXLES, WHEELS, RIMS AND TYRES  11

UNIT IV  SUSPENSION SYSTEM  12
Requirements of Suspension System, Types of Suspension – Constructional details and characteristics of Single Leaf, Multi–Leaf spring, Coil spring and Torsion bar, Rubber, Pneumatic and Hydro – elastic Suspension, Independent Suspension System, Shock Absorbers.

UNIT V  BRAKE SYSTEM  12

TOTAL : 60 PERIODS

OUTCOMES:
At the end of this course the student should be able to
- Understand of the Constructional details of chassis, know the important drive line, Structural, Steering, Braking and Suspension Systems of Automobiles.
• Improve the Problem–Solving skill in Steering Mechanism, Propeller Shaft, Braking and Suspension systems.
• Acquire the importance of axle and tyre selection
• Understand the Dynamics of the chassis affecting vehicle characteristics

REFERENCES

AM5102 AUTOMOTIVE ENGINES AND SUBSYSTEMS

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

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

UNIT I ENGINE BASIC THEORY 9

UNIT II FUEL SUPPLY AND IGNITION SYSTEMS 9

UNIT III COOLING AND LUBRICATION SYSTEMS 9
Air cooling and water cooling – thermosyphon cooling, forced cooling systems. Fins and radiator - design aspects – properties of coolants. Theory of lubrication — types of lubrication, splash lubrication system, petroil lubrication system, forced feed lubrication system - properties of lubricants – Additives used in lubricants.

UNIT IV AIR MOTION, COMBUSTION AND COMBUSTION CHAMBERS 9
Importance of swirl, squish and turbulence - Combustion in SI and CI engines. - Premixed combustion, diffused combustion - laminar and turbulent combustion of fuels in engines - Droplet combustion — Cylinder pressure data and heat release analysis. Optimized design of combustion chambers- Supercharger and Turbochargers - VGT
UNIT V  ADVANCES IN ENGINE TECHNOLOGY

TOTAL : 45 PERIODS

OUTCOMES:
• To students will have the basic knowledge on Automotive Engines and its various sub components along with its functions.

REFERENCES

AM5103  AUTOMOTIVE TRANSMISSION  L  T  P  C
3  0  0  3

OBJECTIVES:
• The main objective of this course is to impart knowledge in automotive transmission. The detailed concept, construction and principle of operation of various types of mechanical transmission components, hydrodynamic devices, hydrostatic devisedes and automatic transmission system will be taught to the students. The design of clutch and gearbox will also be introduce to the students. At the end of the course the students will have command over automotive transmission concepts and application.

UNIT I  CLUTCH
Requirements of Transmission system. Clutches – Functions, Principle of operation and types – single plate, multi plate, diaphragm, centrifugal and overrunning clutches.

UNIT II  GEAR BOX
Purpose of gear box. Construction and working principle of sliding, constant and synchronmesh gear boxes. Problems on performance of automobile such as Resistance to motion, Tractive effort, Engine speed & power and acceleration. Determination of gear box ratios for different vehicle applications

UNIT III  HYDRODYNAMIC TRANSMISSION
UNIT IV AUTOMATIC TRANSMISSION


UNIT V HYDROSTATIC DRIVE AND ELECTRIC DRIVE


TOTAL : 45 PERIODS

OUTCOMES:

- At the end of the course the students will have command over automotive transmission concepts and applications like the constructional, working principle of various types of manual and automotive transmission of an automobile.
- The performance characteristics, design of clutch and gear box for different vehicle applications.
- The construction and working principles of hydrostatic drive and electric drives used in the automotive transmission system.

REFERENCES

1. Dr. N. K. Giri, “Automobile Mechanics”, Seventh reprint, Khanna Publishers, Delhi, 2005

MA5153 ADVANCED NUMERICAL METHODS

(Common to Environmental Science and Technology, Chemical Engineering and PRPC)

3 2 0 4

OBJECTIVES:

The course will develop numerical methods aided by technology to solve algebraic, transcendental and differential equations and to apply finite element methods for solving the boundary value problems in differential equations. The course will further develop problem solving skills and understanding of the application of various methods in solving engineering problems. This will also serve as a precursor for future research.
UNIT I ALGEBRAIC EQUATIONS 12+3

UNIT II ORDINARY DIFFERENTIAL EQUATIONS 12+3

UNIT III FINITE DIFFERENCE METHOD FOR TIME DEPENDENT PARTIAL DIFFERENTIAL EQUATIONS 12+3

UNIT IV FINITE DIFFERENCE METHODS FOR ELLIPTIC EQUATIONS 12+3
Laplace and Poisson’s equations in a rectangular region : Five point finite difference schemes, Leibmann’s iterative methods, Dirichlet's and Neumann conditions – Laplace equation in polar coordinates : Finite difference schemes – Approximation of derivatives near a curved boundary while using a square mesh.

UNIT V FINITE ELEMENT METHOD 12+3

TOTAL : 60+15 =75 PERIODS

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

- Solve an algebraic or transcendental equation, linear system of equations and differential equations using an appropriate numerical method.
- Solving the initial boundary value problems and boundary value problems using finite difference and finite element methods.
- Selection of appropriate numerical methods to solve various types of problems in engineering and science in consideration with the minimum number of mathematical operations involved, accuracy requirements and available computational resources.

REFERENCES:
AM5111 ENGINE AND CHASSIS LABORATORY

OBJECTIVES:
- The main objective of this course is to impart knowledge in the assembling and dismantling and study of different types of an engine and its various systems like steering system, transmission system, electrical system, ignition system, injection system and braking system. At the end of the course the student will be well versed in the assembling and dismantling of any vehicles.

LIST OF EXPERIMENTS
1. Performance and emission Test of Automotive SI Engine.
2. Performance and emission Test of Automotive CI Engine.
3. Heat balance test on IC engine
5. Determination of in-cylinder pressure Vs crank angle.
6. Study of chassis system and Chassis dynamometer.
7. Study of Wheel Alignment System
8. Assembling and dismantling of the following
   i. SI engine.
   ii. CI engine
   iii. V engine
   iv. Single plate, Diaphragm Clutch.
   v. Constant mesh, Sliding mesh gear box
   vi. Transfer case
   vii. Differential
   viii. Front axle, Rear axle
   ix. Brake system
   x. Steering system

TOTAL: 45 PERIODS

AM5201 ENGINE MANAGEMENT SYSTEMS

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

UNIT I FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS
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
Inductive, Hall Effect, thermistor, piezo electric, piezoresistive, based sensors. Throttle position, mass air flow, crank shaft position, cam position, engine speed sensor, exhaust oxygen level (two step, linear lambda and wideband), knock, manifold temperature and pressure sensors. Solenoid, relay(four and five pin), stepper motor
UNIT III SI ENGINE MANAGEMENT

Layout and working of SI engine management systems. Group and sequential injection techniques. Advantages of electronic ignition systems. Types of solid state ignition systems and their principle of operation, Contactless (BREAKERLESS) electronic ignition system, Electronic spark timing control.

UNIT IV CI ENGINE MANAGEMENT


UNIT V DIGITAL ENGINE CONTROL SYSTEM

Cold start and warm up phases, idle speed control, acceleration and full load enrichment, deceleration fuel cutoff. Fuel control maps, open loop and closed loop control – Integrated engine control system, Electromagnetic compatibility – EMI Suppression techniques – Electronic dash board instruments – Onboard diagnosis system.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should able to
- Explain the fundamentals, operation, function of various sensors and actuators in engine management systems.
- Explain the fundamentals, operation, function of various fuel injection systems pertain to SI and CI Engine.
- Explain the control algorithm during various engine operating conditions.

REFERENCES


AM5202 AUTOMOTIVE POLLUTION AND CONTROL

OBJECTIVES:

- The main objective of this course is to impart knowledge in automotive pollution control. The detailed concept of formation and control techniques of pollutants like UBHC, CO, NOx, particulate matter and smoke for both SI and CI engine will be taught to the students. The instruments for measurement of pollutants and emission standards will also be introduced to the students. At the end of the course the students will have command over automotive pollution and control.
UNIT I  EMISSION FROM AUTOMOBILES  
Automotive waste management - Recycling and End of Life Vehicle (ELV) - Recycling of Metals, Nonmetals, tyres and wiring harness and disposal of hazardous materials.

UNIT II  EMISSION FROM SPARK IGNITION ENGINE AND ITS CONTROL  

UNIT III  EMISSION FROM COMPRESSION IGNITION ENGINE AND ITS CONTROL  
Formation of White, Blue, and Black Smokes, Soot, Particulate Matter NOx, SOx, HC, CO and Intermediate Compounds – Significance Effect of design and Operating variables on Emission formation —Fuel modification/additives, CRDI - High Injection Pressure and Injection Rate Shaping and Multiple injection, EGR- EGR Cooling and Heating, EGR Control, Fumigation, Diesel Oxydation Catalysts, Diesel de-NOx Catalysts, NOx traps, SCR, Diesel Particulate Filters - DPF material, structure and regeneration- HCCI Engines.

UNIT IV  NOISE POLLUTION FROM AUTOMOBILES  

UNIT V  TEST PROCEDURES AND EMISSION MEASUREMENTS  

TOTAL : 45 PERIODS

OUTCOMES:
By the end of this course, students will be able to
- Understand the various emissions formed in IC engines
- Understand the effects of pollution on human health and environment
- Understand the emission control techniques
- Understand the emission norms

REFERENCES
4. Eran Sher “Handbook of Air Pollution from Internal Combustion Engines- Pollutant Formation and Control” ACADEMIC PRESS, 1998

AM5203 ELECTRIC AND HYBRID VEHICLES

OBJECTIVES:

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

UNIT I INTRODUCTION

Need of electric vehicles hybrid vehicles – comparative study of diesel, petrol, pure electric and hybrid vehicles. Limitations of electric vehicles. Specification of some electric and hybrid vehicles

UNIT II ENERGY SOURCES : BATTERIES AND FUEL CELLS


UNIT III PROPULSION MOTORS AND CONTROLLERS

Characteristic of permanent magnet and separately exited DC motors. AC single phase and 3-phase motor – inverters – DC and AC motor speed controllers.

UNIT IV VEHICLE DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES

Aerodynamic-Rolling resistance- Transmission efficiency- Vehicle mass- Electric vehicle chassis and Body design considerations- Heating and cooling systems- Controllers- Power steering- Tyre choice- Wing Mirror, Aerials and Luggage racks
UNIT V  HYBRID VEHICLES


TOTAL : 45 PERIODS

OUTCOMES:
The student should be able to

- Explain how a hybrid vehicle works and describe its main components and their function.
- Describe the different hybrid topologies with respect to their functional blocks and their characteristics.
- Design and implement both simple and advanced models of the vehicles.
- Analyze the performance of a hybrid vehicle.
- Build efficiency models of important components.
- Evaluate the environmental impact of road vehicles.
- Calculate basic electrical and thermal properties for power electronic converters.
- Describe the operating principle and properties for the most common types of electrical motors in hybrid technology.
- Describe the operating principle for fuel cells and energy storage elements and calculate basic performance of them.
- Describe the fuel alternatives for hybrid vehicles.

REFERENCES

AM5204  VEHICLE DYNAMICS L T P C

3 0 0 3

OBJECTIVES:
The objective of this course is to provide fundamental knowledge of the dynamics of ground vehicles, knowledge of suspension design and function, basic concepts on concerning stability and control and to study about basic analysis of vehicle dynamics in performance, handling and ride modes.
UNIT I  BASIS OF VIBRATION

UNIT II  TYRES

UNIT III  VERTICAL DYNAMICS

UNIT IV  LONGITUDINAL DYNAMICS AND CONTROL

UNIT V  LATERAL DYNAMICS

Note: students may be given training on Matlab or similar simulation tools.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course the student should be able to
- To understand the fundamentals and concepts of vibration
- To analyze the influence of vehicle configuration and design parameters on vehicle performance
- To simulate and analyze vehicle performance
- To grasp the concepts of vehicle handling and stability of vehicles
- Develop physical and mathematical models to predict the dynamic response of vehicles

REFERENCES
1. Dean Karnopp, Vehicle Stability, 1st edition, Marcel Dekker, 2004
AM5211    AUTOMOTIVE ELECTRICAL AND ELECTRONICS
          LABORATORY

LIST OF EXPERIMENTS

1    Testing of
    a. battery
    b. starting systems
    c. charging systems
    d. ignition systems
    e. body controller systems

2    Study of automotive lighting system and adjustment of head lights beam

3    Study of various sensors and actuators used in two wheelers and four wheelers for
electronic control

4    Study of Logic gates, Adders, Flip flops

5    Study of SCR and IC Timers

6    Interfacing amplifier, filter, Multiplexer and De-multiplexer

7    Interfacing seven segment displays

8    Basic microprocessor and microcontroller programming like arithmetic and Logic
operation, code conversion, waveform generation, look up table

9    Interfacing ADC and DAC for Data Acquisition and Control Application

10   Interfacing Sensors for Measurements of position, displacement, velocity, force, temperature, proximity/range etc

11   Display, Keyboard, Stepper Motor and DC Motor interface using microcontroller.

12   Study of Virtual Instrumentation

13   Study of Development of Embedded Systems

14   Mini Project

TOTAL: 60 PERIODS
OBJECTIVES:
- To explain the principle of chassis management system and different sensors used in the systems.

UNIT I  INTRODUCTION  9
Components of chassis management system – role of various sensors and actuators pertaining to chassis system – construction – working principle of wheel speed sensor, steering position, tyre pressure, brake pressure, steering torque, fuel level, Gyro sensor.

UNIT II  DRIVELINE CONTROL SYSTEM  9

UNIT III  SAFETY AND SECURITY SYSTEM  9
Airbags, seat belt tightening system, collision warning systems, child lock, anti lock braking systems, Vision enhancement, road recognition system, Anti theft technologies, smart card system, number plate coding, central locking system.

UNIT IV  COMFORT SYSTEM  9
Active suspension systems, requirement and characteristics, different types, Vehicle Handling and Ride characteristics of road vehicle, pitch, yaw, bounce control, power windows, thermal management system, adaptive noise control.

UNIT V  INTELLIGENT TRANSPORTATION SYSTEM  9

TOTAL : 45 PERIODS

OUTCOMES:
- At the end of the course, the students will be able to explain working of chassis management systems used in present day vehicles.

REFERENCES
LIST OF EXPERIMENTS
Design, model and (Structural / Thermal) analysis of the following components
1. Engine Cylinder
2. Piston Assembly.
3. Connecting rod.
4. Valves.
5. Crank shaft.
6. Cam shaft.
8. Suspension Spring.
10. Rear axle.
11. Gear box.

TOTAL: 60 PERIODS

REFERENCES:
1. ACAD, CATIA and ANSYS software guide / manual
3. Dr. N. K. Giri, "Automobile Mechanics", Seventh reprint, Khanna Publishers,
UNIT III COMBUSTION THERMODYNAMICS

UNIT IV FLAMES AND CHEMICAL KINETICS
Flames – premixed, diffusion, Laminar and turbulent – Explosion limits, Flammability limits, Ignition, Engine combustion systems. Chemical Kinetics – Reaction rates - Rate constant, Pollutants formed through chemical kinetics

UNIT V CHEMICAL EQUILIBRIUM AND DISSOCIATION

TOTAL : 45 PERIODS

OUTCOMES:
• Students will possess extended knowledge in thermodynamics such as entropy and its significance.
• Students will possess a comprehensive understanding of importance of chemical kinetics and dissociation involved in combustion and pollution formation in IC engines

REFERENCES

AM5002 ALTERNATIVE FUELS

OBJECTIVES:
• At the end of the course, the student will be able to acquire knowledge of alternate fuels and the changes in the engine design for handling them.

UNIT I CONVENTIONAL FUELS FOR I.C. ENGINES
UNIT II  ALCOHOLS AS FUELS  
Availability of different alternative fuels for engines. Alcohol - Properties, Production methods and usage in engines. Blending, dual fuel operation, surface ignition, spark ignition and oxygenated additives. Performance, combustion and emission Characteristics in engines. Advantages and disadvantages of alcohol fuels

UNIT III  VEGETABLE OILS AND BIODIESEL AS FUELS  
Properties of Vegetable oils and biodiesel- Methods of using vegetable oils – Blending, preheating, and emulsification – Preparation of biodiesel from non-edible, edible oil and Algae - Performance, combustion and emission Characteristics in diesel engines. Advantages and disadvantages of Vegetable oils and biodiesel

UNIT IV  HYDROGEN AS FUEL  

UNIT V  BIOGAS, CNG AND LPG AS FUELS  
Biogas, Compressed Natural gas (CNG) and LPG – Properties and production methods. CO2 and H2S scrubbing in Biogas, Modifications required for use in Engines- Performance, combustion and emission Characteristics in engines. Advantages and disadvantages of Gaseous fuels. Working of LPG and CNG kits used in automotive engines.

OUTCOMES:
By the end of this course, students will be able to

- Student will possess a comprehensive understanding of available alternative fuels for IC engines. They will posses complete knowledge on producing different biofuels, modifying them and using them in IC engines
- Students will acquire the skills in developing new technologies for alternative fuels efficiently in IC engines.
- Students will demonstrate the importance of using alternative fuels for sustainable energy supply and for emission control in IC engines.

REFERENCES
AM5003 HYDRAULIC AND PNEUMATIC SYSTEMS

OBJECTIVES:
- The objective of this course is to introduce the essential principles of hydraulic and pneumatic system and related automobile applications

UNIT I INTRODUCTION

UNIT II PNEUMATIC SYSTEMS

UNIT III HYDRAULIC SYSTEMS

UNIT IV SERVO AND PLC SYSTEMS
Electro pneumatics, ladder diagram. Servo and Proportional valves - types, operation, application. Hydro-Mechanical servo systems. PLC-construction, types, operation, programming.

UNIT V AUTOMOTIVE APPLICATIONS
Hydraulic tipping mechanism, power steering, fort lift hydraulic gear, hydro-pneumatic suspension, air brake. Maintenance and trouble shooting. Design and analysis of a hydraulic / Pneumatic system. Case Study

TOTAL : 45 PERIODS

OUTCOMES:
- Students will have the basic knowledge on various laws and simple problem pertaining to hydraulic and pneumatic system. At the end of the course the students will have through knowledge over different component and their function related to hydraulic and pneumatic system and how it is used for automotive applications.

REFERENCES
OBJECTIVES:
- The main objective of this course is to impart knowledge in computer simulation of IC engine process. The detailed concept of air standard, fuel air cycle, progressive and actual cycle simulation of SI engine will be taught to the students. The simulation of two-stroke SI engine will also be introduced to the students. At the end of the course the students will have command over simulation of IC engine process.

UNIT I INTRODUCTION 9

UNIT II COMBUSTION AND STOICHIOMETRY 9
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. Conversion of volumetric analysis to mass analysis. 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 COMPUTER SIMULATION OF SI ENGINE WITH FUEL AIR CYCLE 9
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. Wiebe’s law combustion analysis.

UNIT IV COMPUTER SIMULATION OF SI ENGINE WITH GAS EXCHANGE PROCESS 9
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 COMPUTER SIMULATION OF CI ENGINE 9

TOTAL: 45 PERIODS

OUTCOMES:
- Student will possess a comprehensive understanding of all the processes involved in engine cycles. They will acquire the skills in developing the complete theoretical model of combustion of an internal combustion engine.
- Students will demonstrate the importance of intake and exhaust processes in developing a theoretical model of a complete engine.
- Students will possess complete knowledge on adiabatic flame temperature, heat transfer and their importance in engine modeling.
REFERENCES

AM5005 PRODUCTION OF AUTOMOBILE COMPONENTS

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

OBJECTIVES:
- The objective of this course is to make the students to know and understand the production methods of various engine components like piston, connecting rod, crankshaft etc and various chassis components like friction lining materials, propeller shaft, steering column, gears etc.

UNIT I CASTING
9 Sand casting of cylinder block and liners - Centrifugal casting of flywheel, piston rings, bearing bushes, and liners, permanent mould casting of piston, pressure die casting of carburetor and other small auto parts. Melting practice of alloys.

UNIT II MACHINING
9 Special consideration of machining of various components such as flywheel, piston rings, bearing bushes, and liners. Machining of connecting rods - crank shaft - cam shaft - piston - piston pin - valve - front and rear axle housing - fly wheel - Honing of cylinder bores - Copy turning and profile grinding machines.

UNIT III FORGING, EXTRUSION AND FORMING PROCESS

UNIT IV POWDER METALLURGY AND PROCESSING OF PLASTICS
UNIT V  RECENT TRENDS IN MANUFACTURING OF AUTO COMPONENTS  9


TOTAL :  45 PERIODS

OUTCOMES:
By the end of this course, students will be able to
- Understand the methods to manufacture the vehicle components
- Understand the requirements of each component and material
- Understand the step by step procedure for manufacturing vehicle components
- Understand the advanced techniques used for manufacturing Automobile components

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

AM5006  THEORY OF FUELS AND LUBRICANTS  L  T  P  C
                              3  0  0  3

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

UNIT I  MANUFACTURE OF FUELS AND LUBRICANTS  9
Structure of petroleum, refining process, fuels, thermal cracking, catalytic cracking, polymerization, alkylation, isomerisation, blending, transesterification products of refining process. Additive - mechanism, requirements of additive, petrol fuel additives, diesel fuel additives - Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants. Additives and additive mechanism, for lubricants. Introduction to Nano fluids

UNIT II  THEORY OF LUBRICATION  9
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  PROPERTIES AND TESTING OF LUBRICANTS  9
Specific requirements for automotive lubricants, oxidation deterioration and degradation of lubricants, synthetic lubricants, classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease, classification, properties, testing.

UNIT IV  PROPERTIES AND TESTING OF FUELS  9
Thermo-chemistry of fuels, properties and testing of fuels, relative density, calorific value, flash point, fire point, distillation, vapour pressure, spontaneous ignition temperature, viscosity, pour point, flammability, ignitability, diesel index, API gravity, aniline point, carbon residue, copper strip corrosion etc.

UNIT V  FUELS AND COMBUSTION  9
Stoichiometry – calculation of theoretically correct air required for combustion of liquid and gaseous fuels – reaction equation, properties of air/fuel mixture, Heat of reaction, complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion, Calculation of adiabatic flame temperature, combustion chart.

TOTAL :  45 PERIODS

OUTCOMES:
- At the end of the course, the students will be able to have a complete knowledge on the various properties of fuels, lubricants and testing methods.

REFERENCES

AM5007  VEHICLE DESIGN AND DATA CHARACTERISTICS  L T P C
3 0 0 3

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

UNIT I  INTRODUCTION  9
Assumptions to be made in designing a vehicle, Range of values for Gross Vehicle Weight, Frontal Area, maximum speed, maximum acceleration, gradability in different gears, Basics of Automobile Design.
UNIT II  RESISTANCE TO VEHICLE MOTION  9
Calculation, Tabulation and Plotting of Curves for Air and Rolling Resistances at various vehicle speeds, Calculation and Plotting of Driving force, Power requirement for different loads and acceleration, Maximum Power calculation

UNIT III  PERFORMANCE CURVES-I  9
Calculation, Tabulation and Plotting of Torque and Mechanical Efficiency for different vehicle speeds, Interpolation of Pressure – Volume diagram, Calculation of frictional Mean Effective Pressure, Calculation of Engine Cubic Capacity, Bore and Stroke Length

UNIT IV  PERFORMANCE CURVES – II  9
Connecting rod length to Crank Radius Ratio, Plotting of Piston Velocity and Acceleration against Crank Angle, Plotting Gas force, inertia force and Resultant force against Crank Angle, Turning Moment and Side Thrust against Crank Angle.

UNIT V  GEAR RATIOS  9
Determination of Gear Ratios, Acceleration and Gradability, Typical Problems on Vehicle performance

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

REFERENCES

EY5151  FLUID MECHANICS AND HEAT TRANSFER  L T P C
3 0 0 3

OBJECTIVES:
- To understand the laws of fluid flow and Heat transfer
- To develop the skills to correlate the Physics with applications

UNIT I  BASIC EQUATION, POTENTIAL FLOW THEORY AND BOUNDARY LAYER CONCEPT  9

UNIT II  INCOMPRESSIBLE AND COMPRESSIBLE FLOWS  9
UNIT III CONDUCTION AND RADIATION HEAT TRANSFER
Governing Equation and Boundary conditions, Extended surface Heat Transfer, Transient
conduction – Use of Heisler’s charts, Conduction with moving boundaries, Radiation -
Heat Transfer, Gas Radiation

UNIT IV TURBULENT FORCED CONVECTIVE HEAT TRANSFER
Turbulence theory – mixing length concept – turbulence model – k ε model – analogy
between heat and momentum transfer – Reynolds, Colburn, Prandtl turbulent flow in a tube –
high speed flows.

UNIT V PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGER
Condensation on bank of tubes – boiling – pool and flow boiling, Heat exchanger – ε – NTU
approach and design procedure – compact heat exchanger.

TOTAL: 45 PERIODS

OUTCOME
• Student will be able to use the concepts of Heat Transfer and fluid flow in the field
of energy applications.

TEXT BOOKS

AM5008 AUTOMOTIVE AIR CONDITIONING SYSTEMS

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

UNIT I FUNDAMENTALS
Terminology, design factors and concepts related to air conditioning system -
Construction and Working principles of Thermostatic Expansion valve and Orifice tube
based system- Heating system types -detailed study of HVAC components like
compressor, evaporator, condenser, TXV, orifice tube , Receiver-drier, heater core etc.
Location of air conditioning components in a vehicle.

UNIT II REFRIGERANTS & AIR MANAGEMENT SYSTEMS
Refrigerants Temperature and pressure relation, Properties of R-12 and R134a- refrigerant
oil. Simple problems - Containers - Handling refrigerants - Tapping into the refrigerant
container - Ozone Layer Depletion.
Air Management Systems - Air routing for manual, semi and automatic system- cases and
ducts- Air distribution, control head and doors- Defrost system
UNIT III AUTOMATIC CLIMATE CONTROL SYSTEM
Block diagram - types of Sensors and Actuators, - Control Logic Electrical wiring diagram of manual and automatic system - multiplexing between BCM and PCM- control of compressor clutch, blower motor etc.- diagnostics tools and features.

UNIT IV DESIGN OF AIR-CONDITIONING COMPONENTS
Modeling of Fixed and variable Displacement type compressor, evaporator modeling - heat transfer correlations for the fluids inside the evaporator, analysis of evaporator frosting-condenser modeling - improvement of refrigerant flow control method.

UNIT V AIR CONDITIONING DIAGNOSIS AND SERVICES
AC system diagnosis based on temperature and pressure measurements, sight glass, sound etc. - refrigerant leak detection- Trouble shooting and Servicing of compressor, evaporator, condenser, heater core etc. – HVAC equipment , recovery and charging. Air routing system service.

OUTCOMES:
To students will have the basic knowledge on psychometric terminologies and simple problem pertaining to psychometric and refrigerant system. At the end of the course the students will have through knowledge over different component and their function related to different type of vehicle air conditioning system.

REFERENCES
6. SAE paper No: 931121,900084, 850040,931137,870029 etc.
8. Vehicle service manuals.

AM5009 COMBUSTION THERMODYNAMICS AND HEAT TRANSFER

OBJECTIVES:
The objective of this course is to make the students to know and understand the principle of engine combustion and to introduce the various heat transfer models and its measuring methods.

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

Combustion kinetics, rate of reaction, equation of Arrhenius, activation energy. Chemical thermodynamic model for Normal Combustion.

UNIT III FLAMES

Laminar - premixed and diffusion flames – flame speed correlations- quenching, flammability, and ignition, flame stabilization, turbulent premixed, diffusion flames- Damkohler number.

UNIT IV HEAT TRANSFER IN IC ENGINES


UNIT V INSTRUMENTATION

Pressure sensors, crank angle encoder. Hot wire and laser Doppler anemometry and velocimetry for flow and combustion analysis in IC engines. In-cylinder pressure measurement and Rate of heat release calculation.

TOTAL : 45 PERIODS

OUTCOMES:

- Student will possess a comprehensive understanding of thermodynamics involved in combustion process of I.C. Engines.
- Students will demonstrate the importance of engine heat transfer in designing modern engine combustion systems.
- Students will possess complete knowledge in engine pressure data acquisition and analysis for combustion parameters.

REFERENCES

OBJECTIVES:
- The main objective of this course is to impart knowledge in the construction of vehicle, aerodynamic, concept, paneling of passenger car body trim. At the end of the course the student will be well versed in the design and construction of external body of the vehicles.

UNIT I  
CAR BODY  

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

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

UNIT IV  
VEHICLE AERODYNAMICS  
Vehicle drag and types. 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. Drag reducing devices.

UNIT V  
BODY MATERIALS, TRIM, MECHANISMS AND BODY REPAIR  

TOTAL : 45 PERIODS

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

REFERENCES
UNIT IV


AM5011 FINITE ELEMENT METHODS IN AUTOMOBILE ENGINEERING

OBJECTIVES:
- The objective of this course is to make the students to know and understand the principle of FEM and its application in automotive component design.

UNIT I INTRODUCTION 9

UNIT II 1D ELEMENTS 9

UNIT III 2D ELEMENTS 9

UNIT IV STRUCTURAL AND DYNAMIC ANALYSIS 9

UNIT V HEAT TRANSFER ANALYSIS AND FLOW ANALYSIS 9
1D & 2D problems in fluid mechanics and heat transfer by conduction and convection. Transient thermal analysis. Case Studies like Heat transfer analysis of piston, fins.

TOTAL : 45 PERIODS
OUTCOMES:
Upon completing this course, the students will be able to:
- Identify mathematical model for solution of common engineering problems.
- Formulate simple problems into finite elements.
- Solve structural, thermal, fluid flow problems.
- Use professional-level finite element software to solve engineering problems in Solid mechanics, fluid mechanics and heat transfer.
- Derive element matrix equation by different methods by applying basic laws in mechanics and integration by parts

REFERENCES

AM5012 SIMULATION OF VEHICLE SYSTEMS
L T P C
3 0 0 3

OBJECTIVES:
- To know about the role of modeling and simulation in vehicle design
- To learn about system parameters and states for an automotive vehicle
- To learn about the simulation and analysis of the various vehicle systems

UNIT I INTRODUCTION
Introduction to Modeling and simulation, Role of modeling and simulation, Modeling and simulation process, Discrete event dynamic systems, Continuous time dynamic systems

UNIT II MODELING & SIMULATION OF DRIVETRAIN SYSTEM
Basic driveline model, Modeling of neutral gear, Driveline control – Goals, state space formulation, controller formulation, Driveline control for Speed, Driveline control for gear shifting, Modeling and simulation of power train of a passenger car

UNIT III MODELING & SIMULATION OF SUSPENSION SYSTEM
UNIT IV MODELING & SIMULATION OF BRAKING SYSTEMS
Friction models, Lumped parameter models – drum brake and disc brake, Modal approach for brake disk vibrations, Electronic stability program – Brake slip controller, Traction slip controller, Electronic brake force distribution, Brake assist

UNIT V MODELING AND SIMULATION OF COMPLETE VEHICLE
Wheel model – wheel ground contact point velocities, tire side slip angle, friction co-efficient, Chassis translatory motion, Chassis rotational motion, suspension model, vehicle stability analysis, validation of vehicle model

OUTCOMES:
- The student can learn about the importance of modeling and simulation in vehicle design process
- The student can derive the fundamental equations for various vehicle systems with relevant system parameters
- The student can analyze a vehicle system and identify for sensitive parameters

REFERENCES

AM5013 TWO AND THREE WHEELERS L T P C
TOTAL : 45 PERIODS

OBJECTIVES:
- The objective of this course is to make the students to know and understand the constructional details, operating characteristics and design aspects of Two and Three wheelers.

UNIT I INTRODUCTION
Classifications- design considerations –weight and dimension limitations – requirements, stability problems, gyroscopic effect- pendulum effect of two and three wheelers.

UNIT II POWER UNITS, IGNITION SYSTEMS AND OTHER ELECTRICAL SYSTEMS
2 stoke and 4 stoke engines. Design criteria for engines – design of cylinders, cylinder head, cooling fins, crank case, connecting rod and crank shaft. Carburettor types and design. Battery coil ignition, magneto ignition and electronic ignition. Lighting and other electrical systems.
UNIT III  CLUTCHES AND TRANSMISSION  10

UNIT IV  FRAMES, SUSPENSION, WHEELS AND TYRES  8
Types of frames. Wheel frames- construction design of frames for fatigue strength, torsional stiffness and lateral stability. Front and rear forks. Springs for suspension, Dampers, constructional details of wheel and tyres.

UNIT V  THREE WHEELERS  8
Auto rickshaws, different types, Pick-Ups and delivery type vehicle, frames and transmission, wheel types, wheel mountings attachment, tyre types. Brake systems.

OUTCOMES:
• To students will have the basic knowledge on various two wheelers and its technology along with its functions. At the end of the course the students will have through knowledge over different frames, suspension system and transmission unit used on various two and three wheeler vehicles

REFERENCES

TE5071  COMPUTATIONAL FLUID DYNAMICS FOR THERMAL SYSTEMS  L T P C
3 0 0 3

OBJECTIVES:
• This course aims to introduce numerical modeling and its role in the field of heat, fluid flow and combustion it will enable the students to understand the various discretisation methods and solving methodologies and to create confidence to solve complex problems in the field of heat transfer and fluid dynamics.
• To develop finite volume discretised forms of the CFD equations.
• To formulate explicit & implicit algorithms for solving the Euler Equations & Navier Stokes Equations.
UNIT I GOVERNING DIFFERENTIAL EQUATIONS AND DISCRETISATION TECHNIQUES  

UNIT II DIFFUSION PROCESSES: FINITE VOLUME METHOD  

UNIT III CONVECTION – DIFFUSION PROCESSES: FINITE VOLUME METHOD  
One dimensional convection – diffusion problem, Central difference scheme, upwind scheme – Hybrid and power law discretization techniques – QUICK scheme.

UNIT IV FLOW PROCESSES: FINITE VOLUME METHOD  
Discretisation of incompressible flow equations – Pressure based algorithms, SIMPLE, SIMPLER & PISO algorithms

UNIT V TURBULENCE AND ITS MODELING  
Description of turbulent flow, free turbulent flows, flat plate boundary layer and pipe flow. Algebraic Models, One equation model, k – ε & k – ω models Standard and High and Low Reynolds number models.

TOTAL: 45 PERIODS

OUTCOME:
- On successful completion of this course the student will be able to apply concept of CFD to analyse flow in thermal systems.

REFERENCES
OBJECTIVES:
To impart knowledge to the students in the principles of operation and constructional details of various Automotive Electrical and Electronic Systems like Batteries, Starting System, Charging System, Ignition System, Lighting System and Dash – Board Instruments.

UNIT I  TYPES OF BATTERIES  9
Battery design, Classification of batteries, Principle and construction of Lead Acid Battery, Nickel – Cadmium Battery, Nickel Metal-Hydride, Hybrid Battery, Sodium Sulphur Battery and Aluminum Air Battery, Alkaline batteries, Lithium batteries, Characteristics of Batteries, Battery Rating, Capacity and Efficiency, Tests on Batteries, Battery-Charging Techniques, Battery care and maintenance.

UNIT II  ELECTRICAL COMPONENTS  9

UNIT III  IGNITION SYSTEMS  9

UNIT IV  ELECTRONIC IGNITION SYSTEMS  9

UNIT V  WIRING, LIGHTING AND OTHER INSTRUMENTS  9

TOTAL : 45 PERIODS
OUTCOMES:
Students will have the basic knowledge on various electrical components and systems used in automobiles. At the end of the course the students will have through knowledge over different batteries, starter motors, alternators, ignition system and lighting systems used on various vehicles.

REFERENCES:

AM5015 AUTOMOTIVE AERODYNAMICS L T P C
3 0 0 3

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

UNIT I INTRODUCTION

UNIT II AERODYNAMIC DRAG OF CABS

UNIT III SHAPE OPTIMIZATION OF CABS
Front end modification – front and rear wind shield angle – Boat tailing – Hatch back, fast back and square back – Dust flow patterns at the rear – Effect of gap configuration – effect of fasteners.

UNIT IV VEHICLE HANDLING
Crashworthiness, Crash design techniques for front structures, Lumped Mass Spring (LMS) models, Analytical design tools, Collapse modes
UNIT V  WIND TUNNELS FOR AUTOMOTIVE AERODYNAMICS
Principles of wind tunnel technology – Types, Stress with scale models – full scale wind tunnels – measurement techniques – Equipment and transducers – road testing methods. Introduction to CFD.

**TOTAL : 45 PERIODS**

**OUTCOMES:**
On completion of the course the student will have
- an ability to apply concepts of fluid dynamics on vehicle motion
- an ability to interpret the influence of vehicle design on fuel economy
- an exposure on drag reduction enhancing vehicle performance
- an ability to develop programs and interpret test data through computational fluid dynamics

**REFERENCES**

**AM5016 AUTOMOTIVE SAFETY**

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

**OBJECTIVES:**
- To know the various safety equipments and systems in automotive safety
- To learn about the energy based approach employed in automotive crash modelling and analysis
- To know about the bio-mechanics modelling and simulation tests for automotive collision

**UNIT I  INTRODUCTION**
Evolution of automotive safety, Active safety: driving safety, conditional safety, perceptibility safety, operating safety, passive safety: exterior safety, interior safety, concept of crumble zone, safety sandwich construction

**UNIT II  SAFETY EQUIPMENTS & SYSTEMS**
Seat belt, regulations, automatic seat belt tightener system, collapsible steering column, tiltable steering wheel, air bags, electronic system for activating air bags, bumper design for safety, Collision warning system, Central Locking system, Child safety

**UNIT III  SAFETY CONCEPTS**
Design of the body for safety, Conservation of momentum, Conservation of energy - Energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle

**UNIT IV  CRASH MECHANICS**
Crashworthiness, Crash design techniques for front structures, Lumped Mass Spring (LMS) models, Analytical design tools, Collapse modes
UNIT V  CRASH TEST & MODELLING

Human body modelling, Bio mechanics and occupant simulation, Pedestrian protection and safety, Vehicle simulation tests – frontal, lateral, rear end collisions and roll over. Accident reconstruction,

TOTAL : 45 PERIODS

OUTCOMES:
- The student can learn about the working of important safety components and systems in an automobile
- The student can derive the energy equation for crash analysis for various crash conditions
- The student can learn about the modelling of crash event and the response of human body to crash

REFERENCES

AM5017  INSTRUMENTATION AND EXPERIMENTAL TECHNIQUES

OBJECTIVES:
- Study of the theory, construction and operation of different measurement technology, instruments transducers and their application in automotive industry.

UNIT I  MEASUREMENT SYSTEMS

Static and Dynamic Measurement systems-importance of measurement system – methods of measurement -applications - characteristics of measuring system-static and dynamic characteristics of measuring system – Analysis of experimental detail, Error analysis-types of errors-limiting errors

UNIT II  TRANSDUCERS, MODIFIERS AND TERMINATING DEVICES

Transducers for Automotive Applications – Amplifiers-Classifications and application in automobile – filters -types – Data Acquisition system - analog and digital type DAS-Indicators, Printers and display device –Signal Analyzing with example of automobile applications.
UNIT III  MECHANICAL MEASUREMENT  10
Instrumentation for Measuring Weight, Force, torque, pressure, power, temperature, fluid flow and special methods, vibration piezo electric effect, rotational speed. Measuring Velocity, acceleration and angular motion with respect to automobile applications.

UNIT IV  ENGINE EXPERIMENTAL TECHNIQUES  10

UNIT V  VEHICLE EXPERIMENTAL TECHNIQUES  9

TOTAL : 45 PERIODS

OUTCOMES:
At the end of this course the student will be able to
- Understand the components of the automotive instruments and their functions and the latest developments in this field
- Understand transducers, modifiers and terminating devices
- Understand mechanical measurement
- Grasp the basics of engine experimental techniques
- Grasp the basics of vehicle experimental techniques

REFERENCES

AM5018  SPECIAL TYPE OF VEHICLES  L T P C
3 0 0 3

OBJECTIVES:
- The main objective of this course is to introduce the concept and principle of operation of special vehicles such as Bulldozers, Ditchers, Bucket excavators, farm equipments, military vehicles etc. At the end of the course, the students can have a better understanding of the application of the special types of vehicles in the excavation of earth.
UNIT I     EARTH MOVING AND CONSTRUCTIONAL EQUIPMENTS
Construction details, capacity and applications of earthmovers for dumpers, front-end loaders, bulldozers, excavators, backhoe loaders, scrapers, motor graders etc. criteria for selection of prime mover for dumpers and front end loaders based on vehicle performance characteristics.

UNIT II     POWER TRAIN CONCEPTS

UNIT III     VEHICLE SYSTEMS AND FEATURES

UNIT IV     SPECIAL PURPOSE VEHICLES FOR INDUSTRIAL APPLICATIONS

UNIT V     FARM EQUIPMENTS, MILITARY AND COMBAT VEHICLES
Ride and stability characteristics, power take off, special implementations. Special features and constructional details of tankers, gun carriers and transport vehicles. Harvesting vehicles.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of this course the student will
- Know the concept and principle of operation of special vehicles such as bulldozers, ditches, bucket excavators, far equipments, military vehicles etc.
- Have better understanding of the application of the special types of vehicles in the excavation.
- Understand earth moving and constructional equipments
- Learn the basics of power train concepts for special vehicles
- Grasp the maintenance of farm equipments, military and combat vehicles

REFERENCES
OBJECTIVES:
- At the end of the course, the students will be able to have a complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.

UNIT I MAINTENANCE TOOL, SHOP, SCHEDULE, RECORDS 8

UNIT II POWER PLANT REPAIR AND OVERHAULING 12

UNIT III MAINTENANCE, REPAIR AND OVERHAULING OF THE CHASSIS 10
Maintenance, servicing and repair of clutch, fluid coupling, gearbox, torque converter, propeller shaft. Maintenance of front axle, rear axle, brakes, steering systems.

UNIT IV MAINTENANCE AND REPAIR OF VEHICLE BODY 8
Body panel tools for repairing. Tinkering and painting. Use of soldering, metalloid paste. Tyre maintenance, metallic, plastics

UNIT V MAINTENANCE AND REPAIR OF ELECTRICAL SYSTEMS 7
Care, maintenance, testing and trouble shooting of battery, starter motor, dynamo, alternator and regulator. Transistorized regulator problems.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of the course, the students will be able to have a complete knowledge of the vehicle maintenance procedures and acquire skills in handling situations where the vehicle is likely to fail.

REFERENCES
5. Frazee, fiedell, Spicer,-Automobile collision Work, American technical publications, Chicago, 1953.
6. John Dolce, Fleet maintenance, Mcgraw Hill, Newyork, 1984
AM5020 TRANSPORT MANAGEMENT

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

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

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

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

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

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

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will
- Know about different aspects related to transport system and management.
- Features of scheduling, fixing the fares
- Know about the motor vehicle act and maintenance aspects of transport.
REFERENCES
1. Government Motor Vehicle Act, Publication on latest act to be used as on date

MF5072 RESEARCH METHODOLOGY L T P C 3 0 0 3

OBJECTIVES
• To impart scientific, statistical and analytical knowledge for carrying out research work effectively.

UNIT I INTRODUCTION TO RESEARCH 9
The hallmarks of scientific research – Building blocks of science in research – Concept of Applied and Basic research – Quantitative and Qualitative Research Techniques – Need for theoretical frame work – Hypothesis development – Hypothesis testing with quantitative data. Research design – Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.

UNIT II EXPERIMENTAL DESIGN 9

UNIT III DATA COLLECTION METHODS 9

UNIT IV MULTIVARIATE STATISTICAL TECHNIQUES 9
Data Analysis – Factor Analysis – Culster Analysis -Discriminant Analysis – Multiple Regression and Correlation – Canonical Correlation – Application of Statistical(SPSS) Software Package in Research.

UNIT V RESEARCH REPORT 9
Purpose of the written report – Concept of audience – Basics of written reports. Integral parts of a report – Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report – Experimental, Results and Discussion – Recommendations and Implementation section – Conclusions and Scope for future work.

TOTAL = 45 PERIODS

OUTCOME
• After completion of the syllabus students will able to get knowledge about the different research techniques and research report.
REFERENCES

AM5021 AUTOMOTIVE TESTING AND CERTIFICATION  L  T  P  C
3  0  0  3

OBJECTIVES:
To illustrate the Automotive Testing and Certification of passenger cars.

UNIT I  INTRODUCTION AND ENGINE TESTING  9
Need of vehicle testing and homologation, Vehicle testing organizations, Hierarchy of testing:
Individual component approval, System level approval and Whole vehicle approval.
Classification of vehicles (including M, N and O layout), regulations overview (ECE, EEC, FMVSS, AIS, CMVR, ADR), Laboratory testing of basic engine parameters: Measurement of BHP, IHP, Engine testing on dynamometers, different types of dynamometers, hydraulic, eddy current etc., engine analyzers- for petrol and diesel engines, FIP calibrating and testing.

UNIT II  VEHICLE TESTING : PART 1  9
Vehicle testing on chassis dynamometers: Two wheel & four wheel dynamometers, vehicle testing lanes - side slip testers. CMVR physical verification, Vehicle weighment, Coast down test, Brake test, ABS, Turning circle diameter test, Steering effort test, Wheel Alignment testing, Wheel Balancing, Speedometer calibration, Pass by noise test, External projection test, Wheel guards, Hood latch test, Tell tale symbols, Gradeability test, Accelerator control system.

UNIT III  VEHICLE TESTING : PART 2  9
Horn installation, Rear view mirror installation, Installation requirements for lighting & signaling devices, Windscreen Wiping system. Vertical orientation for dipped beam - head lamp, Interior Fittings, Driver's field of vision (M1 category), Steering Impact test (GVW < 1500 kg) , Body block test, Head form test, Crash test, side impact test, rollover test, Bumper Testing, Vehicle -mass emission, Evaporative emission (petrol vehicles only), Broad band / Narrow band EMI test, Safety belt assemblies, Crash test with Dummy, Fire resistance test, OBD I.

UNIT IV  VEHICLE COMPONENT RELATED TEST PART 1(M1 CATEGORY)  9
UNIT V VEHICLE COMPONENT RELATED TEST PART 2 (M1 CATEGORY)

Performance requirements for Lighting & Signaling devices, Head lamp assembly (Glass lens), Head lamp assembly (Plastic lens), Head lamp + Front Position lamp / Front Direction Indicator lamp / Front Fog lamp, Rear combination lamp (each additional function), Independent Front Position lamp / Front Direction Indicator lamp / Front Fog lamp, Rear combination lamp (single function), Fuel tank: Metallic, Plastic (excluding fire resistance test), Bumper (F&R), Warning Triangles, Safety belt assemblies, Safety belt anchorages, Seat anchorages and head restraints.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course the student will be familiar in the various testing procedures for passenger car for its approval and testing of individual components.

REFERENCES:
1. Automotive Industry Standard (AIS) and Motor Vehicle Manuals