## CURRICULUM

### I SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category*</th>
<th>Periods</th>
<th>Marks#</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA101</td>
<td>Mathematics I</td>
<td>TB</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>PH101</td>
<td>Engineering Physics</td>
<td>TA</td>
<td>4 - -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>CY101</td>
<td>Engineering Chemistry</td>
<td>TA</td>
<td>4 - -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>BE101</td>
<td>Basic Civil and Mechanical Engineering</td>
<td>TC</td>
<td>4 - -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>CE101</td>
<td>Engineering Mechanics</td>
<td>TB</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>HS101</td>
<td>Communicative English</td>
<td>TA</td>
<td>4 - -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>PH103</td>
<td>Physics Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td>CY103</td>
<td>Chemistry Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td>ME103</td>
<td>Workshop Practice</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
</tbody>
</table>

Total Credits 30

### II SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category*</th>
<th>Periods</th>
<th>Marks#</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA102</td>
<td>Mathematics II</td>
<td>TB</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>PH102</td>
<td>Material Science</td>
<td>TA</td>
<td>4 - -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>CY102</td>
<td>Environmental Science</td>
<td>TA</td>
<td>4 - -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>BE102</td>
<td>Basic Electrical and Electronics Engineering</td>
<td>TC</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>ME101</td>
<td>Engineering Thermodynamics</td>
<td>TA</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>CS101</td>
<td>Computer Programming</td>
<td>TA</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>ME102</td>
<td>Engineering Graphics</td>
<td>EGD</td>
<td>2 - 3</td>
<td>50 50 100</td>
<td>4</td>
</tr>
<tr>
<td>CS102</td>
<td>Computer Programming Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td>BE103</td>
<td>Basic Electrical and Electronics Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
</tbody>
</table>

Total 32

# CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks
* TA – Theory Category A, TB – Theory Category B, TC – Theory Category C,
  LB – Laboratory, EGD – Engineering Graphics / Drawing
  POD – Practice Oriented Design, TCP – Theory Combined with Practice, PR - Practice

Approved in 3rd Academic Council Meeting
### III SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category</th>
<th>Periods</th>
<th>Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA103</td>
<td>Mathematics III</td>
<td>TB</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>EI101</td>
<td>Circuit Theory</td>
<td>TA</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>EI102</td>
<td>Electronic Circuits</td>
<td>TA</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>EE134</td>
<td>Electrical Machines</td>
<td>TA</td>
<td>4 0 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>CS144</td>
<td>Data Structures and Object oriented Programming</td>
<td>TA</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>EI103</td>
<td>Electronic Circuits Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td>CS145</td>
<td>Data Structures and Object oriented Programming Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td>EE135</td>
<td>Electrical Machines Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

### IV SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category</th>
<th>Periods</th>
<th>Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA106</td>
<td>Partial differential Equations and Numerical Methods</td>
<td>TB</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>EI104</td>
<td>Linear Integrated Circuits</td>
<td>TA</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>EI105</td>
<td>Digital Logic Theory and Design</td>
<td>TA</td>
<td>3 1 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>EI106</td>
<td>Sensors and Transducers</td>
<td>TA</td>
<td>4 0 -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>---</td>
<td>Programme Elective-I/General Elective –I</td>
<td>TX®</td>
<td>- - -</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>EI107</td>
<td>Linear and Integrated Circuits Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td>EI108</td>
<td>Sensors and Transducers Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td>EI109</td>
<td>Simulation Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

TX® - Theory Course (Category TA/ TB/ TC /TCP)
### V SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category</th>
<th>Periods</th>
<th>Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI110</td>
<td>Control Systems Engineering</td>
<td>TA</td>
<td>3 1</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>EI111</td>
<td>Electrical and Electronic Instruments</td>
<td>TA</td>
<td>4 0</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>EI112</td>
<td>Microprocessor and its Applications</td>
<td>TA</td>
<td>3 1</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>---</td>
<td>Programme Elective –II</td>
<td>TX®</td>
<td>- -</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>---</td>
<td>Programme Elective-III/General Elective –II</td>
<td>TX®</td>
<td>- -</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>EI113</td>
<td>VLSI Design Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40</td>
<td>100</td>
</tr>
<tr>
<td>EI114</td>
<td>Instrumentation Systems Design Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40</td>
<td>100</td>
</tr>
<tr>
<td>EI115</td>
<td>Microprocessor and Applications Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40</td>
<td>100</td>
</tr>
</tbody>
</table>

Total: 26

### VI SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category</th>
<th>Periods</th>
<th>Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI116</td>
<td>Process Control</td>
<td>TA</td>
<td>4 -</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>EI117</td>
<td>Industrial Instrumentation</td>
<td>TA</td>
<td>4 -</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>EI118</td>
<td>Digital Signal Processing</td>
<td>TA</td>
<td>3 1</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>---</td>
<td>Programme Elective –IV</td>
<td>TX®</td>
<td>- -</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>---</td>
<td>Programme Elective-V/ General Elective –III</td>
<td>TX®</td>
<td>- -</td>
<td>40 60</td>
<td>100</td>
</tr>
<tr>
<td>EI119</td>
<td>Process Control Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40</td>
<td>100</td>
</tr>
<tr>
<td>EI120</td>
<td>Embedded System Design Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40</td>
<td>100</td>
</tr>
<tr>
<td>EI121</td>
<td>Virtual Instrumentation Laboratory</td>
<td>LB</td>
<td>- - 3</td>
<td>60 40</td>
<td>100</td>
</tr>
<tr>
<td>HS102</td>
<td>General Proficiency</td>
<td>PR</td>
<td>- - 3</td>
<td>100</td>
<td>---</td>
</tr>
</tbody>
</table>

Total: 27

TX® - Theory Course (Category TA/ TB/ TC /TCP)
### VII SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category</th>
<th>Periods</th>
<th>Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>E122</td>
<td>PLC and DCS</td>
<td>TA</td>
<td>4</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>E123</td>
<td>Analytical Instrumentation</td>
<td>TA</td>
<td>4</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>ME135</td>
<td>Maintenance and Safety Engineering</td>
<td>TA</td>
<td>4</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Programme Elective-VI</td>
<td>TX&lt;sup&gt;®&lt;/sup&gt;</td>
<td>-</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Programme Elective-VII/General Elective –IV</td>
<td>TX&lt;sup&gt;®&lt;/sup&gt;</td>
<td>-</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>E124</td>
<td>Industrial Measurement and Control Laboratory</td>
<td>LB</td>
<td>-</td>
<td>60 40 100</td>
<td>2</td>
</tr>
<tr>
<td>E125</td>
<td>Project Work (Phase I)</td>
<td>PR</td>
<td>-</td>
<td>100 -- 100</td>
<td>2</td>
</tr>
<tr>
<td>E126</td>
<td>Professional Ethics and Practice</td>
<td>PR</td>
<td>-</td>
<td>100 -- 100</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

### VIII SEMESTER

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category</th>
<th>Periods</th>
<th>Marks</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Programme Elective –VIII</td>
<td>TX&lt;sup&gt;®&lt;/sup&gt;</td>
<td>-</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Programme Elective-IX</td>
<td>TX&lt;sup&gt;®&lt;/sup&gt;</td>
<td>-</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Programme Elective X /General Elective-V</td>
<td>TX&lt;sup&gt;®&lt;/sup&gt;</td>
<td>-</td>
<td>40 60 100</td>
<td>4</td>
</tr>
<tr>
<td>E127</td>
<td>Comprehensive Test and Viva-Voce</td>
<td>PR</td>
<td>-</td>
<td>60 40 100</td>
<td>1</td>
</tr>
<tr>
<td>E128</td>
<td>Project Work (Phase II)</td>
<td>PR</td>
<td>-</td>
<td>60 40 100</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Professional Development Courses (3 one credit courses)</td>
<td>PR</td>
<td>-</td>
<td>100 - 300</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>22</strong></td>
</tr>
</tbody>
</table>

TX<sup>®</sup> - Theory Course (Category TA/ TB/ TC/TCP)
**LIST OF PROGRAMME ELECTIVES**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP01</td>
<td>Visual Programming for Instrumentation Engineers</td>
<td>TA</td>
</tr>
<tr>
<td>EIP02</td>
<td>Embedded System Design</td>
<td>TA</td>
</tr>
<tr>
<td>EIP03</td>
<td>Web based Instrumentation</td>
<td>TA</td>
</tr>
<tr>
<td>EIP04</td>
<td>Instrumentation Buses and Data Networks</td>
<td>TA</td>
</tr>
<tr>
<td>EIP05</td>
<td>Applied Soft Computing</td>
<td>TA</td>
</tr>
<tr>
<td>EIP06</td>
<td>Power Plant Instrumentation</td>
<td>TA</td>
</tr>
<tr>
<td>EIP07</td>
<td>Digital Image Processing</td>
<td>TA</td>
</tr>
<tr>
<td>EIP08</td>
<td>Computer Networks</td>
<td>TA</td>
</tr>
<tr>
<td>EIP09</td>
<td>Design of Process Control System Components</td>
<td>TA</td>
</tr>
<tr>
<td>EIP10</td>
<td>Fiber Optics and Laser Instrumentation</td>
<td>TA</td>
</tr>
<tr>
<td>EIP11</td>
<td>Instrumentation and Control in Petrochemical Industries</td>
<td>TA</td>
</tr>
<tr>
<td>EIP12</td>
<td>System Identification and Adaptive Control</td>
<td>TA</td>
</tr>
<tr>
<td>EIP13</td>
<td>Virtual Instrumentation</td>
<td>TA</td>
</tr>
<tr>
<td>EIP14</td>
<td>Advanced Control Theory</td>
<td>TA</td>
</tr>
<tr>
<td>EIP15</td>
<td>Advanced Digital Signal Processing</td>
<td>TA</td>
</tr>
<tr>
<td>EIP16</td>
<td>Biomedical Instrumentation</td>
<td>TA</td>
</tr>
<tr>
<td>EIP17</td>
<td>VLSI Design</td>
<td>TA</td>
</tr>
<tr>
<td>EIP18</td>
<td>Robotics and Automation</td>
<td>TA</td>
</tr>
<tr>
<td>EIP19</td>
<td>Industrial Electronics</td>
<td>TA</td>
</tr>
<tr>
<td>EIP20</td>
<td>Digital Control Systems</td>
<td>TA</td>
</tr>
<tr>
<td>EIP21</td>
<td>Signals and Systems</td>
<td>TA</td>
</tr>
<tr>
<td>EIP22</td>
<td>Network Analysis and Synthesis</td>
<td>TA</td>
</tr>
<tr>
<td>EIP23</td>
<td>Product Design and Development</td>
<td>TA</td>
</tr>
<tr>
<td>Sl. No.</td>
<td>Subject Code</td>
<td>Subject</td>
</tr>
<tr>
<td>--------</td>
<td>--------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>CEG01</td>
<td>Entrepreneurship Development</td>
</tr>
<tr>
<td>2</td>
<td>CEG02</td>
<td>Finite Element Analysis</td>
</tr>
<tr>
<td>3</td>
<td>CEG03</td>
<td>Fluid Mechanics and Machines</td>
</tr>
<tr>
<td>4</td>
<td>CEG04</td>
<td>Building Maintenance</td>
</tr>
<tr>
<td>5</td>
<td>CEG05</td>
<td>Building Physics</td>
</tr>
<tr>
<td>6</td>
<td>CEG06</td>
<td>Non Destructive Testing Methods</td>
</tr>
<tr>
<td>7</td>
<td>CEG07</td>
<td>Building Automation and Smart Structures</td>
</tr>
<tr>
<td>8</td>
<td>CEG08</td>
<td>Health Monitoring of Structures</td>
</tr>
<tr>
<td>9</td>
<td>CEG09</td>
<td>Remote Sensing and GIS</td>
</tr>
<tr>
<td>10</td>
<td>CEG10</td>
<td>Experimental Stress Analysis</td>
</tr>
<tr>
<td>11</td>
<td>CEG11</td>
<td>Environment Impact Assessment</td>
</tr>
<tr>
<td>12</td>
<td>CEG12</td>
<td>Industrial Waste Disposal and Treatment</td>
</tr>
<tr>
<td>13</td>
<td>CEG13</td>
<td>Project Management</td>
</tr>
<tr>
<td>14</td>
<td>CEG14</td>
<td>Fluid Mechanics and Strength of Materials</td>
</tr>
<tr>
<td>15</td>
<td>MEG01</td>
<td>Elements of Project Management</td>
</tr>
<tr>
<td>16</td>
<td>MEG02</td>
<td>Fluid and Thermal machines</td>
</tr>
<tr>
<td>17</td>
<td>MEG03</td>
<td>Industrial Automation</td>
</tr>
<tr>
<td>18</td>
<td>MEG04</td>
<td>Industrial Refrigeration and Air-Conditioning</td>
</tr>
<tr>
<td>19</td>
<td>MEG05</td>
<td>Quantitative Techniques for Engineers</td>
</tr>
<tr>
<td>20</td>
<td>MEG06</td>
<td>Renewable energy</td>
</tr>
<tr>
<td>21</td>
<td>ECG01</td>
<td>Consumer Electronics</td>
</tr>
<tr>
<td>22</td>
<td>ECG02</td>
<td>Communication Theory</td>
</tr>
<tr>
<td>23</td>
<td>ECG03</td>
<td>CMOS VLSI Design</td>
</tr>
<tr>
<td>24</td>
<td>ECG04</td>
<td>Communication for Engineers</td>
</tr>
<tr>
<td>25</td>
<td>ECG05</td>
<td>Avionics</td>
</tr>
<tr>
<td>26</td>
<td>CSG01</td>
<td>Hardware and Troubleshooting</td>
</tr>
<tr>
<td>27</td>
<td>CSG02</td>
<td>JAVA Programming</td>
</tr>
<tr>
<td>28</td>
<td>CSG03</td>
<td>Fundamentals of Operating Systems</td>
</tr>
<tr>
<td>29</td>
<td>CSG04</td>
<td>Object Oriented Programming using C++</td>
</tr>
<tr>
<td>30</td>
<td>CSG05</td>
<td>Microprocessors and its Applications</td>
</tr>
<tr>
<td>31</td>
<td>EEG01</td>
<td>Electrical Machines and Utilizations</td>
</tr>
<tr>
<td>32</td>
<td>EEG02</td>
<td>Soft Computing Techniques</td>
</tr>
<tr>
<td>33</td>
<td>EEG03</td>
<td>Power Generation Systems</td>
</tr>
<tr>
<td>34</td>
<td>EIG01</td>
<td>System Design Using Advanced Microcontrollers</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Title</td>
<td>Type</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>EIG02</td>
<td>Measurement and Instrumentation</td>
<td>TA</td>
</tr>
<tr>
<td>EIG03</td>
<td>Process Instrumentation</td>
<td>TA</td>
</tr>
<tr>
<td>EIG04</td>
<td>PLC and Industrial Automation</td>
<td>TA</td>
</tr>
<tr>
<td>EIG05</td>
<td>Micro-Electro Mechanical Systems</td>
<td>TA</td>
</tr>
<tr>
<td>EIG06</td>
<td>Neural Networks and Fuzzy logic</td>
<td>TA</td>
</tr>
<tr>
<td>CHG01</td>
<td>Process Engineering Principles</td>
<td>TA</td>
</tr>
<tr>
<td>CHG02</td>
<td>Fundamentals of Momentum, Heat and Mass Transfer</td>
<td>TA</td>
</tr>
<tr>
<td>CHG03</td>
<td>Heat Transfer Analysis</td>
<td>TA</td>
</tr>
<tr>
<td>CHG04</td>
<td>Non-Conventional Energy</td>
<td>TA</td>
</tr>
<tr>
<td>ITG01</td>
<td>Bio-Informatics</td>
<td>TA</td>
</tr>
<tr>
<td>ITG02</td>
<td>Principles of Programming Languages</td>
<td>TA</td>
</tr>
<tr>
<td>ITG03</td>
<td>Introduction to Operating Systems</td>
<td>TA</td>
</tr>
<tr>
<td>ITG04</td>
<td>Introduction to Database and Oracle</td>
<td>TA</td>
</tr>
<tr>
<td>ITG05</td>
<td>Business Process</td>
<td>TA</td>
</tr>
<tr>
<td>MAG01</td>
<td>Linear Algebra</td>
<td>TA</td>
</tr>
<tr>
<td>MAG02</td>
<td>Queuing Theory and Networks</td>
<td>TA</td>
</tr>
<tr>
<td>MAG03</td>
<td>Optimization Techniques</td>
<td>TA</td>
</tr>
<tr>
<td>PHG01</td>
<td>Introduction to Nanoscience and Nanotechnology</td>
<td>TA</td>
</tr>
<tr>
<td>PHG02</td>
<td>Nanotechnology and Nanoelectronics</td>
<td>TA</td>
</tr>
<tr>
<td>PHG03</td>
<td>Non Destructive Testing</td>
<td>TA</td>
</tr>
<tr>
<td>PHG04</td>
<td>Smart Materials and Structures</td>
<td>TA</td>
</tr>
<tr>
<td>CYG01</td>
<td>Cheminformatics</td>
<td>TA</td>
</tr>
<tr>
<td>CYG02</td>
<td>Instrumental Methods of Chemical Analysis</td>
<td>TA</td>
</tr>
<tr>
<td>HSG01</td>
<td>Soft skill and Personality Development</td>
<td>TA</td>
</tr>
<tr>
<td>HSG02</td>
<td>Engineering Economics and Management</td>
<td>TA</td>
</tr>
</tbody>
</table>
# CONSOLIDATED CREDIT DISTRIBUTION

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Course Type</th>
<th>Credits</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Theory</td>
<td>Lab/ Practice</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>Basic Sciences (Mathematics, Physics, Chemistry)</td>
<td>32</td>
<td>4</td>
<td></td>
<td>36</td>
</tr>
<tr>
<td>2</td>
<td>Basic Engineering Courses</td>
<td>32</td>
<td>10</td>
<td></td>
<td>42</td>
</tr>
<tr>
<td>3</td>
<td>Programme Core Courses</td>
<td>56</td>
<td>22</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>4</td>
<td>Programme Electives</td>
<td>32</td>
<td>-</td>
<td></td>
<td>32</td>
</tr>
<tr>
<td>5</td>
<td>General Electives</td>
<td>08</td>
<td>-</td>
<td></td>
<td>08</td>
</tr>
<tr>
<td>6</td>
<td>Project Work and Comprehensive Viva-voce</td>
<td>-</td>
<td>09</td>
<td></td>
<td>09</td>
</tr>
<tr>
<td>7</td>
<td>Humanities and Social Sciences</td>
<td>04</td>
<td>-</td>
<td></td>
<td>04</td>
</tr>
<tr>
<td>8</td>
<td>General Skill Development Courses</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(a) Soft skill Development</td>
<td>-</td>
<td>01</td>
<td></td>
<td>01</td>
</tr>
<tr>
<td></td>
<td>(b) Professional Development and Ethics</td>
<td>-</td>
<td>04</td>
<td></td>
<td>04</td>
</tr>
<tr>
<td></td>
<td>(c) Mandatory Courses</td>
<td>3 zero credits</td>
<td>3 zero credits</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
<td><strong>164</strong></td>
<td><strong>50</strong></td>
<td></td>
<td><strong>214</strong></td>
</tr>
</tbody>
</table>
SYLLABUS (Core Subjects)
Department: Mathematics  
Programme: B.Tech.

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA101</td>
<td>Mathematics I</td>
<td>L 3 T 1 P -</td>
<td>4 C</td>
<td>40 60 100</td>
</tr>
</tbody>
</table>

Prerequisite: -

Objectives:
- To introduce the ideas of differential and integral calculus
- To familiarize students with functions of several variables
- To introduce methods for solving differential equations

Outcome:
- Understands Calculus
- Functions of several variables
- Able to solve differential equations

UNIT – I  
Curvature, radius of curvature, evolutes and involutes. Beta and Gamma functions and their properties.

UNIT – II  
Partial derivatives, Total derivative, Differentiation of implicit functions, Change of variables, Jacobians and their properties, Partial differentiation of implicit functions, Maxima and minima of functions of two variables, Lagrange’s method of undetermined multipliers.

UNIT – III  
Multiple Integrals, change of order of integration in double integrals, Applications: Plane areas (double integration), Change of variables (Cartesian to polar), volumes by solids of revolution, double and triple integrations (Cartesian and polar) – Center of mass and Gravity (constant and variable densities).

UNIT – IV  
Exact equations, First order linear equations, Bernoulli’s equation, orthogonal trajectories, growth, decay and geometrical applications. Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut’s type.

UNIT – V  
Linear differential equations of higher order - with constant coefficients, the operator D, Euler’s linear equation of higher order with variable coefficients, simultaneous linear differential equations, solution by variation of parameters method.

Total contact Hours: 45  
Total Tutorials: 15  
Total Practical Classes:  
Total Hours: 60  

Text Books:

Reference Books:
**Department:** Physics  
**Programme:** B.Tech.  
**Semester:** One  
**Category:** TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>PH101</td>
<td>Engineering Physics</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Prerequisite**

- To provide a bridge between basic Physics and Engineering courses.
- To introduce the concepts and applications of Ultrasonics, Optics, Lasers, Optical Fibers, and wave mechanics and fundamentals of crystal structure.

**Outcome**

- At the end of the course, Students would have adequate exposure to the concepts of the various topics of this Engineering Physics course and their real life applications.

**UNIT – I**  
**Acoustics and Ultrasonics**  
**Hours:** 12

**Acoustics:** Factors affecting Acoustics of Buildings and their Remedies - Sabine’s formula for Reverberation Time – sound absorption coefficient & its determination;  

**UNIT – II**  
**Optics**  
**Hours:** 12

**Interference:** Air Wedge – Michelson’s Interferometer – Types of fringes- Determination of Wavelength of a light source– Antireflection Coatings -Interference Filter;  
**Diffraction:** Concept of Resolution of Spectral lines-Rayleigh’s criterion -Resolving Power of Grating, Prism & Telescope;  
**Polarisation:** Basic concepts of Double Refraction and Optical Rotation- Quarter and Half Wave Plates – Specific Rotatory Power – Laurent’s Half Shade Polarimeter-polarizing filters

**UNIT – III**  
**Crystal Structure and Lattice Defects**  
**Hours:** 12

**Crystal structure:** Space Lattice, Unit Cell, Lattice Parameters, Crystal Systems, Bravais Lattices- Atomic Radius, Coordination Number and Packing Factor of SC, BCC, FCC, HCP structures – Miller Indices- Powder X Ray Diffraction Method;  
**Lattice Defects:** Qualitative ideas of point, line, surface and volume defects and their influence on properties of solids

**UNIT – IV**  
**Wave Mechanics**  
**Hours:** 12

Matter Waves – de Broglie hypothesis – Uncertainty Principle – Schrodinger Wave Equations – Time Dependent – Time Independent – Application to Particle in a One Dimensional potential Box –Concept of Quantum Mechanical Tunneling (without derivation) – Applications of tunneling (qualitative) to Alpha Decay, Tunnel Diode, Scanning Tunneling Microscope.

**UNIT – V**  
**Lasers and Fiber Optics**  
**Hours:** 12

**Fiber Optics:** Principle and Propagation of light in optical fiber– Numerical aperture and acceptance angle – Types of optical fibers-based on Material, refractive index profile, Modes of propagation(single & Multimode Fibres) -Qualitative ideas of attenuation in optical Fibers-Applications of Optical Fibers- Fibre Optic communication (Schematic), Active and passive fibre optic sensors, Endoscope

**Total contact Hours:** 60  
**Total Tutorials:** -  
**Total Practical Classes:** -  
**Total Hours:** 60

**Text Books:**


**Reference Books:**

Department: Chemistry  
Programme: B.Tech

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY101</td>
<td>Engineering Chemistry</td>
<td>4</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>

**Prerequisite:**

- To know the importance of chemistry in engineering education
- To understand the chemistry of industrial processes
- To apply the knowledge of chemistry to solve engineering problems

**Objectives:**

- Students will be able to understand and appreciate usefulness of chemistry concepts in the design, fabrication and maintenance of materials for engineering applications.
- Students will gain knowledge about the chemistry background of some of the important industrial processing techniques.
- With the knowledge gained in conceptual chemistry, engineering students will be able to approach confidently the design and development of futuristic materials to meet the requirement of industry and society.

**Outcome:**

**UNIT – I  Water Treatment**


**UNIT – II  Industrial Polymers**


**UNIT – III  Electrochemical Cells**

Galvanic cells, single electrode potential, standard electrode potential, electromotive series. EMF of a cell and its measurement. Nerst equation. Electrolyte concentration cell. Reference electrodes – hydrogen, calomel, Ag/AgCl and glass electrodes. Batteries - primary and secondary batteries, Laclanche cell, lead acid storage battery, Ni-Cd battery and alkaline battery. Fuel cells - H₂-O₂ fuel cell.

**UNIT – IV  Corrosion and Control**


**UNIT – V  Engineering Materials**


**Text Books:**


**Reference Books:**

**Prerequisite**

- To be able to differentiate the types of buildings according to national building code.
- To understand building components and their functions as well as different types of roads, bridges and dams.
- To convey the basics of Mechanical Engineering.
- To establish the necessity of basics of Mechanical Engineering to other engineering disciplines.
- To explain the concepts of thermal plants used in power systems being a common issue.
- To narrate the methods of harnessing renewable energies and their working principles.
- To explain the role of basic manufacturing processes.
- To develop an intuitive understanding of underlying working principles of mechanical machines and systems.

**Objectives**

- Parallels are drawn between the subject and the student’s everyday experience so that this course may be related to what the students already know.
- Students are made to understand the principles of Mechanical Engineering based on theories.
- Students are encouraged to make engineering judgments, to conduct independent exploration of topic of renewable energy systems and to communicate the findings in a professional manner.
- Students are made to develop natural curiosity to explore the various facets of mechanical equipment and machines.
- While emphasizing basic principles, students are provided with explanations used in real time engineering systems.

**Outcome**

- Parallels are drawn between the subject and the student’s everyday experience so that this course may be related to what the students already know.
- Students are made to understand the principles of Mechanical Engineering based on theories.
- Students are encouraged to make engineering judgments, to conduct independent exploration of topic of renewable energy systems and to communicate the findings in a professional manner.
- Students are made to develop natural curiosity to explore the various facets of mechanical equipment and machines.
- While emphasizing basic principles, students are provided with explanations used in real time engineering systems.

**UNIT – I**

**Buildings and Building Materials**

- Buildings-Definition-NBC Classification - plinth area, floor area, carpet area, floor space index-construction materials-stone, brick, cement, cement-mortar, concrete, steel- their properties and uses. Impact of manufacture and use of building materials on the environment.

**UNIT – II**

**Buildings and their Components**


**UNIT – III**

**Basic Infrastructure**


**UNIT – IV**

**IC Engines and Steam Generators**

- IC engines – Classification – Working principles - Diesel and petrol engines: two stroke and four stroke engines – Merits and demerits.
- Steam generators (Boilers) – Classification – Constructional features (of only low pressure boilers) – Boiler mountings and accessories – Merits and demerits - Applications.

**UNIT – V**

**Conventional and Non-conventional Power Generation**

- Power Generation Systems – Conventional and Non-Conventional:
## UNIT – VI
### Introduction to Manufacturing Technology

| Machines: Lathe – Drilling machine – Grinding machine (Description only) |

| Total contact Hours: 60 | Total Tutorials: - | Total Practical Classes: - | Total Hours: 60 |

### Text Books:


### Reference Books:


### Web sites:

1. [http://nptel.iitm.ac.in/courses/Webcourse-contents/](http://nptel.iitm.ac.in/courses/Webcourse-contents/)
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>CE101</td>
<td>Engineering Mechanics</td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

**Prerequisite**
- 

**Objectives**
- To explain the importance of mechanics in the context of engineering.
- To understand the static equilibrium of particles and rigid bodies in two dimensions.
- To introduce the techniques for analyzing the forces in the bodies.
- To study the motion of a body and to write the dynamic equilibrium equation.

**Outcome**
- On successful completion of the course, a student would be able to identify and analyze the problems by applying the principles of engineering mechanics, and to proceed to advanced study on mechanical systems.

**UNIT – I Fundamentals of Mechanics**

**UNIT – II Application of Force System**
- Types loads and supports – simply supported beams, cantilever beams and plane trusses – reactions (Introduction only).
- Friction: Laws of friction, Static dry friction, simple contact friction problems, body on inclined planes, ladders, wedges, simple screw jack.

**UNIT – III Properties of Surfaces**
- Properties of sections – centroids, center of gravity, area moment of inertia, product moment of inertia, polar moment of inertia, radius of gyration, mass moment of inertia.
- Principle of virtual work – work done – application to simple structural arrangements.

**UNIT – IV Kinematics and Kinetics of Particles**

**UNIT – V Kinematics and Kinetics of Rigid Bodies**

**Total contact Hours: 45**
**Total Tutorials: 15**
**Total Practical Classes:**
**Total Hours: 60**

**Text Books:**

**Reference Books:**
### Department: Humanities and Social Sciences  
**Programme:** B.Tech.  
**Semester:** One  
**Category:** TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>HS101</td>
<td>Communicative English</td>
<td>L 4 T - P - C 4</td>
<td>CA 40 SE 60 TM 100</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite**

- To improve the LSRW skills of I. B.Tech students
- To instill confidence and enable the students to communicate with ease
- To equip the students with the necessary skills and develop their language prowess

**Objectives**

On successful completion of the module students should be able to:

- Communicate effectively in English
- Get rid of their inhibitions
- Possess effective language skills
- Improve their career prospects

**Outcome**

**UNIT – I**  
**Basic Concepts of Communicative English**  
**Definition – Importance – Process – Channels and Types – Barriers – Strategies for Effective Communicative Listening Skills.**

**UNIT – II**  
**Comprehension and Analysis**  
**Comprehension of Technical and Non – Technical Passages – Skimming. Scanning, Inferring – Note-making, Predicting and responding to context – Intensive Reading and Reviewing.**

**UNIT – III**  
**Writing**  

**UNIT – IV**  
**Oral Communication**  
**Basics of Phonetics - Presentation Skills - Group Discussions – Extempore - Debates - Role Plays.**

**UNIT – V**  
**Vocabulary and Language Through Literature**  
**Analysis of**

1. “English in India”, R.K. Narayan
3. “Politics and the English Language”, George Orwell


**Total contact Hours: 60**  
**Total Tutorials: -**  
**Total Practical Classes: -**  
**Total Hours: 60**

**Text Books:**


**Reference Books:**

Department : Physics  
Programme : B.Tech.

Semester : One  
Category : LB

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>PH103</td>
<td>Physics Laboratory</td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

Prerequisite

Objectives
To provide a practical understanding of some of the concepts learnt in the theory course on Physics and Materials Science.

Outcome
The Students would have gained practical experience about some of the Theoretical concepts learnt in the Physics and Materials Science courses.

List of Experiments:
(Any 10 experiments including a maximum of 2 Demonstration experiments are to be performed.)

1. Radius of curvature of a Lens - Newton’s rings
2. Thickness of a thin object by Air – wedge
3. Spectrometer – Resolving power of a Prism
4. Spectrometer – Resolving power of a Transmission grating
5. Determination of wavelength of a Laser source using transmission grating, reflection grating (vernier calipers) & particle size determination
6. Determination of numerical aperture & Acceptance angle of an optical fiber.
7. Laurent’s Half shade polarimeter – Determination of specific rotatory power*
8. Spectrometer - Hollow prism / Ordinary & Extraordinary rays by Calcite Prism*
9. Determination of optical absorption coefficient of materials using laser*
10. Coefficient of Thermal conductivity - Radial flow method
11. Coefficient of Thermal conductivity – Lee’s Disc method
12. Jolly’s Bulb Apparatus experiment – determination of α
13. Magnetism: I – H curve
14. Field along the axis of a coil carrying current
15. Vibration magnetometer – calculation of magnetic moment & pole strength
16. Electrical conductivity of semiconductor – two probe / four probe method*
17. Hall effect in a semiconductor*
18. Michelson’s Interferometer*

*Demonstration Experiments.

Total contact Hours: 45  
Total Tutorials: 45  
Total Practical Classes: 45  
Total Hours: 45

Reference Book:
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY103</td>
<td>Chemistry Laboratory</td>
<td>-</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

**Prerequisite**
- 

**Objectives**
- To educate the principles involved in chemical analysis.
- To provide practical knowledge of handling chemicals and chemical analysis.
- To understand the importance of chemical analysis in various fields.

**Outcome**
- Students will be able to understand chemical analysis and its usefulness in engineering, industry and other fields.
- Students will gain laboratory skills and that will give confidence in analyzing samples in engineering, industry and other fields.
- Students will gain knowledge about the principles and methods of listed methods of quantitative analyses.

**List of experiments: (Any 10 experiments)**
1. Determination of total, permanent and temporary hardness of water by EDTA method.
2. Determination of magnesium in water by complexometry.
3. Determination of calcium in lime stone by complexometry.
4. Determination of alkalinity of water.
5. Determination of percentage of acetic acid in vinegar.
6. Determination of ferrous ion in Mohr’s salt.
7. Determination of lead dioxide by permanganometry.
8. Determination of ferrous and ferric ions in a solution by dichrometry.
10. Determination of dissolved oxygen in water.
11. Determination of COD of water sample.
12. Determination of available chlorine in bleaching powder.
13. Determination of chloride content in water by argentometry.
14. Determination of lead in polluted water by conductometry.
15. Preparation of potash alum from scrap aluminium.

**Text Books:**

**Reference Books:**
Department: Mechanical Engineering
Programme: B.Tech.
Semester: One
Category: LB

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME103</td>
<td>Workshop Practice</td>
<td>L 3 T 2 P</td>
<td>CA 60</td>
<td>SE 40 TM 100</td>
</tr>
</tbody>
</table>

Prerequisite: -

Objectives:
- To convey the basics of mechanical tools used in engineering
- To establish hands on experience on the working tools
- To develop basic joints and fittings using the hand tools
- To establish the importance of joints and fitting in engineering applications
- To explain the role of basic workshop in engineering
- To develop an intuitive understanding of underlying physical mechanism used in mechanical machines.

Outcome:
- Parallels are drawn between the subject and the student’s everyday experience so that this course may be related to what the students already know.
- Students are introduced to basic hand tools used in various mechanical cutting operations.
- Students are encouraged to make simple joints and fittings.
- Students are made to develop natural curiosity to explore the various facets of basic cutting operations.
- While emphasizing basic operations, students are provided with modern hand tools to use in real time engineering jobs.
- Students are exposed to make objects like tray, welded joints.

UNIT – I  Fitting  Hours: 11
1. Study of tools and Machineries
2. Symmetric fitting
3. Acute angle fitting
4. Obustute angle fitting

UNIT – II  Welding  Hours: 11
1. Study of arc and gas welding equipment and tools
2. Simple lap welding (Arc)
3. Single V butt welding (Arc)
4. Corner joint (Arc)

UNIT – III  Sheet Metal  Hours: 11
1. Study of tools and machineries
2. Funnel
3. Waste collection tray
4. Rectangular Box

UNIT – IV  Carpentry  Hours: 12
1. Study of tools and machineries
2. Half lap joint
3. Corner mortise joint
4. Dovetail joint

Total contact Hours: -  Total Tutorials: -  Total Practical Classes: 45  Total Hours: 45

Text Books:

Web sites:
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA102</td>
<td>Mathematics II</td>
<td>3 1 - 4</td>
<td>40 60</td>
<td>100</td>
</tr>
</tbody>
</table>

**Prerequisite**

- To acquaint with theory of Matrices
- Hyperbolic functions and theory of equations
- Vector calculus and statistics

**Objectives**

- Understands Matrix theory
- Solving techniques of equations
- Understands Vectors and statistics

**UNIT – I**

Eigen values and Eigen vectors of a real matrix, Characteristic equation, Properties of Eigen values. Cayley-Hamilton Theorem, Diagonalisation of matrices. Reduction of a quadratic form to canonical form by orthogonal transformation and nature of quadratic forms.

**UNIT – II**

Trigonometry: Hyperbolic and circular functions, logarithms of complex number, resolving real and imaginary parts of a complex quantity.

Theory of equations: Relation between roots and coefficients, reciprocal equations, transformation of equations and diminishing the roots.

**UNIT – III**

Finite differences: Definitions and relation between operators ($\Delta, \nabla, \delta, \theta, \mu, \beta$), Solution of difference Equations, Solving Boundary value problems for ordinary differential equations using finite difference method.

**UNIT – IV**

Gradient, divergence and curl, their properties and relations. Stoke’s theorem and Gauss divergence theorem (without proof). Simple applications involving cubes, sphere and rectangular parallelepipeds.

**UNIT – V**

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions: Binomial, Poisson and Normal - evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation.

**Text Books:**


**Reference Books:**

Subject Code | Subject                          | Hours / Week | Credit | Maximum Marks |
-------------|---------------------------------|--------------|--------|---------------|
PH102        | Material Science                | L: 4, T: -   | 4      | 40 60 100    |

Prerequisite: 

Objectives: 
- To impart knowledge to the Engineering students about the significance of Materials Science and its contribution to Engineering and Technology.
- To introduce the Physical concepts and properties of Different category of materials and their modern applications in day-to-day life.

Outcome: 
- Engineering Students would have gained fundamental knowledge about the various types of materials and their applications to Engineering and Technology.

UNIT – I
Dielectric Materials

Hours: 12


UNIT – II
Magnetic Materials and Superconductors

Hours: 12


Superconductors: Basic concepts – properties of superconductors –Meissner effect – Type I and II superconductors – BCS theory (qualitative) - High Temperature Superconductors– Qualitative ideas of Josephson effect, quantum interference and SQUID – their applications.

UNIT – III
Semiconductors

Hours: 12


UNIT – IV
Nuclear Reactors & Materials

Hours: 12


UNIT – V
Smart Materials and Nanomaterials

Hours: 12

Smart Materials: Introduction –definitions. Shape Memory alloys (SMA): One way and two way Shape memory effect, pseudoelasticity, Properties and applications of SMA- features of Ni-Ti SMA alloy. Liquid Crystals : Types – nematic, cholesteric, smectic- Application to Display Devices


Total contact Hours: 60
Total Tutorials: -
Total Practical Classes: -
Total Hours: 60

Text Books:

Reference Books:
Department: Chemistry
Programme: B.Tech.
Semester: Two
Category: TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CY102</td>
<td>Environmental Science</td>
<td>4</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>

Prerequisite: 

Objectives:
- To widen the knowledge of environmental awareness and pollution
- To educate the importance of preserving the earth’s resources and ecosystem
- To highlight the modern techniques and regulations to monitor and control pollution

Outcome:
- Students will be able to understand about the environment and natural resources we are blessed with.
- Students will become aware of environmental issues like pollution, dwindling natural resources and degrading ecosystem.
- Students will be inspired to act as environmentally friendly and work for sustainable development of the humanity.

UNIT – I
Ecosystem and Biodiversity
Hours: 12

UNIT – II
Air Pollution
Hours: 12

UNIT – III
Water and Land Pollution
Hours: 12

UNIT – IV
Instrumental Pollution Monitoring
Hours: 12

UNIT – V
Energy and Environment
Hours: 12

Total contact Hours: 60
Total Tutorials: Total Practical Classes: Total Hours: 60

Text Books:
1. Anubha Kaushik and C.P. Kaushik, Environmental Science and Engineering, New Age International (P) Ltd, New Delhi, 2009. (Unit I)
2. S.S. Dara, A Text Book of Environmental Chemistry and Pollution Control, S. Chand and Company Ltd, New Delhi, 2008. (Unit II, III, & V)
Reference Books:

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>BE102</td>
<td>Basic Electrical and Electronics Engineering</td>
<td>3 1 - 4</td>
<td>40 60 100</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To apply Kirchhoff’s law to simplify the given circuit.
- To understand the concept of AC circuit and to simplify the given RL, RC, RLC series and parallel circuits.
- To understand the principle of electromagnetic induction and the working principle of electrical machines.

**Objectives:**
- The students understand the working principle of transistor, FET, MOSFET, CMOS and their applications.
- To design adders, subtractors and to gain knowledge on sequential logic circuits.
- To understand the need for communication and acquire knowledge on different communication systems.
- To have an overview of different emerging technologies in day-to-day applications.

**Outcomes:**
- The students explored the basic terminology, laws and concepts of DC and AC circuits in electrical engineering.
- The students know the principle of operation of DC and AC electrical machines and different types of power plants.
- Will understand the importance of FET’s, MOSFET’s, CMOS and their applications.
- Will be able to design Combinational and Sequential circuits.
- Awareness towards different Communication Systems.
- Gain knowledge in the working principle of real time applications used in day today life like ATM, Microwave Oven, Bluetooth, WiFi and Computer Networks.

**UNIT – I**
DC Circuits  
Hours: 07

**UNIT – II**
AC Circuits  
Hours: 08
Concepts of AC circuits – rms value, average value, form and peak factors – Simple RL, RC and RLC series and parallel circuits – Concept of real and reactive power – Power factor – Series and parallel resonance - Introduction to three phase system - Power measurement by two wattmeter method.

**UNIT – III**
Electrical Machines and Power Plants  
Hours: 08
Law of Electromagnetic induction, Fleming’s Right & Left hand rule - Principle of DC rotating machine, Single phase transformer, single phase induction motor and synchronous motor (Qualitative approach only) - Layout of thermal, hydro and nuclear power generation (block diagram approach only). Components of AC transmission and distribution systems – One line diagram.

**UNIT – IV**
Electronics  
Hours: 07

**UNIT – V**
Communication  
Hours: 08

**UNIT – VI**
Overview of Emerging Technologies  
Hours: 07
Internet of Things (IOT).
Microwave Ovens - RFID - Automated Teller Machines (ATM).

| Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: - | Total Hours: 60 |

**Text Books:**

**Electrical**


**Electronics and Communication**


**Reference Books:**

**Electrical**


**Electronics and Communication**


**Web sites:**

1. www.electronics-tutorials.ws
2. www.en.wikipedia.org/wiki/Telecommunication

**Department:** Mechanical Engineering  
**Programme:** B.Tech.
### Subject Information

**Subject Code:** ME101  
**Subject:** Engineering Thermodynamics  
**Category:** TA  
**Semester:** Two  

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME101</td>
<td>Engineering Thermodynamics</td>
<td>3 1 - 4</td>
<td>40 60 100</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite:** -

**Objectives:**
- To convey the basics of the thermodynamic principles
- To establish the relationship of these principles to thermal system behaviors
- To develop methodologies for predicting the system behavior
- To establish the importance of laws of thermodynamics applied to energy systems
- To explain the role of refrigeration and heat pump as energy systems
- To develop an intuitive understanding of underlying physical mechanism and a mastery of solving practical problems in real world.

**Outcome:**
- Parallels are drawn between the subject and the student’s everyday experience so that this course may be related to what students already know.
- Students are made to understand the principles of thermodynamics and adjudge the viability of operation of any thermal system in real-time applications.
- Students are encouraged to make engineering judgments, to conduct independent exploration of topic of thermodynamics and to communicate the findings in a professional manner.
- Students are made to develop natural curiosity to explore the various facets of thermodynamic laws.
- While emphasizing basic laws, students are provided with modern tools to use in real-time engineering problems.

#### UNIT – I

**Hours: 09**


#### UNIT – II

**Hours: 09**

The concept of energy, work and heat – reversible work- internal energy - Perfect gas – specific heats – Joules law - enthalpy- Conservation of Energy principle for closed and open systems - First law of thermodynamics – Application of first law to a process (flow and non-flow) – Steady flow energy equation and its engineering application - Calculation of work and heat for different processes.

#### UNIT – III

**Hours: 09**


#### UNIT – IV

**Hours: 09**


#### UNIT – V

**Hours: 09**

Reverse Carnot cycle - COP - Vapor compression refrigeration cycle and systems (only theory) - Gas refrigeration cycle - Absorption refrigeration system – Liquefaction – Solidification (only theory).

**Total contact Hours: 45**  
**Total Tutorials: 15**  
**Total Practical Classes:** -  
**Total Hours: 60**

**Text Books:**

**Reference Books:**

Web sites:
1. http://nptel.iitm.ac.in/courses/Webcourse-contents/
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS101</td>
<td>Computer Programming</td>
<td>3 1 - 4</td>
<td>4</td>
<td>40 60 100</td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To introduce the basics of computers and information technology.
- To educate problem solving techniques.
- To impart programming skills in C language.
- To practice structured programming to solve real life problems.

**Objectives:**
- To introduce the basics of computers and information technology.
- To educate problem solving techniques.
- To impart programming skills in C language.
- To practice structured programming to solve real life problems.

**Outcome:**
- On successful completion of the course, students will be able to:
  - Understand the basics of computers and its related components
  - Have the ability to write a computer program to solve specified problems

**UNIT I**

<table>
<thead>
<tr>
<th>Hours: 09</th>
</tr>
</thead>
</table>

**UNIT II**

<table>
<thead>
<tr>
<th>Hours: 09</th>
</tr>
</thead>
</table>

**UNIT III**

<table>
<thead>
<tr>
<th>Hours: 09</th>
</tr>
</thead>
</table>

**UNIT IV**

<table>
<thead>
<tr>
<th>Hours: 09</th>
</tr>
</thead>
</table>
| Structures – Arrays and Structures – Nested structures – Structure as Argument to functions – Union
Pointers – Declaration, Initialization and Accessing Pointer variable – Pointers and arrays – pointers as argument and return value – Pointers and strings - pointers and structures.

**UNIT V**

<table>
<thead>
<tr>
<th>Hours: 09</th>
</tr>
</thead>
</table>

**Text Books:**

**Reference Books:**
## Course Code: ME102  Course Name: Engineering Graphics

<table>
<thead>
<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>2</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

### Prerequisite:
- 

### Objectives:
- To convey the basics of engineering drawing
- To explain the importance of an engineering drawing
- To teach different methods of making the drawing
- To establish the importance of projects and developments made in drawing that are used in real systems

### Outcome:
- From what students have already learnt and know, relation has been brought about how to bring their vision into realities.
- Students are made to follow and understand the basic of mechanical drawing
- Students are encouraged to make engineering drawing of physical object representing engineering systems.
- Students are made to develop natural curiosity to explore the various facets of engineering drawings.

### UNIT – 0

Introduction to Standards for Engineering Drawing practice, Lettering, Line work and Dimensioning.

### UNIT – I

Projection of Points and Projection of lines

### UNIT – II

Projection of Points and Projection of lines

### UNIT – III

Projection of solids in complicated positions

### UNIT – IV

Sections of solids - Development of Surfaces

### UNIT – V

Axonometric Projections: Isometric Projections (simple solids); Perspective Projections (planes and simple solids; Orthographic Projections

### Text Books:
3. BIS, Engineering Drawing practices for Schools & College, SP 46 : 2003

### Reference Books:
4. James D Bethune and et. al., Modern Drafting, Prentice Hall Int.,

### Web sites:
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS102</td>
<td>Computer Programming Laboratory</td>
<td>4 - - 4</td>
<td>4</td>
<td>40 60 100</td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To study and understand the use of OS commands
- To get familiarity on MS-Office packages like MS-Word, MS-Excel and MS-PowerPoint
- To gain a hands on experience of compilation and execution of ‘C’ programs
- To inculcate logical and practical thinking towards problem solving using C programming.

**Objectives:**
- On successful completion of the course, students will be able to:
  - Have the ability to write a computer program to solve specified problems
  - Problem solving ability will be gained by the students

**Cycle - I: Fundamentals of Computing**

1. Study of OS commands
2. Use of mail merge in word processor
3. Use of spreadsheet to create Charts (XY, Bar, Pie) with necessary formulae.
4. Use of Power point to prepare a slide show.

**Cycle - II: Programming Using C**

1. Study of Compilation and execution of simple C programs
2. Basic C Programs
   a. Arithmetic Operations
   b. Area and Circumference of a circle
   c. Swapping with and without Temporary Variables
3. Programs using Branching statements
   a. To check the number as Odd or Even
   b. Greatest of Three Numbers
   c. Counting Vowels
   d. Grading based on Student’s Mark
4. Programs using Control Structures
   a. Computing Factorial of a number
   b. Fibonacci Series generation
   c. Prime Number Checking
   d. Computing Sum of Digit
5. Programs using String Operations
   a. Palindrome Checking
   b. Searching and Sorting Names
6. Programs using Arrays
   a. Sum of ‘n’ numbers
   b. Sorting an Array
   c. Matrix Addition, Subtraction, Multiplication and Transpose
7. Programs using Functions
   a. Computing nCr
   b. Factorial using Recursion
   c. Call by Value and Call by Reference
8. Programs using Structure
   a. Student Information System
   b. Employee Pay Slip Generation
   c. Electricity Bill Generation
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Pointer and Array</td>
<td>a. Counting No. of Lines, Characters and Black Spaces</td>
</tr>
<tr>
<td>b. Pointer to function</td>
<td>b. Content copy from one file to another</td>
</tr>
<tr>
<td>c. Pointer to Structure</td>
<td>c. Reading and Writing Data in File</td>
</tr>
</tbody>
</table>

| Total contact Hours: - | Total Tutorials: - | Total Practical Classes: 45 | Total Hours: 45 |
### Subject Code: BE103

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Basic Electrical and Electronics Engineering</td>
<td>-</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Laboratory</td>
<td></td>
<td>2</td>
<td>40</td>
</tr>
</tbody>
</table>

#### Prerequisite:
- To understand the basic electrical tools and their applications.
- To get trained in using different types of wiring.
- To find faults in electrical lamp and ceiling fan.
- To understand and apply Kirchhoff’s laws to analyze electrical circuits.
- To study the operation of CRO and principle of fiber optic communication.
- To design adder and subtractors.
- To understand the frequency response of RC coupled amplifier.

#### Objectives:
- The students get exposure on the basic electrical tools, applications and precautions.
- The students are trained for using different types of wiring for various purposes in domestic and industries.
- The students are taught to find faults in electrical lamp and ceiling fan.
- Will be able to learn and use equipments like Signal Generator, Power Supply and CRO.
- To apply Kirchhoff’s law for simplification of circuits.
- To design combinational circuits.
- To obtain the frequency response of Amplifiers.

#### Outcome:
- Electrical Lab
  1. Electrical Safety, Precautions, study of tools and accessories.
  2. Practices of different joints.
  3. Wiring and testing of series and parallel lamp circuits.
  4. Staircase wiring.
  5. Doctor’s room wiring.
  7. Go down wiring.
  8. Wiring and testing a ceiling fan and fluorescent lamp circuit.
  9. Study of different types of fuses and A.C. and D.C. meters.

- Electronics and Communication Lab
  1. Study of Kirchoff’s Laws.
  2. Study of Fiber Optic Communication.
  4. Zener Diode as Voltage Regulator.
  5. Design of Adder and Subtractor Circuits.
Department : Mathematics  
Programme : B.Tech.  
Semester : Three  
Category : TB  

Subject Code  | Subject  | Hours / Week | Credit | Maximum Marks |
-------------|----------|--------------|--------|---------------|
MA103        | Mathematics - III | L 3 | T 1 | P - | C 4 | CA 40 | SE 60 | TM 100 |

Prerequisite

Objectives

- To introduce the ideas of Laplace and Fourier Transforms
- To familiarize students with of Complex Analysis
- To introduce Fourier series.

Outcome

- Understands Transform Calculus
- Understand Complex Analysis
- Able to apply Fourier series

UNIT – I  
Laplace Transform  

UNIT – II  
Complex Variable- Analytic Functions  
Analytic functions – Necessary conditions – Cauchy-Riemann equations (Cartesian and polar form) and sufficient conditions (excluding proof) – Harmonic and orthogonal properties of analytic function – Construction of analytic functions. Conformal mapping – Simple and standard transformations like w = z+c, cz, 1/z Bilinear transformation. (excluding Schwarz-Christoffel transformation)

UNIT – III  
Complex Integration  
Complex integration, Cauchy’s Integral theorem, Cauchy’s integral formula and problems, Taylor’s and Laurent’s theorem (without proof) Classification of singularities. Residues and evaluation of residues – Cauchy’s Residue theorem – Contour integration Application of residue theorem to real integrals – unit circle and semicircular contour (excluding poles on boundaries).

UNIT – IV  
Fourier Series  

UNIT – V  
Fourier Transform  
Fourier integral theorem (statement only), Fourier transform and its inverse, properties. Fourier sine and cosine transforms, their properties, convolution and Parseval’s identity.

Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: - | Total Hours: 60

Text Books:

Reference Books:
### Subject Code | Subject         | Hours / Week | Credit | Maximum Marks
---|----------------|--------------|--------|----------------|
EI101 | Circuit Theory | L | T | P | C | CA | SE | TM
|                | 3 | 1 | - | 4 | 40 | 60 | 100

**Prerequisite**

- To analyze electrical circuits using KCL and KVL
- To learn network theorems and apply them for circuit analysis
- To study resonance and coupled circuits
- To study two port parameters
- To study transient analysis of RC, RL, RLC circuits

**Objectives**

- Analyse DC And AC circuits
- Design resonant and tuned circuits
- Find the transient response of RC, RL and RLC circuits
- Find the two port parameters of the circuit.

**Outcome**

- Analyse DC And AC circuits
- Design resonant and tuned circuits
- Find the transient response of RC, RL and RLC circuits
- Find the two port parameters of the circuit.

### UNIT – I  BASICS OF CIRCUIT ANALYSIS


### UNIT – II  NETWORK THEOREMS FOR DC AND AC CIRCUITS

Review of loop and nodal methods of analysis, star-to-delta or delta-to-star transformation, Source transformation, Superposition theorem, Thevenin’s theorem, Norton’s theorem, reciprocity theorem, compensation theorem, Maximum power transfer theorem, Millman’s theorem and Tellegen’s theorem applied to dc and ac circuits.

### UNIT – III  RESONANCE AND COUPLED CIRCUITS

Resonance – Series and parallel resonance circuits- Concept of band width and Q factor.

### UNIT – IV  TRANSIENT ANALYSIS

Initial conditions in elements, Transient response of R-L, R-C, R-L-C circuits (Series combinations only) for step and sinusoidal excitations -Solution using Laplace transform.

### UNIT – V  NETWORK FUNCTIONS AND PARAMETERS


Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: | Total Hours: 60

**Text Books:**


**Reference Books:**

3. Kuriakose, Circuit Theory, PHI Learning, 2005
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI102</td>
<td>Electronic Circuits</td>
<td>L 3, T 1, P 1, C 4</td>
<td>40</td>
<td>60</td>
</tr>
</tbody>
</table>

**Prerequisite**
- Understand the working of diodes, transistors.
- Understand the application of different electronic devices and electronic circuits.

**Objectives**
- This course gives an overview of various semiconductor devices.
- At the end of this course, the students will be able to analyze and design amplifier circuits, oscillators and filter circuits employing BJT, FET devices.
- Understand the operating principles of major electronic devices, circuit models and connection to the physical operation of device
- Be able to apply this knowledge to the analysis and design of basic circuits.
- Have the ability to analyze and design discrete or integrated electronic circuits

**Outcome**
- This course gives an overview of various semiconductor devices.
- At the end of this course, the students will be able to analyze and design amplifier circuits, oscillators and filter circuits employing BJT, FET devices.
- Understand the operating principles of major electronic devices, circuit models and connection to the physical operation of device
- Be able to apply this knowledge to the analysis and design of basic circuits.
- Have the ability to analyze and design discrete or integrated electronic circuits

**UNIT – I**
### Semiconductor Diodes
**Hours: 12**

**UNIT – II**
### Bipolar Junction Transistors (BJT)
**Hours: 12**

**UNIT – III**
### Transistor Amplifiers and Frequency Response
**Hours: 12**

**UNIT – IV**
### Feedback and Power Amplifiers
**Hours: 12**
Concept of feedback, Classification of Negative feedback amplifiers - the oscillator- Barkhausen criteria for oscillations -RC phase shift oscillator, Wien bridge oscillator, Colpitt’s oscillator, Hartley oscillator, crystal oscillator. Multivibrators – Astable, Monostable, Bistable modes of operation, Schmitt trigger.
Class A power amplifier, maximum value of efficiency of Class A amplifier, transformer coupled amplifier, Class B and Class AB Push-Pull amplifiers, complimentary symmetry circuits (transformerless class B power amplifier), phase inverter, class C operation.

**UNIT – V**
### FET and Power Semiconductor Devices
**Hours: 12**
The JFET- Characteristics and Parameters - JFET Basing-JFET amplifiers - common source, common Drain, common Gate amplifiers - The MOSFET-Enhancement and Depletion mode MOSFETs - MOSFET characteristics and Parameters - MOSFET biasing and applications. , Basic Four Layer Device - Silicon Controlled Rectifier (SCR)-Applications of SCR- The DIAC and TRIAC, Uni-junction Transistor(UJT).

**Text Books:**

**Reference Books:**
Department: Electrical and Electronics Engineering  
Programme : B.Tech. (EI)  
Semester : Three  
Category : TA  

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE134</td>
<td>Electrical Machines</td>
<td>4</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Prerequisite: -  

Objectives:  
- To expose the students to the concepts of various types of electrical machines and applications of electrical machines.

Outcome:  
The student will know  
- Constructional details, principle of operation, Performance, starters and speed control of DC Machines  
- Constructional details, principle of operation of Transformers. Constructional details, principle of operation of AC Machines  
- Constructional details, principle of operation of Special Machines and Utilization of electrical Energy.

UNIT – I  
Magnetic Circuits  
| Hours: 12 |

Magnetomotive force, magnetic field strength-permeability of free space, relative permeability-reluctance-comparison of electric and magnetic circuits-composite magnetic circuit-magnetic leakage and fringing Kirchhoff’s Laws for the magnetic circuits-magnetization curve-hysteresis loop-current-ring theory of magnetism- hysteresis loop-minimum volume of a permanent magnet-load line of a permanent magnet-barium ferrite magnets-magnetic field of a long solenoid-magnetic energy in a non-magnetic medium-magnetic pull. Inductance of a coil - determining factors. Magnetic relays and contactors. Earth leakage circuit breakers.

UNIT – II  
DC Machines  
| Hours: 12 |

Construction details of machine-operation of DC generators-EMF equation-characteristics of different types of generators-operation of DC motors-torque equation-characteristics of different types of DC motors. Starters-braking and speed control of DC motors. Applications & selection of DC motors and generators

UNIT – III  
Transformers  
| Hours: 12 |


UNIT – IV  
Induction Machines  
| Hours: 12 |

Types- constructional features- slip- torque characteristics-starters-braking and speed control methods-principle of operation and types of single phase induction motors. Application & selection of single phase and three phase induction motors, AC servomotor

UNIT – V  
Synchronous Machines  
| Hours: 12 |


Total contact Hours: 60  
Total Tutorials:  
Total Practical Classes:  
Total Hours: 60

Text Books:  

Reference Books:  
2. Bandhopadyay, Electrical Machines, PHI, 2005
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS144</td>
<td>Data Structures and Object oriented Programming</td>
<td>3 1 - 4</td>
<td></td>
<td>40 60 100</td>
</tr>
</tbody>
</table>

**Prerequisite**
- To acquaint students with data structures used when programming for the storage and manipulation of data.
- To emphasize the concept of data abstraction and the problem of building implementations of abstract data types.
- To understand the concepts of object oriented programming and to expertise the skills through C++ language.

**Objectives**
- Select of relevant data structures and combinations of relevant data structures for the given problems in terms of memory and run time efficiency.
- Apply data abstraction in solving programming problems.
- An ability to conceptualize the problem in terms of object oriented features.
- An ability to use the OO programming techniques (C++) in developing applications.
- An ability to design and develop a complete object oriented applications.

**Outcome**
- Select of relevant data structures and combinations of relevant data structures for the given problems in terms of memory and run time efficiency.
- Apply data abstraction in solving programming problems.
- An ability to conceptualize the problem in terms of object oriented features.
- An ability to use the OO programming techniques (C++) in developing applications.
- An ability to design and develop a complete object oriented applications.

**UNIT – I** Searching and Sorting | Hours: 12
---|---

**UNIT – II** Stack, Queue and Linked List | Hours: 12
---|---

**UNIT – III** Dynamic Storage Management | Hours: 12
---|---

**UNIT – IV** Principles of Object Oriented Programming | Hours: 12
---|---
Principles of Object Oriented Programming - Beginning With C++ - Tokens-Expressions-control Structures – Functions in C++, classes and objects, constructors and destructors, operators overloading and type conversions

**UNIT – V** Advanced Object Oriented Programming | Hours: 12
---|---
Inheritance: Extending classes, Pointers, Virtual functions and polymorphism, File Handling Operations

Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: - | Total Hours: 60

**Text Books:**
Subject Code: EI103
Subject: Electronic Circuits laboratory

<table>
<thead>
<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

Prerequisite: -

Objectives:
- To study characteristics of electron devices like diode, transistor and FET
- To study characteristics of Thyristors like SCR, DIAC and TRIAC
- To design and test the performance of amplifiers, filters and wave shaping circuits

Outcome:
- The students will be able to design simple electronic circuits like amplifiers, filters and wave shaping circuits

**LIST OF EXPERIMENTS:**
(Any 10 experiments)
1. PN Junction diode and zener diode characteristics
2. FET characteristics
3. SCR, DIAC and TRIAC characteristics
4. Measurement of h-parameters of transistors in CB, CE, CC configurations
5. Rectifier with and without filters (Full wave and Half wave)
6. CE Amplifier and CC amplifiers
7. Single stage R-C coupled Amplifier
8. FET amplifier (Common Source)
9. Clippers and clampsers
10. RC wave shaping circuits
11. RC oscillators
12. Power Amplifiers
13. Astable multivibrator
14. Monostable multivibrator
15. LC Oscillators

Total contact Hours: -
Total Tutorials: -
Total Practical Classes: 45
Total Hours: 45
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS145</td>
<td>Data Structures and Object Oriented</td>
<td>-</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Programming Laboratory</td>
<td></td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>Objectives</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To learn programming in C and C++</td>
<td>The student will be able to write simple programs in C and C++</td>
</tr>
</tbody>
</table>

### Data Structures and Object Oriented Programming Lab
(The following experiments (1-8) are to be implemented only in C Language)

1. Searching Techniques
2. Sorting Techniques
3. Implied Linked List and doubly linked and its applications
4. Stack and its applications
5. Binary tree traversal
6. Graph traversal
7. Spanning Tree
8. Shortest path algorithms

(The following experiments (9-12) are to be implemented only in C++)

9. Programs to implement classes and objects with constructors and destructors
10. Programs to implement different types of inheritances like multiple, Multilevel and hybrid.
11. Programs to implement virtual functions to demonstrate the use of run time polymorphism
12. Programs to implement Queue and its applications

Total contact Hours: - | Total Tutorials: - | Total Practical Classes: 45 | Total Hours: 45
Department: Electrical and Electronics Engineering  
Programme: B.Tech. (EI)  
Semester: Three  
Category: LB

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE135</td>
<td>Electrical Machines Laboratory</td>
<td>-</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
</table>
| ● To study characteristics of DC motor, DC generator and transformer  
● To study characteristics of Alternator and induction motor  
● To study the measurement of power using two watt meter method |

<table>
<thead>
<tr>
<th>Outcome</th>
</tr>
</thead>
</table>
| ● test the characteristics of DC motors, DC Generators and Transformers  
● test the characteristics of alternator and induction motor  
● measure the power using two watt meter method |

<table>
<thead>
<tr>
<th>Cycle - I</th>
</tr>
</thead>
</table>
| 1. Power measurement using Two wattmeter method for the following: a) load with UPF  
  b) Load with Lagging PF  c) Load with Leading PF  
2. OCC of Shunt generator.  
4. Swinburn’s Test.  
5. Load test on single phase Induction motor.  
7. Load test on single phase Alternator.  
8. Load test on three phase transformer.  
9. Load test on shunt motor.  
 Variation of starting torque with rotor resistance of a slip ring induction motor. |

Total contact Hours: -  
Total Tutorials: -  
Total Practical Classes: 45  
Total Hours: 45
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>MA106</td>
<td>Partial Differential Equations and Numerical Methods</td>
<td>3 1 0 4 40 60 100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite:** Higher secondary Mathematics

**Objective:**
- To introduce the ideas of Partial Differential Equations
- To familiarize students Boundary value problems related to PDE
- To solve problems in ordinary and partial differential equations by some basic numerical methods

**Outcome:**
- Understands how to solve first order Partial Differential Equations
- Gain knowledge on solving Boundary Value Problems
- Will be able to solve ordinary and partial differential equations numerically

**UNIT – I**
**Solution of Partial Differential Equations**
Hours: 12
Formation of PDE by elimination of arbitrary constants and arbitrary functions – General, Singular, Particular and complete integrals – Lagrange’s linear first order equation – Higher order differential equations with constant coefficients.

**UNIT – II**
**Solution of Boundary Value Problems I**
Hours: 12

**UNIT – III**
**Solution of Boundary Value Problems II**
Hours: 12
Fourier series solution for one dimensional heat flow equation – Fourier series solution for two dimensional heat flow equations under steady state conditions (Cartesian and polar forms).

**UNIT – VI**
**Numerical solution of Ordinary Differential Equation**
Hours: 12

**UNIT – V**
**Numerical solution of Partial Differential Equations**
Hours: 12

*Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: | Total Hours: 60*

**Text Books:**

**Reference Books:**

**Web sites:**
1. www.math.niu.edu
2. nm.mathforcollege.com
**Department:** Electronics and Instrumentation Engineering  
**Programme:** B.Tech. (EI)  
**Semester:** Four  
**Category:** TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>CA</th>
<th>SE</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI104</td>
<td>Linear Integrated Circuits</td>
<td>3 1 1 - 4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite:**

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and DAC.
- To teach the theory of ADC and DAC.
- To introduce the concepts of waveform generation and introduce some special function ICs.

**Objectives**

- Design simple circuits like amplifiers using Opamps.
- Design waveform generating circuits.
- Design simple filters circuits for particular application.
- Gain knowledge in designing stable voltage regulators.

**Outcome**

- Design simple circuits like amplifiers using Opamps.
- Design waveform generating circuits.
- Design simple filters circuits for particular application.
- Gain knowledge in designing stable voltage regulators.

**UNIT – I**  
Integrated Circuits and Operational Amplifier  

**INTEGRATED CIRCUITS:** Classification, chip size and circuit complexity, Fundamentals of Monolithic IC technology, basic planar processes, Fabrication of a typical circuit, Active and passive components of ICs, fabrication of FET, Thin and thick film technology.

**OPERATIONAL AMPLIFIER:** Basic information of Op-amp, ideal and practical Op-amp, Op-amp characteristics, 741 op-amp and its features, modes of operation-inverting, non-inverting, differential mode.

**UNIT – II**  
OP-Amp Applications  

Basic application of Op-amp, instrumentation amplifier, ac amplifier, V to I and I to V converters, Precision rectifiers, log and antilog amplifiers, sample & hold circuits, multipliers and dividers, Differentiators and Integrators, Comparators, Schmitt trigger, Multivibrators, Triangular wave generator.

**UNIT – III**  
Active Filters, Oscillators and Regulators  

Introduction-Low pass and High pass filters- Design of first and second order Butterworth lowpass and high pass filters Band pass, Band reject and all pass filters- Oscillator types and principle of operation – RC phase shift and Wien bridge oscillators - triangular, saw-tooth, square wave generators and VCO- Introduction to voltage regulators, features of 723, Three Terminal IC regulators – Fixed and variable - DC to DC Converter- Switching Regulators-SMPS.

**UNIT – IV**  
Timers & Phase Locked Loops  

Introduction to 555 timer, functional diagram, monostable, astable operations and applications, Schmitt Trigger. PLL - introduction, block schematic, principles and description of individual blocks of 565-PLL applications, Analog and digital phase detectors. Programmable timers - XR2240

**UNIT – V**  
D-A AND A-D Converters  

Introduction, basic DAC techniques, weighted resistor DAC, R-2R ladder DAC, Different types of ADCs - parallel comparator type ADC, counter type ADC, successive approximation ADC, dual slope ADC and Sigma delta ADC. DAC and ADC specifications. DAC 0800 and ADC 0804 pin diagram and applications.

**Text Books:**


**Reference Books:**

**Department:** Electronics and Instrumentation Engineering  
**Semester:** Four  
**Programme:** B.Tech. (EI)  
**Category:** TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI105</td>
<td>Digital Logic Theory and Design</td>
<td>3 L 1 T 4 P</td>
<td>40 CA 60 SE 100 TM</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To introduce basic postulates of Boolean algebra and show the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits.

**Objectives:**
- The students will be able to understand and design of digital circuit and its principle
- The students will be able to explain the working of various sequential circuits
- Understand the digital Logic families and relevant ICs and its usages
- The student will understand algorithmic state machines and threshold logic and its usages.

**UNIT I – Minimization Techniques and Logic Gates**


**Logic Gates:** AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR Implementations of Logic Functions using gates, NAND–NOR implementations–Multi level gate implementations- Multi output gate implementations. TTL and CMOS Logic and their characteristics – Tristate gates.

**UNIT II – Combinational Circuits**


**UNIT III – Sequential Circuits**


**UNIT IV – Synchronous and Asynchronous Sequential Circuits**


**UNIT V – Memory Devices**


**Total Hours:** 45
- **Total Tutorials:** 15
- **Total Practical Classes:**
- **Total Hours:** 45

**Text Books:**
Reference Books:

**Programme:** B.Tech. (EI)  
**Department:** Electronics and Instrumentation Engineering  
**Semester:** Four  
**Category:** TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>CA</th>
<th>SE</th>
<th>TM</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI106</td>
<td>Sensors and Transducers</td>
<td>4</td>
<td>0</td>
<td></td>
<td></td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
</tbody>
</table>

### Prerequisite

- To get the basic idea of measurements and the errors associated with measurement.
- To differentiate between the types of transducers available.
- To gain information about the function of various measuring instruments and using them.

### Objectives

- To get the basic idea of measurements and the errors associated with measurement.
- To differentiate between the types of transducers available.
- To gain information about the function of various measuring instruments and using them.

### Outcome

- To get the basic idea of measurements and the errors associated with measurement.
- To differentiate between the types of transducers available.
- To gain information about the function of various measuring instruments and using them.

### UNIT – I  
**Introduction**  
Hours: 12


### UNIT – II  
**Static and Dynamic Characteristics**  
Hours: 12


### UNIT – III  
**Active and Passive Transducers**  
Hours: 12


### UNIT – IV  
**Inductive, Capacitive and Piezoelectric Transducers**  
Hours: 12


### UNIT – V  
**MISCELLANEOUS AND SMART TRANSDUCERS**  
Hours: 12

Eddy current transducers. Hall effect transducers – Photo electric detector, different types and characteristics – Magneto-strictive Transducer, Optical sensors, IC sensor for temperature – signal conditioning circuits, Introduction to Fiber optic sensors – Temperature, pressure, flow and level measurement using fiber optic sensors. Intelligent and smart transducers- principle- design approach, interface design, configuration support, communication in smart transducer networks. SQUID sensors, Film sensors, MEMS – Nano sensors.

- Total contact Hours: 60  
- Total Tutorials: -  
- Total Practical Classes: -  
- Total Hours: 60

### Reference Books:

### Subject Information

**Subject Code:** EI107  
**Subject:** Linear and Digital Integrated Circuits Laboratory

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI107</td>
<td>L  T  P  C  CA  SE  TM</td>
<td>3  2  60  40  100</td>
<td></td>
</tr>
</tbody>
</table>

#### Prerequisite
- To design simple circuits that perform arithmetic operations.
- To design active filters using 741 IC.
- To design multivibrator circuits and voltage regulators.
- To understand the working of DAC, Multiplexers, decoders and Counters

#### Objectives
- The students get exposure to the basic IC applications
- Will be able design signal conditioning circuits required for Instrumentation and control Applications.
- Will learn the design of counters, multiplexers and decoders

#### Outcome

(Any 10 Experiments)

1. OPAMP applications, Inverting and Non-inverting Amplifiers, Summer, Differential amplifier, Differentiator and Integrator
2. First order active filters (LPF, HPF and BPF).
3. Astable and Monostable Multivibrators, Schmitt trigger using 741 IC.
4. Comparator, Zero crossing detector and Window detector
5. 555 timer Applications.
7. 4 bit DAC using OP AMP.
8. IC 565 PLL Applications.
10. Decade counter-7490.
11. 3-8 Decoder -74138.
12. 4 bit Comparator-7485.
13. 8 x 1 Multiplexer -74151 and 2x4 Demultiplexer-74155
14. Decoder drives for LED.
15. ADC 0809

#### Total contact Hours: -  
#### Total Tutorials: -  
#### Total Practical Classes: 45  
#### Total Hours: 45
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI108</td>
<td>Sensors and Transducers Laboratory</td>
<td>-</td>
<td>3</td>
<td>60</td>
</tr>
</tbody>
</table>

**Prerequisite**
- To study the characteristics of different transducers
- To measure torque, strain and load using strain gauge
- To know the applications of hall effect, optical, magnetic and electric pickup transducers
- To model RTD and thermocouple

**Objectives**
- Learn the characteristics, working and applications of various transducers used in Instrumentation area.

**Outcome**

**List of Experiments**
(Any 10 Experiments)
1. Characteristic of Temperature transducers (LDR, thermistor and thermocouple).
3. Measurement of strain, Load and Level using strain gauges
4. Measurement of torque and Pressure using strain gauges
6. Characteristics of Optical Transducers (LDR, Phototransistor, Photovoltaic and photoconductive cells)
8. Ramp response characteristic of filled in system thermometer.
10. Characteristics of P/I and I/P converters.
11. Measurement of Pressure and Temperature using ICs (LM 35, LM 335 and AD 590)
12. Measurement of Position using synchro Transmitter and receiver

Total contact Hours: -  Total Tutorials: -  Total Practical Classes: 45  Total Hours: 45
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI109</td>
<td>Simulation Laboratory</td>
<td>-</td>
<td>3</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
<td>2</td>
<td>100</td>
</tr>
</tbody>
</table>

**Prerequisite**

To design and simulate electrical and electronic circuits using MATLAB, PROTEUS

**Objective**
The student will be able to design and simulate simple electrical and electronic circuits

**Outcome**

1. Analysis of Transistor biasing circuits (Fixed, Emitter and Collector base bias).
2. Analysis of Transistor as an amplifier and switch.
4. Design of filters and resonance circuits.
5. Design and Analysis of Feedback Amplifiers and Oscillators.
6. Analysis of FET biasing and Amplifier circuits.
7. Analysis of cascade amplifiers.
8. Transient Analysis.
11. Determining Opamp Characteristics.
12. Opamp applications.
13. Realization of flip-flops, half adder and full adder.
15. Multivibrators using 555 timer.
17. PCB Designing.

**List of Experiments**

<table>
<thead>
<tr>
<th>Total contact Hours: -</th>
<th>Total Tutorials: -</th>
<th>Total Practical Classes: 45</th>
<th>Total Hours: 45</th>
</tr>
</thead>
</table>
Department: Electronics and Instrumentation Engineering  
Programme: B.Tech. (EI)  
Category: TA  
Semester: Five  

| Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code | Subject Code |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|

<table>
<thead>
<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prerequisite: -

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

Outcome:
- Perform time domain and frequency domain analysis of control systems required for stability analysis.
- Design the compensation technique that can be used to stabilize control systems.

UNIT – I  
Introduction to Systems  
Hours: 12
Basic elements in control systems – Open and Closed loop systems – Feedback characteristics – Effects of feedback – Mathematical modeling of physical systems: Mechanical, Thermal, Hydraulic and Pneumatic systems - Transfer function – AC and DC servomotors – Block diagram reduction techniques – Signal flow graph – Control system components – Computer simulation (For assignments only).

UNIT – II  
Time Response Analysis  
Hours: 12
Time response – Types of test inputs - I and II order system responses – Error coefficients – Generalized error series - Steady state error - Time domain specifications - PID and ON/OFF controllers - Performance criteria - Selection of controller modes - Computer simulation (For assignments only).

UNIT – III  
Frequency Response Analysis  
Hours: 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 response from open loop response – Computer simulation (For assignments only).

UNIT – IV  
Stability of Control System  
Hours: 12

UNIT – V  
State-Variable Analysis  
Hours: 12
Introduction of state, state variables and state model, derivation of state models from block diagrams, Relationship between state equations and transfer functions- Characteristic equation, eigenvalues, eigenvectors, canonical forms Diagonalization- solving the time invariant state equations- State Transition Matrix. Controllability and observability. Computer simulation (For assignments only).

Total contact Hours: 45  
Total Tutorials: -15  
Total Practical Classes: -  
Total Hours: 60

Text Books:

Reference Books:
### Objectives
- To study about electrical instruments and measurements
- To study about resistance and impedance measuring methods.
- To study about signal generators and analyzers
- To study about cathode ray oscilloscope, recorders and displays

### Outcome
- The students will be able to understand the working principles of different electrical instruments.
- The students will understand the need for resistance, capacitance and inductance measurement made by various techniques.
- The students will be able to visualize the working of different signal generators, analyzer and recorders.

### UNIT – I
**Measurement of Voltage, Current, Power And Energy**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours: 12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galvanometers – Ballistic, D’Arsonval galvanometer – Theory, calibration, application – Principle, construction, operation and comparison of moving coil, moving iron meters, dynamometer, induction type &amp; thermal type meter, rectifier type – Extension of range and calibration of voltmeter and ammeter – Errors and compensation</td>
<td></td>
</tr>
</tbody>
</table>

### UNIT – II
**Potentiometers, Instrument Transformers & Magnetic Measurements**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours: 12</th>
</tr>
</thead>
</table>

### UNIT – III
**Resistance and Impedance Measurement**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours: 12</th>
</tr>
</thead>
</table>

### UNIT – IV
**Signal Generators and Analysers**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours: 12</th>
</tr>
</thead>
</table>

### UNIT – V
**Cathode Ray Oscilloscope, Recorders and Displays**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours: 12</th>
</tr>
</thead>
</table>

### Total contact Hours: 60
**Total Tutorials:** -  **Total Practical Classes:** -  **Total Hours: 60**

### Text Books:

### Reference Books:
1. Patranabhis, Principles of Electronic Instrumentation - PHI, 2007
### Subject: Microprocessor and its applications

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
<th>CA</th>
<th>SE</th>
<th>TM</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI112</td>
<td>Microprocessor and its applications</td>
<td>3</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To study 8085 and 8086 programming and its applications
- To study interfacing devices like 8255, 8253, 8259 and 8251

**Objectives:**
- Write simple assembly language programs in 8085 and 8086
- Interface any I/O device to 8085
- Design a microprocessor-based system for any application

**Outcome:**
- On completion of the course, students can
- Write simple assembly language programs in 8085 and 8086
- Interface any I/O device to 8085
- Design a microprocessor-based system for any application

**UNIT I: Introduction to 8085**
- Hours: 12
- Architectures: Generic-8-bit microprocessor and its architecture-8085 functional block diagram
- Architecture-functions of different sections-Memory mapping-Memory interfacing-Instruction format-addressing modes-instruction set of 8085 CPU-instruction cycle-timing diagram-different machine cycles-fetch and execute operations-estimation of execution time.

**UNIT II: Programming 8085**
- Hours: 12
- Data transfer instructions-arithmetic operations-logic and branch operations-writing assembly language programmes-looping, count indexing-16-bit arithmetic instructions-arithmetic operations related to memory-logical operations, rotation compare, counter and time delays-debugging techniques. Stack-subroutine-call and return instructions-parameter passing techniques-nested subroutine. Parallel input-output and interfacing applications-peripheral and memory mapped I/O. 8085 interrupts-Restart as software instructions

**UNIT III: Interfacing Devices**
- Hours: 12
- 8255 programmable peripheral interface-8253 programmable interval timer-8259 programmable interrupt controller-direct memory access (DMA) and 8257 DMA controller-8155 multipurpose programmable devices-8279 programmable keyboard display interface-serial I/O and data communication-8251 USART-Interfacing data converters ADC and DAC.

**UNIT IV: Introduction to 8086**
- Hours: 12
- Architecture of 8086 Microprocessor-Special functions of General purpose registers-8086 flag register and function of 8086 flags-Addressing modes of 8086-Instruction set of 8086-Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation-Pin diagram of 8086-Minimum mode and maximum mode of operation-Timing diagram-Memory interfacing to 8086 (Static RAM & EPROM).

**UNIT V: Applications of Microprocessors**
- Hours: 12
- Typical applications of microprocessors: Seven segment display interface, LCD interface, stepper motor control, temperature control, frequency measurement, phase angle and power factor measurement, Measurement of strain, deflection and water level measurement, Microprocessor based traffic control.

**Total contact Hours:** 45  | **Total Tutorials:** 15  | **Total Practical Classes:** -  | **Total Hours:** 60

**Text Books:**

**Reference Books:**
1. N. Senthil Kumar, M. Saravanan and S. Jeevananthan, —Microprocessor and Microcontrollers, OXFORD UNIVERSITY PRESS, November, 2010
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI113</td>
<td>VLSI Design Laboratory</td>
<td>-</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To perform customized digital IC Design using FPGA/CPLD.</td>
</tr>
<tr>
<td></td>
<td>To develop digital systems using VHDL and VERILOG and to validate the same through functional simulation and hardware verification.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The students get exposure to the system design aspects of FPGA.</td>
</tr>
<tr>
<td></td>
<td>Will be able Design ICs for customized requirements.</td>
</tr>
<tr>
<td></td>
<td>Will learn firmware development for FPGA/CPLD using VHDL and VERILOG.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1. Implementation of Basic Logic Gates, Half and Full Adders in FPGA and logic synthesis.</td>
</tr>
<tr>
<td></td>
<td>2. Implementation of Combinational logic circuits-Encoders, Decoders, Multiplexers, Demultiplexers, Comparators in FPGA.</td>
</tr>
<tr>
<td></td>
<td>3. Implementation of Sequential logic Circuits - Flips Flops, Registers, Counters in FPGA.</td>
</tr>
<tr>
<td></td>
<td>5. Peripheral Interfacing using FPGA - Switches, LEDs, Segment Displays.</td>
</tr>
<tr>
<td></td>
<td>6. Design of Motor Controller using FPGA/CPLD.</td>
</tr>
<tr>
<td></td>
<td>7. Design of LCD Display controllers using FPGA/CPLD.</td>
</tr>
<tr>
<td></td>
<td>8. Design of Data Acquisition controllers using FPGA/CPLD.</td>
</tr>
<tr>
<td></td>
<td>9. Design of Programmable Signal generators using FPGA/CPLD.</td>
</tr>
<tr>
<td></td>
<td>10. Design of UART communication controller using FPGA/CPLD.</td>
</tr>
<tr>
<td></td>
<td>11. Implementation of CRT controller using FPGA/CPLD.</td>
</tr>
<tr>
<td></td>
<td>12. Design and Implementation of SD card communication controller using FPGA.</td>
</tr>
<tr>
<td></td>
<td>13. Realization of Keypad controller using FPGA.</td>
</tr>
<tr>
<td></td>
<td>14. Implementation of PID controllers in FPGA.</td>
</tr>
</tbody>
</table>

**Total contact Hours:** -  **Total Tutorials:** -  **Total Practical Classes:** 45  **Total Hours:** 45
### Department: Electronics and Instrumentation Engineering  
### Programme: B.Tech. (EI)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Five</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category</td>
<td>LB</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EL114</td>
<td>Instrumentation System Design Laboratory</td>
<td>L  T  P  C  CA  SE  TM</td>
<td>3  2  60  40  100</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite:** -

**Objectives**
- To learn the basics of designing and testing electronic instruments like digital voltmeters, function generators and Power supplies.
- To learn the design, testing and calibration of instruments used in process control industries.

**Outcome**
- The students will be able to design, test and calibrate the industrial instruments.

1. (Any 10 Experiments)
3. Design, Testing and calibration of Monolithic function Generator using XR 2206 and LM566
5. Design, Testing and calibration of Batch counter using TTL ICs.
6. Design, Testing and calibration of DAC and ADC (both passive and digital)
13. Design and testing of advanced measurement circuits.

**Total contact Hours:** -  
**Total Tutorials:** -  
**Total Practical Classes:** 45  
**Total Hours:** 45

---

53
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI115</td>
<td>Microprocessor and Applications Laboratory</td>
<td>L T P C CA SE SE TM</td>
<td>60 40 100</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite**: -

**Objectives**
- To write 8085 and 8086 assembly language programs
- To interface 8085 / 8086 for measurement and control applications

**Outcome**
- Get exposure to 8085 and 8086 assembly language programs.
- Will be able to interface I/O devices to microprocessor
- Will learn the design of microprocessor based systems

1. Programming 8085 and 8086 microprocessors
2. Interfacing programmable interrupt controller.
3. Interfacing of keyboard and display devices
5. Interface of programmable timer
8. Frequency measurement
9. Study of 8251 and 8237
10. Temperature controller

**Total contact Hours**: -  
**Total Tutorials**:  -  
**Total Practical Classes**: 45
**Department:** Electronics and Instrumentation Engineering  
**Programme:** B.Tech. (EI)  
**Semester:** Six  
**Category:** TA  
**Subject Code** | **Subject** | **Hours / Week** | **Credit** | **Maximum Marks**  
--- | --- | --- | --- | ---  
EI116 | Process Control | 4 | - | - | 40 | 60 | 100  
**Prerequisite** -  
**Objectives**  
- To study the basic characteristics of first order and higher order processes and get adequate knowledge about the characteristics of various controller modes.  
- To study controller tuning and various complex control schemes  
- To study about the construction, characteristics and application of control valves.  
- To study the importance of state-space representation and stability analysis of discrete data system.  
- To develop different types of algorithm for digital controllers.  

**Outcome**  
The students  
- Can understand characteristics of various processes  
- Know the functions of process Control elements  
- Can design a controller for a selected process.  
- Can analyze any discrete-time system and design a digital control.  

**UNIT – I**  
**Introduction**  
Hours: 12  

**UNIT – II**  
**Controllers and FCE**  
Hours: 12  

**UNIT – III**  
**Controller Tuning and Multiloop Control**  
Hours: 12  

**UNIT – IV**  
**Analysis of Discrete Data Systems**  
**Hours: 12**  

**UNIT – V**  
**Design of Digital Controller**  
**Hours: 12**  

| Total contact Hours: 60 | Total Tutorials: - | Total Practical Classes: - | Total Hours: 60  
--- | --- | --- | ---  

**Text Books:**  

**Reference Books:**  
4. C.M. Houpis, G.B. Lamount, Digital Control Systems Theory, Hardware and Software,  

55
**Department**: Electronics and Instrumentation Engineering  
**Programme**: B.Tech. (EI)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI117</td>
<td>Industrial Instrumentation</td>
<td>4</td>
<td>0</td>
<td>12</td>
</tr>
</tbody>
</table>

**Prerequisite**: -

**Objectives**: To equip the students with the knowledge of industrial measurements like

- Pressure, level, temperature, flow measurements
- Acceleration, density, viscosity measurements
- EMC, safety measures and specification details of instruments.

**Outcome**: The Students will be able to

- identify various instruments based on their working and will be able to test and calibrate them.
- understand the automation requirements of any industries like chemical industries, construction industry etc.,
- interpret process flow diagrams, will be able to prepare documents required in projects.

**UNIT – I**  
**Pressure Measurement**  
**Hours**: 12


**UNIT – II**  
**Level & Flow Measurement**  
**Hours**: 12


**UNIT – III**  
**Temperature Measurement**  
**Hours**: 12


**UNIT – IV**  
**Measurement of Acceleration, Density, Viscosity**  
**Hours**: 12

Accelerometers – LVDT, piezo-electric, strain gauge and variable reluctance type accelerometers – seismic instrument as an accelerometer and vibrometer – calibration of vibration pick ups – units of density, specific gravity and viscosity used in industries – Baume scale API scale – pressure head type densitometer – float type densitometer – ultrasonic densitometer -Bridge type gas densitometer. Viscosity terms – say bolt viscometer – rotameter type viscometer - Falling ball viscometer – industrial consistency meters.

**UNIT – V**  
**Industrial Safety and Specifications**  
**Hours**: 12


**Text Books**:  

Reference Books:

### Subject Code: EI118

**Subject:** Digital Signal Processing

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th>-</th>
</tr>
</thead>
</table>

**Objectives**

- To find the output of a discrete-time system for the given discrete-time inputs
- To study about frequency analysis of discrete-time signals through DFT and FFT
- To study about the design of IIR and FIR filters
- To study the finite word length effects in digital filters

**Outcome**

- Analyze the response of a discrete-time system for different inputs
- Find the frequency components present in a signal
- Plot the frequency response of a discrete-time system
- Design IIR and FIR digital filters for the given application

### UNIT – I

**Discrete-Time Signals and Linear Systems**

**Hours:** 12

Classification of signals: continuous and discrete, energy and power -representation of discrete-time signals, elementary discrete-time signals, classification of discrete-time signals, Classification of systems, Representation of a system with difference equation, impulse response and step response, FIR and IIR systems, Convolution sum and correlation, sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect, reconstruction of analog signal from its samples.

### UNIT – II

**DTFT and Z-Transform**

**Hours:** 12


### UNIT – III

**DFT and FFT**

**Hours:** 12


### UNIT – IV

**Design of Digital Filters**

**Hours:** 12

FIR filter design: Linear phase characteristics- Windowing technique of designing FIR filter-- Need and choice of windows, frequency sampling method.

IIR filter design: Analog filter design - Butterworth and Chebyshev filters, digital design using impulse invariant and bilinear transformation – War ping effect, prewarping.

### UNIT – V

**Finite Word Length Effects in Digital Filters**

**Hours:** 12

Number representation, quantization, rounding truncation. Input quantization error, Product quantization error, Coefficient quantization error, Overflow limit cycle oscillations, Zero input limit cycle oscillation, Scaling. Finite word length effects in computation of DFT using direct evaluation and FFT algorithms.

**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

**Text Books:**


**Reference Books:**

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI119</td>
<td>Process Control Laboratory</td>
<td>-</td>
<td>-</td>
<td>60</td>
</tr>
</tbody>
</table>

**Prerequisite**

- To understand the process plant and Piping and Instrumentation diagrams.
- To get adequate knowledge about practical issues of various controller modes and methods of tuning of PID controller.
- To get adequate knowledge about practical issues of closed loop control of processes.

**Objectives**

- The students will be able to design and implement different closed loop control schemes for different processes.

**Outcome**

2. Study of Inherent and Installed Characteristics of Control Valves.
3. Tuning and Closed loop control of Level Process.
4. Tuning and Closed loop control of Flow Process.
5. Tuning and Closed loop control of Temperature Process.
6. Tuning and Closed loop control of Pressure Process.
7. Design and implementation of ON/OFF Controller for the Temperature Process.
8. Tuning PID Controller for soft processes. (Mathematically described processes).
9. Tuning and closed loop control of Electronic Processes.
10. PID Implementation Issues and configuring Industrial PID Controller.
11. Simulation study on PID Enhancements (Cascade and Feed-forward Control Schemes)

**List of Experiments**

**Total contact Hours:** 45  
**Total Tutorials:** 45  
**Total Practical Classes:** 45  
**Total Hours:** 45
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI120</td>
<td>Embedded System Design Laboratory</td>
<td>-</td>
<td>3</td>
<td>60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>• To Design microcontroller based Embedded systems.</td>
</tr>
<tr>
<td>• To develop firmware for the systems and to validate the same through functional simulation and hardware verification.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>• The students get exposure to the system design aspects of Microcontrollers.</td>
</tr>
<tr>
<td>• Will be able Design applications for customized requirements.</td>
</tr>
<tr>
<td>• Will learn firmware development for microcontrollers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>List of Experiments (Any 10 Experiments)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Parallel Port Interfacing Using MCS51.</td>
</tr>
<tr>
<td>2. Implementation of Timer and Counter programming using MCS51.</td>
</tr>
<tr>
<td>4. Design of Real Time Clock using MCS 51 using segment Displays.</td>
</tr>
<tr>
<td>5. Design of PC interface Hardware with MCS51 using UART communication.</td>
</tr>
<tr>
<td>6. Interfacing 16x2 LCD Display using MCS51</td>
</tr>
<tr>
<td>8. Design of PC based DC motor control (Speed &amp; Direction) system.</td>
</tr>
<tr>
<td>10. Implementation of Interrupts in LPC2148.</td>
</tr>
<tr>
<td>11. Implementation of UART features of ARM LPC2148.</td>
</tr>
<tr>
<td>13. Interfacing SD card and Graphical LCD using LPC2148.</td>
</tr>
<tr>
<td>15. Implementation of USB communication using LPC2148.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Total contact Hours: -</th>
<th>Total Tutorials: -</th>
<th>Total Practical Classes: 45</th>
<th>Total Hours: 45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Code</td>
<td>Subject</td>
<td>Hours / Week</td>
<td>Credit</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------------------</td>
<td>--------------</td>
<td>--------</td>
</tr>
<tr>
<td>EI121</td>
<td>Virtual Instrumentation Laboratory</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Learn the basics of virtual instrumentation including use of IEEE GPIB, RS232 interfaces, and data acquisition boards.</td>
</tr>
<tr>
<td>- Interfacing of a computer to various instruments for data acquisition and instrument control using a state-of-the-art software platform such as National Instrument's LABVIEW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Develop ability for programming in LabVIEW using various data structures, program structures, plotting the graphs and charts for system monitoring, processing and controlling</td>
</tr>
<tr>
<td>- Understand the basics of interfacing and programming using related hardware</td>
</tr>
<tr>
<td>- Monitor or process system through individual/team project</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Basic LabView Programming - Part1</td>
</tr>
<tr>
<td>2. Basic LabView Programming - Part2</td>
</tr>
<tr>
<td>3. Implementing Serial Communication using LabVIEW</td>
</tr>
<tr>
<td>4. Design of Virtual Digital Voltmeter using LabVIEW</td>
</tr>
<tr>
<td>5. Design of Virtual Function Generator using LabVIEW</td>
</tr>
<tr>
<td>6. Hardware &amp; Firmware design for Programmable Digital Voltmeter</td>
</tr>
<tr>
<td>7. Hardware &amp; Firmware design for Programmable Function Generator</td>
</tr>
<tr>
<td>8. GPIB based instrument control using Labview.</td>
</tr>
<tr>
<td>9. Distributed Instrument control using Ethernet</td>
</tr>
<tr>
<td>10. DAQ Post processing and Report Generation</td>
</tr>
<tr>
<td>11. Design of Mass Spring Dashpot System using CD tools and Simulation module</td>
</tr>
<tr>
<td>12. Design of GUI using MATLAB</td>
</tr>
<tr>
<td>13. Design of Serial communication using GUI in MATLAB</td>
</tr>
<tr>
<td>14. Implementation of ECG signal processing algorithms using LabVIEW</td>
</tr>
<tr>
<td>15. Implementation of Image processing using LabVIEW</td>
</tr>
<tr>
<td>16. Realization of PID controllers using LabVIEW</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>List of Experiments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total contact Hours: -</td>
</tr>
<tr>
<td>Total Tutorials: -</td>
</tr>
<tr>
<td>Total Practical Classes: 45</td>
</tr>
<tr>
<td>Total Hours: 45</td>
</tr>
</tbody>
</table>
### Subject Code: HS102

**Subject:** General Proficiency

<table>
<thead>
<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>-</td>
<td>-</td>
<td>3</td>
</tr>
</tbody>
</table>

### Prerequisite

- To enhance the students’ communication and language skills and make them industry-ready.
- To encourage brainstorming discussions and teamwork.
- To train students to master soft skills through various activities.

### Objectives

### Outcomes

On successful completion of the module, students will be able to:

- Communicate in English effectively and confidently.
- Imbibe the requisite soft skills.
- Improve critical thinking and analytical skills.

### Art of communication:

- Verbal and Non-verbal Communication
- Barriers to Communication
- Importance of Body Language (Proxemics, kinesics, haptic, chronemics and paralanguage)
- Effective Listening
- Feedback – presentation skills.

### Introduction to soft skills:

- Self-Confidence
- Leadership Qualities
- Emotional Quotient
- Time Management
- Stress Management
- Interpersonal Skills.

### Comprehension and Analysis:

- British and American English
- GRE based comprehension
- Analytical writing
- Analyzing contemporary issues – current English usage.

### Adapting to corporate life:

- Group discussions
- Meetings
- Public Speaking
- Debate
- Intercultural communication – etiquettes – interviews – email writing.

### Aptitude:

- Vocabulary building – Verbal and Numerical aptitude.

### Total contact Hours: 45

Total Tutorials: 45
Total Practical Classes: 45
Total Hours: 45

### Reference Books:


### Websites:

1. [www.cambridgeenglish.org](http://www.cambridgeenglish.org)
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI12</td>
<td>PLC and DCS</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre requisite</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Objectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>- To provide idea about various Data Networks.</td>
</tr>
<tr>
<td>- To get an exposure to SCADA.</td>
</tr>
<tr>
<td>- To learn about different PLC languages.</td>
</tr>
<tr>
<td>- To study about Industrial DCS.</td>
</tr>
<tr>
<td>- To have an exposure to HART and Fieldbus</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>The students</td>
</tr>
<tr>
<td>- Know the fundamentals of data networks</td>
</tr>
<tr>
<td>- Can do PLC programming</td>
</tr>
<tr>
<td>- Know the fundamentals of DCS, HART and Field bus</td>
</tr>
</tbody>
</table>

UNIT – I  
**PLC Architecture and Interface Modules**  
PLC Architecture - comparative study of industrial PLC’s- Interface modules-ac and dc input and output modules- analog and discrete input and output modules, BCD and TTL input and output modules - communication modules - PID-Thermocouple-stepper motor, Encoder/Counter, servo and language modules.

UNIT – II  
**PLC Programming**  
Ladder logic - Boolean language - sequential function instruction set-program counter, data manipulation, chart-Arithmetic, shift registers and sequencers – Structured Text Programming.

UNIT – III  
**Data Network Fundamentals**  
Network hierarchy and switching-ISO/OSI Reference model-Data link control protocol: HDLC-SDLC-Multiple access protocols-Token ring Token bus and CSMA/CD, Polling, reservation, FDMA, TDMA, CDMA, Addressing concepts: class full, classless addressing and network address translation. TCP/IP-Bridges-routers-gateways-standard Ethernet and ARCNET configuration

UNIT – IV  
**Distributed Control System**  
Evolution – Different architecture – Local control unit functions – Operator Interface – LLOI and HLOI - redundancy concepts – Displays – Communication networks and communications standards in DCS – Engineering Interface – Factors to be considered in selecting a DCS.

UNIT – V  
**Hart and Fieldbus**  

**Total contact Hours: 60**  
**Total Tutorials: -**  
**Total Practical Classes: -**  
**Total Hours: 60**

**Text Books:**

**Reference Books:**
EI123 Analytical Instrumentation

Hours / Week: L 4  T -  P -  C 4  CA 40  SE 60  TM 100

Prerequisite: -

Objectives:
- To provide a solid background in the fundamental concepts and methods of spectroscopy, chromatography & environmental pollution and an appreciation of issues in each of these fields in current research.

Outcome:
- Acquire knowledge about the interaction of electromagnetic radiations with matter and apply analytical techniques to accurately determine the elements present in the given sample.
- Select Instrument for a particular analysis with some idea of its merits, demerits and limitations
- Learn specific technique employed for monitoring different pollutants in air and water.
- They can understand the applications and usage of chromatography in real time industrial environments.

UNIT – I Spectroscopy Hours: 12
UV – Visible spectrophotometers – Single beam and double beam instruments – Sources and detectors.
IR spectrophotometers –Sources and detectors – Sample handling techniques – FTIR spectrometers – Raman Spectrometers

UNIT – II Flame, NMR & Microwave Spectroscopy Hours: 12
Flame emission spectrometry – Atomic absorption spectrometry - NMR, ESR / EPR spectroscopy – basic principles – instrumentation techniques and applications.

UNIT – III Mass Spectrometers & Radiation Measurement Hours: 12
Ionization chamber - Proportional counter – GM counter - scintillation counter - solid state detector - Gamma ray spectrometers - isotope dilution and tracer techniques for quantitative estimation and analysis

UNIT – IV Chromatography Hours: 12
Gas chromatography – Methods of analysis in gas chromatography - Column details
Detectors: Thermal conductivity detectors- Flame ionization detectors - Flame photometric detectors - Electron capture detectors - Effect of temperature.
Liquid chromatography – Pre column - Separation column - Detectors - HPLC.

UNIT – V Environmental Pollution Monitoring Instruments Hours: 12

Total contact Hours: 60  Total Tutorials: -  Total Practical Classes: -  Total Hours: 60

Text Books:

Reference Books:
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME135</td>
<td>Maintenance and Safety Engineering</td>
<td>4</td>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>

**Prerequisite**
- 

**Objectives**
- To study the issues of maintenance, reliability and safety of technical systems
- To study Fault finding and diagnostics in engineering industry
- To get Knowledge of lubricants and lubrication systems and know maintenance requirements of plant and equipment
- To study Hazard identification and risk assessment in operation and maintenance of industrial plant
- To Familiarize with prevailing regulations for safe environment and health

**Outcomes**
- The Students
  - Know Effective maintenance strategy and continuously improve maintenance systems.
  - Can Plan maintenance programs and Evaluate plants' reliability programs.
  - Can Effectively computerized maintenance management systems.
  - Know Condition monitoring techniques to develop effective maintenance policies.
  - Understand Importance of safety and codes

**UNIT - I**

**UNIT - II**

**UNIT - III**

**UNIT - IV**

**UNIT - V**

**Total Contact Hours : 60** | **Total Tutorials : -** | **Total Practical Classes : -** | **Total Hours : 60**

**Text Books:**

**Reference Books:**
Websites:
1. http://nptel.iitm.ac.in/courses/Webcourse-contents
**Department:** Electronics and Instrumentation Engineering  
**Programme:** B.Tech. (EI)  
**Semester:** Seven  
**Category:** LB

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI124</td>
<td>Industrial Measurement and Control Laboratory</td>
<td>-</td>
<td>L 3</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>T 2</td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>P 3</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CA 60</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SE 40</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>TM 100</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite**
- To understand practical issues of applications of PLC hardware and programming a PLC.
- To get adequate knowledge about practical issues of implementations of PLC and DCS.
- To get adequate knowledge about practical issues of calibration of Process instruments.
- To get adequate knowledge about practical issues of various digital controllers.
- To get adequate knowledge about practical issues of closed loop control of processes using Digital Controllers.

**Objectives**
- Calibrate different instruments used in industries.
- Design and implement computer based control schemes for different processes

(Any 10 Experiments)
1. Calibration of Pressure gauge using Dead weight Tester.
2. Calibration of manometers and Control valves.
3. Calibration of Control valves, I to P and P to I converters.
5. PC based Cascade control of level process.
6. PC based control of interacting level process.
10. Control of a real time process using ADC/DAC interface between Simulink and Process hardware.
12. PC based PID Control of 4th order electronic process using C program.
13. Study of basic programming of PLC.
14. Analog operation in PLC.
15. Arithmetic operation, Timer, Counter operation using PLC.
16. Annunciator design using PLC.
17. PLC based control of Level Process, Temperature Process.
18. Design of PID Controller and Auto tuning of PID Controller.
   - (a) Analysis of Multi-input Multi-output System (Four-tank System).
   - (b) Design of Multi-Loop PID Controller and Multivariable PID Controller.
20. Design of Self-Tuning Controller.

**Total contact Hours:** -  
**Total Tutorials:** -  
**Total Practical Classes:** 45  
**Total Hours:** 45
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI125</td>
<td>Project work Phase-I</td>
<td>L</td>
<td>3</td>
<td>100</td>
</tr>
</tbody>
</table>

The objective of the project is to enable the students to work in groups of not more than four members in each group on a project involving analytical, experimental, design or combination of these in the area of Electronics and Instrumentation Engineering. Each project shall have a guide. The student is required to do literature survey, formulate the problem and form a methodology of arriving at the solution of the problem. The evaluation is based on continuous internal assessment.
The course should cover the following topics by way of Seminars, Expert Lectures and Assignments:

1. Engineering Ethics – Moral issues, Ethical theories and their uses
2. Engineering as Experimentation – Code of Ethics
3. Engineer’s responsibility for safety
4. Responsibilities and rights
5. Global issues of engineering ethics
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI127</td>
<td>Comprehension Test and Viva-Voce</td>
<td>-</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>60</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

The student will be tested for his understanding of basic principles of the core Electronics and Instrumentation Engineering subjects through objective type tests and Viva-Voce examination.
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EI128</td>
<td>Project Work Phase-II</td>
<td>L 9 T 6 P</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

Project work phase II will be an extension of the project work started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee. The external university examination will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner.
SYLLABUS (Elective Subjects)
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP01</td>
<td>Visual Programming for Instrumentation Engineers</td>
<td>4 0 - 4 40 60 100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite**  
-  

**Objectives**  
- To introduce visual programming applicable to instrumentation and for instrument control software development using .net  
- To develop window based applications in multi language environment

**Outcome**  
- The student can  
  - Understand fundamentals of .net, vb.c# and vb.net  
  - Understand advanced concepts in c# and vb in .net  
  - Able to choose a platform and language for developing instrumentation software  
  - Create sample applications for instrument control.

**UNIT – I**  
Net Frame Work and C# Basics  
- Hours: 12


**UNIT – II**  
C# Using Libraries  
- Hours: 12

  Name space System – Input and output – Multithreading – Windows Forms – data handling and Exception handling

**UNIT – III**  
Advanced Features Using C#  
- Hours: 12

  Web services – Window services – Messaging, Reflection and COM – Localization and Globalization – XML – Unsafe
  Model – Graphical Device Interface

**UNIT – IV**  
Introduction to VB.Net  
- Hours: 12


**UNIT – V**  
Advanced Programming Constructs  
- Hours: 12

  Sub Procedures – Functions – Modules – Arrays – Structure – Collection
  Case Study: Case studies in developing applications for Instrumentation

**Total contact Hours:** 60  
**Total Tutorials:** -  
**Total Practical Classes:** -  
**Total Hours:** 60

**Text Books:**
1. ISRD Group, Application of .net Technology, Tata Mcgraw Hill Education Private Limited, 2011

**Reference Books:**
1. Balagurusamy E, Programming with C#, Tata Mcgraw Hill 2008
Department: Electronics and Instrumentation Engineering  |  Programme: B.Tech. (EI)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP02</td>
<td>Embedded System Design</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

Prerequisite: Microprocessor and Applications

Objectives:
- To introduce system design concepts to students using microcontrollers.
- To introduce foundational concepts of microcontroller architecture and programming.
- To introduce hardware and software integration for real time systems using microcontrollers and thereby imparting real time system design knowledge to students.

Outcome:
- Foundational knowledge in activating and using a generic microcontroller. Preliminary design considerations for system level implementation.
- Knowledge of 8051 Microcontroller hardware features and internal peripherals. Programming knowledge of 8051 microcontrollers.
- Knowledge of ARM Processor hardware features and internal peripherals. Programming knowledge of ARM Processors.
- Software design techniques to be followed for embedded system designing.
- Using real time operating systems for embedded systems.

UNIT – I
Review Of Embedded Systems  | Hours: 12

UNIT – II
MCS51 Microcontroller  | Hours: 12

UNIT – III
LPC2148 Microcontroller  | Hours: 12

UNIT – IV
System Design Using MCU  | Hours: 12

UNIT – V
Real Time Operating Systems  | Hours: 12
Concept of Scheduling – Round Robin and Preemptive scheduling – Implementing a simple scheduler in ‘C’ - Task and Task States, tasks and data, semaphores and shared Data Operating system Services-Message queues- Events- Memory Management, Interrupt Routines in an RTOS environment, Implementing SD card – Graphical LCD system using RTOS.

Total contact Hours: 45  | Total Tutorials: -15  | Total Practical Classes: -  | Total Hours: 60

Text Books:

Reference Books:
**Department:** Electronics and Instrumentation Engineering  
**Programme:** B.Tech. (EI)  
**Semester:**  
**Category:** TA  

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP03</td>
<td>Web Based Instrumentation</td>
<td>L 4</td>
<td>T 0</td>
<td>P -</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>C 4</td>
<td>CA 40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>SE 60</td>
<td>TM 100</td>
</tr>
</tbody>
</table>

**Prerequisite:** -  

**Objectives:**  
- To learn Internet and web concepts  
- To learn various applications of Internet  
- To learn the language constructs of the programming language  
- To understand the basic concepts of the Internet-based control and measurement  

**Outcome:**  
- Select the suitable Internet technology to implement Internet-based control and measurement.  
- To write programs in Java to make it useful to develop Internet-based instrumentation and control  
- To deploy Internet application in Internet  

**UNIT – I**  
**Basic Internet Concepts**  
**Hours:** 12

- Packet Switching - Internet: A Network of Networks  
- ISPs: Broadband and Wireless Access  
- Software to Create a Virtual Network  
- TCP: Software for Reliable Communication  
- Clients + Servers = Distributed Computing  
- Names for Computers  
- NAT: Sharing an Internet Connection  

**UNIT – II**  
**Internet Application**  
**Hours:** 12

- Electronic Mail: Bulletin Board Service (Newsgroups) - Browsing the World Wide Web  
- Virtual Network - TCP: Software for Reliable Communication  
- Clients + Servers = Distributed Computing  
- Names for Computers  
- NAT: Sharing an Internet Connection  

**UNIT – III**  
**Basics of Java Language:**  
**Hours:** 12

- Java Evolution: Overview of Java Language  
- Constants, Variables and Data Types  
- Operators and Expressions  
- Classes, Objects and Methods  
- Arrays and Strings  
- Concepts and Simple Applications  
- Variables, constants and Functions  
- Processing decisions  
- Loop Structure and List  
- File and Database Application: File access, Dialog Boxes, exception handling, Menus in Vb.net  
- Connecting to databases  

**UNIT – IV**  
**Application of Internet Measurement and Control:**  
**Hours:** 12

- Measurements through Internet: Web based data acquisition  
- Monitoring of plant parameters through Internet  
- Calibration of measuring instruments through Internet  
- Internet based Control: Virtual laboratory – Web based Control – Tuning of controllers through Internet  

**Case Study:** Internet based Measurement and Control case studies using Java, JVM and security – Over view of class library: I/O, AWT and NET – JDBC, Object serialization – remote method invocation – Java script – Java vs C++  

**UNIT – V**  
**Miscellaneous Topics**  
**Hours:** 12

- Intranets – Internet commerce – Internet and VRML – Active X  
- Case study: Internet based measurement, Telemonitoring and Tele control in Biomedical, instrumentation Applications  

**Text Books:**  
2. Balagurusamy, Object Oriented Programming Using C++ and JAVA, Tata Mcgraw Hill Education Private Limited, 2012 (Unit III and Unit IV)  

**Reference Books:**  
1. Deitel and Deitel, Java: How to Program, 9th Edition Princtice Hall 2012  
**Department:** Electronics and Instrumentation Engineering  
**Programme:** B.Tech. (EI)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP04</td>
<td>Instrumentation Buses and Data Networks</td>
<td>4 0 - 4</td>
<td>40 60 100</td>
<td></td>
</tr>
</tbody>
</table>

**Prerequisite:** 
- To educate on the basic concepts of data networks
- To introduce the basics of inter networking and serial communications
- To provide details on HART and Field buses
- To educate on MODBUS, PROFIBUS and other communication protocol
- To introduce industrial Ethernet and wireless communication

**Outcomes:**
- Ability to understand and analyze Instrumentation systems and their applications to various industries

**UNIT – I**  
**Hours: 12**

**UNIT – II**  
**Hours: 12**

**UNIT – III**  
**Hours: 12**

**UNIT – IV**  
**Hours: 12**

**UNIT – V**  
**Hours: 12**

**Text Books:**
1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, Practical Industrial Data

**Reference Books:**
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours/Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP05</td>
<td>Applied Soft Computing</td>
<td>4</td>
<td>0</td>
<td>40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
</tr>
</tbody>
</table>

### Objectives
- To expose the students to the concepts of feedforward neural networks.
- To provide adequate knowledge about feedback neural networks.
- To provide adequate knowledge about fuzzy and neuro-fuzzy systems.
- To provide comprehensive knowledge of fuzzy logic control to real-time systems.
- To provide adequate knowledge of genetic algorithms and its application to economic dispatch and unit commitment problems.

### Outcome
- The students will be able to understand the applications of neural network and fuzzy logic in the area of control systems.

#### UNIT – I Artificial Neural Network

- Review of fundamentals – Biological neuron, Artificial neuron, activation function, single layer perceptron - limitation – multilayer perceptron – Back propagation algorithm – recurrent network - adaptive resonance theory based network – radial basis function network - online learning algorithms, BP through time - RTRL algorithm reinforce learning

#### UNIT – II Neural Networks for Modeling And Control


#### UNIT – III Fuzzy Set Theory

- Fuzzy set theory - fuzzy sets - operation on fuzzy sets - Scalar cardinality, fuzzy cardinality, union and intersection-complement (Yeger and Sugeno), equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation- fuzzy membership functions

#### UNIT – IV Fuzzy Logic For Modeling And Control


#### UNIT – V Hybrid Control Schemes


**Total contact Hours:** 60  |  **Total Tutorials:** - |  **Total Practical Classes:** - |  **Total Hours:** 60

### Text Books:

### Reference Books:
Department: Electronics and Instrumentation Engineering
Programme: B.Tech. (EI)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP06</td>
<td>Power Plant Instrumentation</td>
<td>4 L 0 T P 4 C 40 CA 60 SE 100 TM</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prerequisite

Objectives

- To provide an overview of power generation with a particular stress on thermal power generation and also to familiarize the drawing of P&I diagrams of different power plant control loops and various measurements involved in power plants.
- To impart knowledge about the different types of controls and control loops in thermal power plants to improve the efficiency.
- To familiarize the student with the methods of monitoring different parameters like speed, vibration of turbines and their control along with flue gas analysis and trimming of gases to reduce emissions in order to sensitize students to the environmental impact of these systems.

Outcome

- The students could understand the role of P&I diagrams and control loops of the different power plant and control loops.
- The students will be able to design the instrumentation required for the power plant.
- To analyze the various instruments used in power plant control systems and safety system and interlock requirement in plant.
- To explain the environmental impact of electricity generation and show how adequate control processes may reduce or eliminate these impacts.

UNIT – I

Introduction

Piping and instrumentation diagram of a thermal power plant, basic process on a boiler, - measurement of non electrical parameters –flow of feed water, fuel, air and steam with correction factor for temperature, steam pressure and steam temperature , drum level measurement –water level gauge for boiler drums, closed circuit television instrument, gas analysis meters, smoke instruments, dust monitor-analysis of impurities in feed water and steam, flue gas oxygen analyser, dissolved oxygen analyzer, pH meter , fuel analyser, radiation detectors and pollution monitoring instruments.

UNIT – II

Boiler Control

- Boiler control objectives-combustion of fuels (gaseous liquid, and solid), excess air, combustion chemistry and products of combustion, requirement for excess combustion, air-circulation of efficiency of boiler: input/output method-stream temperature control systems super heaters and de-super heaters.

UNIT – III

Boiler Control-II

- Feed water supply and boiler water circulation system-drum level control systems-boiler draft systems-measurement and control of furnace draft-measurement and control of combustion-draft and air flow control related functions, control techniques and safety interlocks in boiler operation.

UNIT – IV

Flue Gas Analysis Trimming of Combustion Control Systems

- Flue gas analysis and its importance, combustion control for liquid and gaseous fuel boilers coal or solid fuel strokes-combustion control for stoker-fired boilers- pulverised coal-fired boilers and trimming of combustion control systems. Turbine monitoring and control: speed, vibration, shell temperature monitoring, lubricant oil temperature control and cooling system.

UNIT – V

Nuclear Power Plant Instrumentation

- Piping and instrumentation diagram of different types of nuclear power plants-radiation detection instruments-process sensors for nuclear power plants-spectrum analyzers-nuclear reactor control systems and allied instrumentation.

Total contact Hours: 60 | Total Tutorials: - | Total Practical Classes: - | Total Hours: 45

Text Books:


Reference Books:

1. A.Sherryet. Al. (Editors), Modern power station practice, Vol.6 (Instrumentation controls and testing), Pergamon Press, 1971
Subject Code | Subject | Hours / Week | Credit | Maximum Marks
---|---|---|---|---
EIP07 | Digital Image Processing | 4 0 - | 4 | 40 60 100

Prerequisite
- 

Objectives
- To Learn the basics of Digital image processing and transforms
- To study image processing techniques such as image enhancement, image restoration, image compression and image segmentation

Outcome
- Students will know the fundamentals of digital image processing and its applications.

UNIT – I
Digital Image Fundamentals and Transforms | Hours: 12


UNIT – II
Image Enhancement Techniques | Hours: 12


UNIT – III
Image Restoration | Hours: 12


UNIT – IV
Image Compression | Hours: 12

Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM.

UNIT – V
Image Segmentation and Representation | Hours: 12


Total contact Hours: 60 | Total Tutorials: - | Total Practical Classes: - | Total Hours: 60

Text Books:

Reference Books:
**Objectives**
The objective of the course is to study about the various network models, protocols and standards that provide guidelines to manufacturers, vendors, government agencies and other service providers to ensure the kind of inter-connectivity necessary in today's marketplace and in international communications.

**Outcome**
At the end of the course a knowledge of the seven layer ISO/OSI model, types of connections, like transmission media available such as coax and fiber optic cables, line coding, modems, RS-232 interfaces at the physical layer is acquired. Also an exposure to the various error correction and detection techniques, flow and error control protocols and the various LAN topologies, the different switching, routing and addressing methods are also obtained.

**UNIT – I**

**Data Communications**


**UNIT – II**

**Data Link Layer**


**UNIT – III**

**Network Layer**


**UNIT – IV**

**Transport Layer**


**UNIT – V**

**Application Layer**


**Total contact Hours: 60** | **Total Tutorials: -** | **Total Practical Classes: -** | **Total Hours: 60**

**Text Books:**

**Reference Books:**
### Design of Process Control System Components

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP09</td>
<td>Design of Process Control System Components</td>
<td>3</td>
<td>4</td>
<td>40</td>
</tr>
</tbody>
</table>

**Prerequisite**

- To understand the health and safety implications of working with process control systems
- To know the operation of typical instrumentation systems
- To identify the various methods of signal transmission

**Objectives**

- Be able to interpret and formulate design specifications for instrumentation systems that meet accuracy and sampling speed requirements.
- Be able to design, construct, and verify an instrumentation system to meet desired specifications
- Be familiar with safety issues concerning design of instrumentation, including the effects of electric current through tissue and defibrillation.

**Outcome**

- Be able to interpret and formulate design specifications for instrumentation systems that meet accuracy and sampling speed requirements.
- Be able to design, construct, and verify an instrumentation system to meet desired specifications.
- Be familiar with safety issues concerning design of instrumentation, including the effects of electric current through tissue and defibrillation.

**UNIT – I**

*Hours: 12*

- Orifice meter - design of orifice for given flow condition
- Design of rotameter
- Design of RTD measuring circuit
- Design of cold junction compensation circuit for thermocouple using RTD
- Transmitters – zero and span adjustment in D/P transmitters and temperature transmitters.

**UNIT – II**

*Hours: 12*

- Bourdon gauges - factors affecting sensitivity
- Design aspect of Bourdon tube
- Design of Air purge system for level measurement
- Electronic P+I+D controllers - design
- Adjustment of set point, bias and controller settings.

**UNIT – III**

*Hours: 12*

- Control valves - characteristics of control valves
- Types of valve bodies
- Valve characteristics
- Materials for body and trim
- Sizing of control valves
- Cavitations, flashing in control valves
- Selection of body materials and characteristics of control valves for typical applications.

**UNIT – IV**

*Hours: 12*

- Types of pumps
- Pump performance
- Different types of pump systems
- Characteristics of pump system
- Pressure, friction and flow
- Pump operation
- Maintenance
- Instruments used in pumping practice
- Pump noise and vibration
- Selection of pumps.

**UNIT – V**

*Hours: 12*

- Interlocks and alarms: Interlock design principles, fail-safe design
- Alarms and their types
- Design of logic circuits for alarm and annunciator circuits
- Interlocks design.

**Total contact Hours: 45**  **Total Tutorials: -15**  **Total Practical Classes: -**  **Total Hours: 60**

**Text Books:**


**Reference Books:**

### Subject: Fibre Optics and Laser Instrumentation

**Subject Code:** EIP10  
**Subject:** Fibre Optics and Laser Instrumentation

<table>
<thead>
<tr>
<th>Subject</th>
<th>Hours/Lecture</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>EIP10</td>
<td>4</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

### Prerequisite
- None

### Objectives
- To study in detail about the application of optical fibres in industries.
- To study about the fundamentals of laser and its applications in industry and medical field.

### Outcome
- The students will have insight on theory and applications of fibre optics and laser industry and medical field.

### UNIT – I: Optical Fibres and Their Properties
- Hours: 12

- Principles of light propagation through a fibre
- Different types of fibres and their properties, fibre characteristics
- Absorption losses
- Scattering losses
- Dispersion
- Connectors & Splices
- Optical Sources
- Optical detectors.

### UNIT – II: Industrial Applications of Optical Fibres
- Hours: 12

- Fibre Optic Sensors
- Fibre Optic Instrumentation System
- Electro optic
- Acousto-optic
- Travelling Wave Modulators
- Interferometric Method of Measurement of Length
- Moire fringes
- Measurement of Pressure, Temperature, Current, Voltage, Liquid level and Strain.

### UNIT – III: Laser Fundamentals
- Hours: 12

- Fundamental Characteristics of Lasers
- Three level and Four level Lasers
- Properties of Lasers
- Laser Modes
- Resonator Configuration
- Q-Switching and Mode locking
- Cavity dumping
- Types of Lasers
- Gas lasers, Solid lasers, Liquid lasers, Semiconductor lasers.

### UNIT – IV: Industrial Applications of Lasers
- Hours: 12

- Laser for measurement of Distance, Length, Velocity, Acceleration, Current, Voltage and Atmospheric Effect
- Material Processing
- Laser heating, Welding, Melting and Trimming of Material
- Removal and Vaporization.

### UNIT – V: Hologram and Medical Applications
- Hours: 12

- Holography
- Basic Principle
- Methods
- Holographic interferometry and applications
- Holography for non-destructive testing
- Medical Applications of Lasers
- Lasers and Tissue interaction
- Laser Instrumentations for surgery
- Removal of Tumours of Vocal cords
- Brain surgery
- Plastic surgery.

Total contact Hours: 60  
Total Tutorials: -  
Total Practical Classes: -  
Total Hours: 60

### Text Books:

### Reference Books:
### Instrumentation Control in Petrochemical Industries

**Prerequisite:**
- To introduce the methods of crude oil extraction, processing and refining.
- To educate on Unit operations in petroleum refinery and petrochemical industry
- To introduce Production routes of important petrochemicals
- To provide knowledge on Control of selected petrochemicals production processes.
- To educate on the safety in instrumentation systems

**Objectives:**
- The student will be able understand and explain different Measurements and analyze instrumentation systems in refineries and petrochemical industries.
- Necessity of Safety in instrumentation systems
- Apply the advanced control techniques in refineries

**Outcome:**
- Techniques used for oil discovery - seismic survey - methods of oil extraction - oil rig system – Primary and Secondary recovery - Enhanced oil recovery - separation of gas and water from oil – control loops in oil gas separator - scrubber – coalesce.

**UNIT – I Oil Extraction and Processing | Hours: 12**
- Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking -catalytic reforming - polymerization - isomerization - alkylation - Production of ethylene, acetylene and propylene from petroleum.

**UNIT – II Petroleum Refining | Hours: 12**
- Chemicals from methane, acetylene, ethylene and propylene - production routes of important petrochemicals such as polyethylene, polypropylene, ethylene dioxide, methanol, xylene, benzene, toluene, styrene, VCM and PVC.

**UNIT – III Chemicals from Petroleum | Hours: 12**
- Control of binary and fractional distillation columns - Control of catalytic and thermal crackers – control of catalytic reformer - control of alkylation process - Control of polyethylene production – Control of VCM and PVC production

**UNIT – V Safety in Instrumentation Systems | Hours: 12**
- Area and material classification as per National Electric Code (NEC) - Classification as per International Electro technical Commission (IEC) -Techniques used to reduce explosion hazards - Pressurization techniques - Type X, Type Y and Type Z - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit.

**Total contact Hours: 60 | Total Tutorials: - | Total Practical Classes: - | Total Hours: 45**

**Text Books:**

**Reference Books:**
Department: Electronics and Instrumentation Engineering  
Programme: B.Tech. (EI)  

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP12</td>
<td>System Identification and Adaptive Control</td>
<td>4 0 - 4 40 60 100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prerequisite:
- To introduce Non parametric methods
- To impart knowledge on parameter estimation methods
- To impart knowledge on Recursive identification methods
- To impart knowledge on Adaptive control schemes
- To introduce stability, Robustness and Applications of adaptive control method

Objectives:
- To introduce Non parametric methods
- To impart knowledge on parameter estimation methods
- To impart knowledge on Recursive identification methods
- To impart knowledge on Adaptive control schemes
- To introduce stability, Robustness and Applications of adaptive control method

Outcome:
- Ability to apply advanced control theory to practical engineering problems

UNIT – I  Non Parametric Methods  
Hours: 12
Non parametric methods: Transient analysis–frequency analysis–Correlation analysis–Spectral analysis

UNIT – II  Parameter Estimation Methods  
Hours: 12

UNIT – III  Recursive Identification Methods  
Hours: 12
The recursive least square method – the recursive instrumental variable methods- the recursive prediction error methods – Maximum likelihood. Identification of systems operating in closed loop: Identification considerations – direct identification – indirect identification

UNIT – IV  Adaptive Control Schemes  
Hours: 12

UNIT – V  Issues Inadaptive Control and Applications  
Hours: 12
Stability – Convergence – Robustness –Applications of adaptive control.

Total contact Hours: 60  
Total Tutorials: -  
Total Practical Classes: -  
Total Hours: 60

Text Books:

Reference Books:
### Subject: Virtual Instrumentation

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP13</td>
<td>Virtual Instrumentation</td>
<td>4 L 0 T -</td>
<td>4 C</td>
<td>40 CA 60 SE 100 TM</td>
</tr>
</tbody>
</table>

#### Prerequisite
- To study background information required for studying virtual instrumentation.
- To study the basic building blocks of virtual instrumentation.
- To study the various techniques of interfacing of external instruments of PC.
- To study the various graphical programming environment in virtual instrumentation.
- To study a few applications in virtual instrumentation.

#### Objectives
- The student will be able to develop virtual instruments for industrial applications.

#### Outcome
- The student will be able to develop virtual instruments for industrial applications.

#### UNIT – I
**Review of Digital Instrumentation**

- Representation of analog signals in the digital domain
- Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

#### UNIT – II
**Fundamentals of Virtual Instrumentation**

- Concept of virtual instrumentation
- PC based data acquisition
- Typical on board DAQ card
- Resolution and sampling frequency
- Multiplexing of analog inputs
- Single-ended and differential inputs
- Different strategies for sampling of multi-channel analog inputs
- Concept of universal DAQ card
- Use of timer-counter and analog outputs on the universal DAQ card.

#### UNIT – III
**Cluster of Instruments in VI System**

- Interfacing of external instruments to a PC
- RS 232, RS 422, RS 485 and USB standards
- IEEE 488 standard
- ISO-OSI model for serial bus
- Introduction to bus protocols of MOD bus and CAN bus.

#### UNIT – IV
**Graphical Programming Environment in VI**

- Concepts of graphical programming
- LabVIEW software
- Concept of VIs and sub VI
- Display types
- Digital – Analog
- Chart
- Oscilloscopic types
- Loops
- Case and sequence structures
- Types of data
- Arrays
- Formulae nodes
- Local and global variables
- String and file I/O.

#### UNIT – V
**Analysis Tools and Simple Applications in VI**

- Fourier transform
- Power spectrum
- Correlation
- Windowing and filtering tools
- Simple temperature indicator
- ON/OFF controller
- P-I-D controller
- CRO emulation
- Simulation of a simple second order system
- Generation of HTML page.

#### Total contact Hours: 60
**Total Tutorials:** -  
**Total Practical Classes:** -  
**Total Hours:** 60

#### Text Books:
2. Peter W. Gofton, Understanding Serial Communications, Sybex International.

#### Reference Books:
**Department:** Electronics and Instrumentation Engineering  
**Programme:** B.Tech. (EI)  
**Semester:**  
**Category:** TA  

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP14</td>
<td>Advanced Control Theory</td>
<td>3 1 -</td>
<td>4</td>
<td>60 100</td>
</tr>
</tbody>
</table>

**Prerequisite:** -

**Objectives:**
- To provide knowledge on design in state variable form
- To provide knowledge in phase plane analysis.
- To give basic knowledge in describing function analysis.
- To study the design of optimal controller.

**Outcome:**
- Ability to apply advanced control theory to practical engineering problems.

**UNIT – I**  
State Variable Design  
Hours: 12
Introduction to state Model - effect of state Feedback - Necessary and Sufficient Condition for Arbitrary Pole placement - pole placement Design - design of state Observers - separation principle

**UNIT – II**  
Phase Plane Analysis  
Hours: 12

**UNIT – III**  
Describing Function Analysis  
Hours: 12

**UNIT – IV**  
Stability  
Hours: 12

**UNIT – V**  
Optimal Control  
Hours: 12
Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti’s equation – Application examples.

**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** -  
**Total Hours:** 60

**Text Books:**

**Reference Books:**
**Subject Code**: EIE15  
**Subject**: Advanced Digital Signal Processing

**Prerequisite**: Digital Signal Processing

---

**Objective**
- To learn methods of power spectral estimation using nonparametric and parametric methods
- Provide the students the fundamentals of estimation
- Impart an understanding of adaptive filters
- Introduce Multirate signal Processing

**Outcome**
- Students will have an understanding in analysis of signals and systems using advanced techniques in digital signal processing

---

**UNIT – I**  
**Frequency Domain Analysis of Signals and System and Digital Filters**  
Hours: 12


**UNIT – II**  
**Random Signal Processing and Spectrum Estimation**  
Hours: 12


**UNIT – III**  
**Linear Estimation and Prediction**  
Hours: 12


**UNIT – IV**  
**Adaptive Filters**  
Hours: 12


**UNIT – V**  
**Multirate Digital Signal Processing**  
Hours: 12

Mathematical description of change of sampling rate - Interpolation and Decimation - continuous time model - Direct digital domain approach - Decimation by an integer factor - Interpolation by an integer factor - Single and multistage realization - poly phase realization - Application to sub band coding - Wavelet transform and filter bank implementation of wavelet expansion of signals.

---

**Total contact Hours**: 45  
**Total Tutorials**: 15  
**Total Practical Classes**:  
**Total Hours**: 60

**Text Books**
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP16</td>
<td>Biomedical Instrumentation</td>
<td>4 0 -</td>
<td>4</td>
<td>40 60 100</td>
</tr>
</tbody>
</table>

**Prerequisite**: -

**Objectives**
- To learn the physiology of the human body and the Instrumentation related to Biomedical Systems
- To introduce the concepts of physiology and the Electrical Components of a Biomedical System.
- To discuss the measurement of physiological parameters.
- To understand the concepts of Imaging System and Telemetry and the various Therapeutic Equipment’s used in Medicine.

**Outcome**
- Students will have an understanding of physiology of the human body and different biomedical equipments used in medical field.

**UNIT – I**
**Physiology**
**Hours: 12**
Cell Structure, Basic Cell functions, Sources of Biomedical signals, Physiology of Cardiovascular, Nervous system & Respiratory system. Special senses: Auditory & Vision System, Engineering Analogy of Physiological system, Difficulties faced in measuring a living system.

**UNIT – II**
**Basic Components Of Biomedical System**
**Hours: 12**

**UNIT – III**
**Measurement of Physiological Parameters**
**Hours: 12**
ECG – ECG Lead systems and recording methods - EEG- EMG – Measurement of blood pressure-Cardiac output - Heart sounds - Respiratory rate - Lung Volumes and Capacities – Pneumotachography, Flow rate of CO₂, O₂ in exhaust air - pH of blood, GSR measurements- Plethysmography

**UNIT – IV**
**Imaging System and Telemetry**
**Hours: 12**

**UNIT – V**
**Assisting and Therapeutic Equipments**
**Hours: 12**

**Total contact Hours: 60**
**Total Tutorials: -**
**Total Practical Classes: -**
**Total Hours: 60**

**Text Book:**
1. R. Anandanatarajan, Biomedical Instrumentation and Measurements, PHI Learning, 2011.

**Reference Books:**
Department: Electronics and Instrumentation Engineering  
Programme: B.Tech. (EI)

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP17</td>
<td>VLSI Design</td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

Prerequisite: Digital Logic Design

Objectives:
- To introduce Digital VLSI design concepts and to introduce IC designing using Field Programmable Gate Arrays.
- To impart skill set in VHDL Hardware Description Language and understand real time modeling of ICs with test benches.

Outcome:
- Foundational skill set in CMOS technology and logic implementation using CMOS.
- Basics of VHDL hardware description language and VHDL levels of abstraction.
- Working knowledge of VHDL programming using concurrent architecture
- Designing complex digital systems using component instantiation.
- Working knowledge of test bench development.

UNIT – I  
Review of IC Technologies  
Hours: 12
Introduction to IC Technology – MOS, PMOS, NMOS, CMOS & BiCMOS technologies- Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design-Gate realization using CMOS-Introduction to Chip Design Process- Evolution of Computer Aided Digital Design - Hardware Description Languages- Introduction to Reconfigurable Hardware -FPGA and CPLD basics- Applications of VLSI.

UNIT – II  
Introduction to VHDL  
Hours: 12
VHDL basics - VHDL levels of abstraction – Structural , Behavioral and dataflow modes of implementation- The VHDL design flow - VHDL design entities - Entity declarations - Architectures –Concurrent signal assignments - Signal assignments with delays – Signal and variable assignments -Sequential statements - VHDL process statements - sensitivity lists – Conditional statements – loops - selective signal assignments.

UNIT – III  
System Implementation Using VHDL  
Hours: 12

UNIT – IV  
Introduction to Verilog  
Hours: 12
VERILOG HDL Design Flow-Module Description -Lexical Conventions - Description of Data types - Net - Register-Scalar Data Description - Vector Data Description -Parameters description - Array Description - Gate level Modeling -Dataflow modeling - Behavioral Modeling -Switch level Modeling

UNIT – V  
System Implementation Using Verilog  
Hours: 12

Total contact Hours: 45  
Total Tutorials: 15  
Total Practical Classes: -  
Total Hours: 60

Text Books:

Reference Books:
EIP18  Robotics and Automation

Prerequisite

Objectives
- To introduce the design of multi degree-of-freedom robots and mobile platforms.
- To review the latest technology available to design robotic systems.
- To design robots using professional engineering tools.
- To learn programming of microcontrollers to control a robotic system.
- To have Hands-on experience to design a robotic system.

Outcome
- Students will be able to design a robot starting with the conceptual design
- Develop the concept into a model, analyze the model on computer using engineering software packages
- Develop an engineering report and demonstrate the robot’s performance.

UNIT – I  Introduction  Hours: 12

UNIT – II  End Effectors  Hours: 12
End effectors and tools– types – Mechanical grippers – Vacuum cups – Magnetic grippers – Robot end effectors interface, work space analysis work envelope workspace fixtures-pick and place operation- continuous path motion-interpolated motion straight line motion.

UNIT – III  Robot Control  Hours: 12
Control of robot manipulators- state equations-constant solutions-linear feedback systems-single axis PID control- PD gravity control- computed torque control- variable structure control- Impedance control.

UNIT – IV  Robot Motion Analysis  Hours: 12
Robot motion analysis and control: Manipulator kinematics –forward and inverse kinematics- arm equation-link coordinates-Homogeneous transformations and rotations and Robot dynamics.

UNIT – V  Robot Applications  Hours: 12

Total contact Hours: 45  Total Tutorials: 15  Total Practical Classes: -  Total Hours: 60

Text Books:

Reference Books:
1. K.S.Fu, R.C. Gonzalez, CSG. Lee, Robotics, control sensing vision and Intelligence, Tata Mcgraw-Hill, 2008
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP19</td>
<td>Industrial Electronics</td>
<td>3</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Prerequisite</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>This course will provide the community qualified graduates prepared to repair, install and maintain electrical and electronic equipment used in the manufacturing and service industries.</td>
</tr>
</tbody>
</table>

**Objectives**
- Employ safety procedures presently being used in local manufacturing environments.
- Communicate effectively using the appropriate written or oral techniques.
- Modify or repair currently used manufacturing systems to operate in accordance with industry requirements and standards.
- Perform maintenance and troubleshooting functions

**UNIT – I**
Regulated Supplies and SCRS

Switched Mode Voltage Regulator, Comparison of Linear and Switched Mode Voltage Regulators, Servo Voltage Stabilizer, monolithic voltage regulators, Fixed and Adjustable IC Voltage regulators, 3-terminal Voltage regulators, Current boosting. Principles of operation and characteristics of SCR, Triggering of Thyristors, Commutation Techniques of Thyristors, Classes A, B, C, D, E and F, Ratings of SCR.

**UNIT – II**
Applications of SCR-I

Static circuit breaker, Protection of SCR, Inverters, Classification, Single Phase inverters, Converters, single phase Half wave and Full wave. Chopper circuits, Principle, methods and Configurations, Diac and Triac – Triggering modes, Firing Circuits, Commutation

**UNIT – III**
Applications of SCRS-II

Voltage compensator – solid state DC voltage regulation – DC shunt motor – armature control and field control of motor speed – electronic control of DC motor – speed regulator action – full wave motor speed regulation by one SCR

**UNIT – IV**
Industrial Timers

Industrial timers - Classification, types, Electronic Timers, Classification, RC and Digital timers, Time base Generators. Electric Welding, Classification, types and methods of Resistance and ARC welding

**UNIT – V**
Industrial Heating Applications


Total contact Hours: 45 | Total Tutorials: 15 | Total Practical Classes: | Total Hours: 60

**Text Books:**

**Reference Books:**
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP20</td>
<td>Digital Control Systems</td>
<td>L 3 T 1 P</td>
<td>C 4</td>
<td>CA 40 SE 60 TM 100</td>
</tr>
</tbody>
</table>

**Prerequisite**
Control Systems

**Objectives**
- To understand digital feedback control systems.
- To develop a knowledge of constructing discrete-time mathematical model system.
- To develop a knowledge of analyzing the system behaviour using discrete-time model and evaluating the system performance.
- To develop knowledge to use controller design techniques to make the system behaviour satisfies specified design objectives.

**Outcome**
- Students will have the basic knowledge of digital feedback control systems
- Students will have the knowledge analyzing the system behaviour using discrete-time model and evaluating the system
- Students will have knowledge of digital control design
- Students will have the ability to evaluate and test the system performance using digital simulations

**UNIT – I**
**Introduction to Digital Control**
*Hours: 12*
Introduction-Discrete time system representation -Mathematical modeling of sampling process Data reconstruction -Modeling discrete-time systems by pulse transfer function, Revisiting Z-transform, Mapping of s-plane to z-plane, Pulse transfer function, Pulse transfer function of closed loop system Sampled signal flow graph Stability analysis of discrete time systems, Jury stability test, Stability analysis using bi-linear transformation.

**UNIT – II**
**Response of discrete time systems**
*Hours: 12*
Time response of discrete systems, Transient and steady state responses, Time response parameters of a prototype second order system, Deadbeat response design, Design of digital control systems with deadbeat response, Practical issues with deadbeat response design, Sampled data control systems with deadbeat response.

**UNIT – III**
**Digital Control System Design**
*Hours: 12*
Design of sampled data control systems, Root locus method, Controller design using root locus, Root locus based controller design using MATLAB, Nyquist stability criteria, Bode plot, Lead compensator design using Bode plot, Lag compensator design using Bode plot, Lag-lead compensator design in frequency domain.

**UNIT – IV**
**Discrete State Space Model**
*Hours: 12*
Introduction to state variable model Various canonical forms Characteristic equation, state transition matrix Solution to discrete state equation, Controllability, observability and stability of discrete state space models Controllability and observability, Stability : Lyapunov stability theorem

**UNIT – V**
**State Feedback Design**
*Hours: 12*
State feedback design, Pole placement by state feedback, Set point tracking controller, Full order observer, Reduced order observer, Output feedback design, Theory Examples, Introduction to optimal control, Basics of optimal control, Performance indices, Linear Quadratic Regulator (LQR) design

**Total contact Hours: 45**
**Total Tutorials: -15**
**Total Practical Classes: -**
**Total Hours: 60**

**Text Books:**

**Reference Books:**
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP21</td>
<td>Signals and Systems</td>
<td>3 1 0 4</td>
<td>40</td>
<td>60 100</td>
</tr>
</tbody>
</table>

**Prerequisite:**
- To understand the fundamentals of signals, systems and their classification
- To study Fourier series, Fourier transform, Laplace transforms and their applications in continuous-time signal and system analysis
- To learn about sampling theorem and aliasing effects.
- To study DTFS, DTFT, Z-transforms and their applications in discrete-time signal and system analysis

**Objective:**
- Understand about signals, systems and their classification
- Will able to analyze the signals and systems in frequency domain
- Will acquire thorough knowledge on sampling concepts
- Analyze CT and DT systems using Laplace transforms and Z-transforms

**Outcome:**
- Understand about signals, systems and their classification
- Will able to analyze the signals and systems in frequency domain
- Will acquire thorough knowledge on sampling concepts
- Analyze CT and DT systems using Laplace transforms and Z-transforms

**UNIT – I**
**Introduction to signals and systems**


**UNIT – II**
**Fourier Series and Fourier transform**


**UNIT – III**
**Analysis of continuous-time and discrete-time systems**


**UNIT – VI**
**LAPLACE TRANSFORMS**

Summary of Laplace transforms, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of Laplace transform–relation between laplace transform and Fourier transform, Laplace transform of certain signals using waveform synthesis. Inverse Laplace transform, Partial fraction expansion, Solutions of differential equation using Laplace transform, Transfer function–stability–State space representation

**UNIT – V**
**Z–TRANSFORMS**


**Total contact Hours:** 45  
**Total Tutorials:** 15  
**Total Practical Classes:** 00  
**Total Hours:** 60
Text Books:

Reference Books:

# CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP22</td>
<td>Network Analysis and Synthesis</td>
<td>3 1 0 4</td>
<td>40</td>
<td>60 100</td>
</tr>
</tbody>
</table>

**Prerequisite**
- To study Fourier analysis of circuits
- To learn about network functions and understand stability concepts in time domain and frequency domain
- To design different types of passive filters, attenuators and equalizers
- To learn elements of network synthesis

**Objective:**
- Will be able to analyze the circuits in frequency domain
- Will acquire thorough knowledge on network functions and stability of networks
- Will be able to design all types of filters, attenuators
- Synthesize the networks for the given network functions

**Outcome:**
- Will be able to analyze the circuits in frequency domain
- Will acquire thorough knowledge on network functions and stability of networks
- Will be able to design all types of filters, attenuators
- Synthesize the networks for the given network functions

**UNIT – I**
**Fourier Analysis of Networks**
Hours: 12

**UNIT – II**
**Network Functions**
Hours: 12
Concept of Complex Frequency, Transform Impedances, Network function of one port and two port networks, Concept of poles and zeros, Relation between locations of poles. Necessary conditions for driving point functions, Transfer function, and Necessary condition for transfer functions-Convolution Integral-Time response and stability. Frequency response. Interrelation between frequency response and convolution integral.

**UNIT – III**
**Passive Filters**
Hours: 12
Classification of filters - Analysis of a proto type low pass filter and High pass filters- Analysis of a proto type Band pass and Band stop filters- constant K filters - m-derived filters – BPF and BSF-Lowpass filter with RL and RC sections-High pass filter with RC and RL Sections-Band pass filter with RLC circuits.

**UNIT – VI**
**Attenuators and Equalizers**
Hours: 12
Attenuators – Types of Attenuators, Symmetrical and asymmetrical Attenuators- section and Pi sections- Equalizers –Inverse Impedance-Two terminal Equalizers- Four terminal Equalizers

**UNIT – V**
**ELEMENTS OF NETWORK SYNTHESIS**
Hours: 12
Reliability of one port networks - Hurwitz polynomials - Positive Real function - Necessary and sufficient conditions of PR function - Properties of driving point impedance - Synthesis of LC,RL and RC driving point impedance, Foster and Cauer forms.

**Text Books:**

**Reference Books:**
1. K.Satya Prasad and S Sivanagaraju, Network Analysis, Cengage Learning, 2011

# CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks

96
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIP23</td>
<td>Product Design and Development</td>
<td>4</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

Objective
- To know the fundamentals of product design, product planning
- To understand about product development economics and schedule
- To learn about submission of project proposal and financial model

Outcome
- The student will be able to design a product in his area of study.

Unit-I
**Product Design**
- Hours: 12

Unit-II
**Product Specification**
- Hours: 12

Unit-III
**Product Development Schedule**
- Hours: 12

Unit-IV
**Design Reviews**
- Hours: 12

Unit-V
**Prototyping**
- Hours: 12
- Submission and Evaluation of Alpha prototype and test report, Beta prototype and customer evaluation, demonstration of working model.

Text Books:

# CA – Continuous Assessment, SE – Semester Examination, TM – Total Marks
## Subject Code: EIG01
### Subject: System Design using Advanced Microcontroller

<table>
<thead>
<tr>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>

### Prerequisite
- Microprocessor and Applications

### Objectives
- To introduce system design concepts to students using Advanced microcontrollers.
- To introduce ARM Architecture and LPC2148 microcontroller.
- To introduce Real time operating systems and its implications.

### Outcome
- Design considerations for system level implementation.
- Knowledge of LPC2148 Microcontroller hardware features and internal peripherals.
- Programming knowledge of LPC2148 microcontrollers.
- Using real time operating systems for Real time systems.

### UNIT – I
#### Introduction to LPC2148 Microcontroller

### UNIT – II
#### LPC2148 Microcontroller Operation

### UNIT – III
#### LPC2148 Advanced Peripherals

### UNIT – IV
#### System Design Using LPC2148

### UNIT – V
#### Real Time Operating Systems
- Concept of Scheduling – Round Robin and Preemptive scheduling – Implementing a simple scheduler in ‘C’ - Task and Task States, tasks and data, semaphores and shared Data Operating system Services-Message queues- Events-Memory Management, Interrupt Routines in an RTOS environment, Implementing SD card – Graphical LCD system using RTOS.

### Total contact Hours: 45 |
### Total Tutorials: 15 |
### Total Practical Classes:  |
### Total Hours: 60 |

### Text Books:

### Reference Books:
Department: Electronics and Instrumentation Engineering
Programme: B.Tech.
Semester :  
Category : TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIG02</td>
<td>Measurement and Instrumentation</td>
<td>4 0 0 -</td>
<td>4</td>
<td>40 60 100</td>
<td></td>
</tr>
</tbody>
</table>

Prerequisite
- To understand the concepts of measurements and instrumentation
- To study about the electrical and electronic instruments
- To learn about the signal generators and signal analyzers
- To learn about oscilloscopes and data loggers
- To understand the concepts of virtual instrumentation

Objectives
- Conceptual understanding of measurements and instrumentation
- Knowledgeable about electrical and electronic measuring devices
- Knowledgeable about signal generators and signal analyzers
- Understanding of the evolving virtual instrumentation concepts

Outcome
- Conceptual understanding of measurements and instrumentation
- Knowledgeable about electrical and electronic measuring devices
- Knowledgeable about signal generators and signal analyzers
- Understanding of the evolving virtual instrumentation concepts

UNIT – I
Introduction to Measurement | Hours: 12

Elements of Generalized measurement system - Methods of measurement - Classification of instruments – Static & Dynamic characteristics of instruments - Mean, Standard deviation. Probability of errors - Types of error Accuracy, Precision, Sensitivity, Linearity, Resolution, Hysteresis, Threshold, Input impedance, loading effects

UNIT – II
Electrical Measuring Instruments | Hours: 12


UNIT – III
Signal Generators and Analyzers | Hours: 12

Sine wave generator – Frequency synthesized sine wave generator – Sweep frequency generator, pulse and square wave generator – Function generator – Wave analyzer –Applications – Harmonic distortion analyzer – Spectrum analyzer – Applications – Audio Frequency generator – Noise generator

UNIT – IV
Cathode Ray Oscilloscope and Data Logging | Hours: 12


UNIT – V
Virtual Instrumentation | Hours: 12

Historical perspective, advantages, blocks diagram and architecture of a virtual instrument, data-flow techniques, graphical programming in data flow, comparison with conventional programming. Development of Virtual Instrument using GUI. VI programming techniques: VIS and sub-VIS, loops and charts, arrays, clusters and graphs, case and sequence structures, formula nodes, local and global variables, string and file I/O, Instrument Drivers, Publishing measurement data in the web.

Total contact Hours: 45  
Total Tutorials: -15  
Total Practical Classes: -  
Total Hours: 60

Text Books:


Reference Books:

1. Patranabis, Principles of Electronic Instrumentation - PHI, 2008
Semester: Category: TA

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIG03</td>
<td>Process Instrumentation</td>
<td>4 - - - -</td>
<td>40</td>
<td>60 100</td>
</tr>
</tbody>
</table>

Prerequisite: -

Objectives:
- To understand the health and safety implications of working with process control Systems
- To get detail about the control issues within such industries
- To make the student to able to correlate instrumentation and its role in such industry
- To understand the role of instrumentation engineer during such process

Outcome:
- The students will know different instruments used in industries and their working principles

UNIT – I

Process Characteristics

Process Control Elements: Signal conversion - I/P, P/I Converters, Pneumatic and Electric actuators, Valve Positioner-Control Valve – Characteristics of Control Valves-Types of control valves- Control valve sizing- cavitation and flashing.

UNIT – II


UNIT – III

Temperature & Pressure Measurement

UNIT – IV


UNIT – V


Total contact Hours: 60  Total Tutorials: -  Total Practical Classes: -  Total Hours: 60

Text Books:

Reference Books:
<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIG04</td>
<td>PLC and Industrial Automation</td>
<td>4</td>
<td>40</td>
<td>60 100</td>
</tr>
</tbody>
</table>

**Prerequisite**
- To understand the basics of Automation
- To understand the PLC hardware, PLC programming
- To understand Supervisory Control & Data Acquisition (SCADA).

**Objectives**
- Be able to interpret and formulate design aspect of industrial automation system
- Be able to design, construct, and verify an automation system to meet desired specifications,
- Be familiar with PLC programming.

**Outcome**
- Be able to interpret and formulate design aspect of industrial automation system
- Be able to design, construct, and verify an automation system to meet desired specifications,
- Be familiar with PLC programming.

**UNIT – I Basics of Automation**
- Introduction to PLC History
- PLC in Industrial Automation – Application areas – Process industries, Buildings, Robotics, Automobiles, Telecom, Electrical distribution, Medical

**UNIT – II Programmable Logic Controller (PLC) Basics**
- PLC architecture - Principle of Working
- PLC Classification based on Type and size - PLC characteristics – CPU, Racks, Power Supply, Memory, Input & Output Modules, Application Specific Modules, Speed of Execution, Communication, Redundancy.

**UNIT – III PLC Hardware**
- PLC Inputs and Outputs Types - Source and Sink Concept - Description and Function of various PLC Modules
- I/O Modules and Communication Modules
- PLC Hardware Configuration - Addressing of PLC I/O - Diagnostic Features
- PLC Wiring - Interfacing with Sensors and Actuators

**UNIT – IV PLC Programming**
- PLC Applications-Programming methods- Relay & logic ladder diagrams-Boolean logic-Definition and Use of Bits and Words - Introduction to PLC Programming Languages
- Ladder, Instruction List, Structed Text
- Instruction Set in Ladder – NO, NC, Set, Reset, Timers, Counters, Comparison, Arithmetic, Logical, Move, Drum Controller
- Programming Examples in Ladder with simple applications - PLC Instructions - Data Transfer Instruction
- Arithmetic Instructions, Data Comparison Instructions, Data Manipulation Instructions, Timer Instructions
- Counter Instructions, Program Control Instructions - Different Programming Techniques
- Trouble shooting PLC

**UNIT – V HMI: Supervisory Control & Data Acquisition (SCADA)**
- Need for HMI - Types and Characteristics of Local HMI operator panels - Introduction to Programming of HMI Panels
- Interface between HMI Panels and PLC - Definition of SCADA Functional Block Diagram
- Function of SCADA - SCADA data base configuration - Alarm management - Real time & historical trends
- Communication between PLC and SCADA
- SCADA Applications

**Text Books:**

**Reference Books:**
Subject Code | Subject | Hours / Week | Credit | Maximum Marks |
---|---|---|---|---|
EIG05 | Micro-Electro Mechanical Systems | L: 4 T: - P: - | C: 4 | CA: 40 SE: 60 TM: 100 |

Prerequisite:
- To Study about MEMS and parts of MEMS
- To Study the design methodology of MEMS for various mechanics.
- To Study about actuators in MEMS.
- To Study about MEMS based circuits.
- To Study about optical and RF based MEMS.

Objectives:
- The students will be able to understand the fundamentals of MEMs and their applications.

Outcome:
- The students will be able to understand the fundamentals of MEMs and their applications.

UNIT – I  
Introduction To MEMS  
Hours: 12
MEMS and Microsystems, Miniaturization, Typical products, Micro Sensors, Micro actuation, MEMS with micro actuators, Micro-accelerometers and Micro fluidics, MEMS materials, Micro Fabrication.

UNIT – II  
Mechanics for MEMS Design  
Hours: 12
Elasticity, Stress, strain and material properties, Bending of thin plates, Spring configurations, torsional deflection, Mechanical vibration, Resonance, Thermo mechanics – actuators, force and response time, Fracture and thin film mechanics, material, physical vapor deposition (PVD), chemical mechanical polishing (CMP)

UNIT – III  
Electro Static Design  
Hours: 12
Electrostatics: basic theory, electro static instability, Surface tension, gap and finger pull up, Electro static actuators, Comb generators, gap closers, rotary motors, inch worms, Electromagnetic actuators, bistable actuators.

UNIT – IV  
Circuit And System Issues  
Hours: 12
Electronic interfaces, Feed back systems, Noise, Circuit and system issues, Case studies – Capacitive accelerometer, Peizo electric pressure sensor, Thermal sensors, radiation sensors, mechanical sensors, bio-chemical sensors Modeling of MEMS systems, CAD for MEMS.

UNIT – V  
Introduction To Optical And RF MEMS  
Hours: 12
Optical MEMS, system design basics – Gaussian optics, matrix operations, Resolution, Case studies, MEMS scanners and retinal scanning, display, Digital Micro mirror devices, RF Mems – design basics, case study – Capacitive RF MEMS switch, Performance issues.

Total contact Hours: 45 | Total Tutorials: -15 | Total Practical Classes: - | Total Hours: 60

Text Books:

Reference Books:
Department: Electronics and Instrumentation Engineering
Programme: B.Tech.

<table>
<thead>
<tr>
<th>Subject Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Credit</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EIG06</td>
<td>Neural Networks and Fuzzy Logic</td>
<td>4 L 0 T 4 P</td>
<td>4 C</td>
<td>40 CA 60 SE 100 TM</td>
</tr>
</tbody>
</table>

Prerequisite -

Objectives
- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks
- To provide adequate knowledge about fuzzy and neuro-fuzzy systems
- To provide comprehensive knowledge of fuzzy logic control to real time systems

Outcome
- The students will be able to understand the applications of neural network and fuzzy logic in the area of control systems

UNIT – I  
Introduction to Neural Networks  
Hours: 12
Evolution of neural networks; Artificial Neural Network: Basic model, Classification, Feed forward and Recurrent topologies, Activation functions; Learning algorithms: Supervised, Un-supervised and Reinforcement; Fundamentals of connectionist modeling: McCulloach – Pits model, Perceptron, Adaline, Madaline.

UNIT – II  

UNIT – III  
Applications of Neural Networks  
Hours: 12

UNIT – IV  
Fuzzy Logic Systems  
Hours: 12

UNIT – V  
FLC and Neuro-FLC  
Hours: 12
Basic structure and operation of Fuzzy logic control systems; Design methodology and stability analysis of fuzzy control systems; Applications of Fuzzy controllers. Applications of fuzzy theory.
BNN network based fuzzy controllers – architecture of multivariable FLC – Fuzzy neuron – RBF networks in pattern recognition – architecture and training algorithm of RBF.

Total contact Hours: 60 | Total Tutorials: - | Total Practical Classes: | Total Hours: 60

Text Books:

Reference Books: