PROGRAMME EDUCATIONAL OBJECTIVES (PEO) – AGRICULTURAL & IRRIGATION ENGINEERING

i) To train and educate students with general knowledge and skills in agricultural water management, agricultural production process, farm machinery and farm management.

ii) To provide a sound theoretical knowledge in engineering principles applied to water resources and agricultural engineering.

iii) To prepare students for successful agricultural water management carrier integrating agriculture and irrigation technology.

iv) To develop innovative capacity of students for increasing agricultural production with scarce water resources available.

v) To impart positive and responsive out-reach attitudes, initiative and creative thinking in their mission as engineers.

vi) To understand ethical issues and responsibility of serving the society and the environment at large.
PROGRAM OUTCOMES – AGRICULTURAL AND IRRIGATION ENGINEERING

Graduates of Agricultural and Irrigation Engineering will have

a) Ability to apply the knowledge of mathematics, science and engineering in agriculture

b) Ability to design and conduct experiments, analyze and interpret data to prepare farm specific reports

c) Ability to design an irrigation system to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, and sustainability

d) Ability to think creatively, to formulate problem statements, to communicate effectively, to synthesize information, and to evaluate agricultural systems

e) Ability to function in interdisciplinary teams within the Institute and also with other organizations at National/International level while planning the research projects.

f) Ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

g) Will develop competencies in computer and automatic control systems, information systems, mechanical systems, natural resource systems to solve engineering problems

h) Graduates will be able to express themselves clearly in oral and verbal communication needs.

i) Ability to devise a strategy or action plan to utilize the acquired knowledge of irrigation engineering in increasing water-use-efficiency and farm mechanization for reducing cost of cultivation.

j) Graduates will be capable of self-education in emerging water resources problems and understand the value of lifelong learning.
## PEOs and POs – Agricultural and Irrigation Engineering

<table>
<thead>
<tr>
<th>PEOs</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>g</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>i)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ii)</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iii)</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>iv)</td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>v)</td>
<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VI)</td>
<td></td>
<td></td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# B. E. AGRICULTURAL AND IRRIGATION ENGINEERING
## I - VIII SEMESTERS CURRICULA AND SYLLABI
### SEMESTER I

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS 8151</td>
<td>Technical English - I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MA 8151</td>
<td>Mathematics - I</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>PH 8151</td>
<td>Engineering Physics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CY 8151</td>
<td>Engineering Chemistry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>GE 8151</td>
<td>Computing Techniques</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>GE 8152</td>
<td>Engineering Graphics</td>
<td>2</td>
<td>0</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PH 8161</td>
<td>Physics Laboratory</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>CY 8161</td>
<td>Chemistry Laboratory</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>GE 8161</td>
<td>Computer Practices Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>GE 8162</td>
<td>Engineering Practices Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>17</td>
<td>2</td>
<td>13</td>
<td>27</td>
</tr>
</tbody>
</table>

### SEMESTER II

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS 8251</td>
<td>Technical English - II</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>MA 8251</td>
<td>Mathematics – II</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>PH 8202</td>
<td>Physics for Agricultural and Irrigation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CY 8251</td>
<td>Chemistry for Civil and Agricultural</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>GE 8251</td>
<td>Engineering Mechanics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>AI 8201</td>
<td>Principles of Agricultural and Irrigation</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CY 8211</td>
<td>Applied Chemistry Laboratory for Agricultural</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Engineers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8211</td>
<td>Agricultural and Irrigation Engineering</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>18</td>
<td>3</td>
<td>7</td>
<td>25</td>
</tr>
</tbody>
</table>

### SEMESTER III
<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA 8357</td>
<td>Transform techniques and Partial Differential Equations</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>AI 8301</td>
<td>Soil Science and Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8302</td>
<td>Surveying</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8303</td>
<td>Theory of Machines</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>CE 8351</td>
<td>Fluid Mechanics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>CE 8353</td>
<td>Strength of Materials</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8311</td>
<td>Surveying Laboratory</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>CE 8362</td>
<td>Strength of Materials Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>18</td>
<td>2</td>
<td>7</td>
<td>24</td>
</tr>
</tbody>
</table>

**SEMESTER IV**

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MA 8353</td>
<td>Numerical Methods</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>GE 8351</td>
<td>Environmental Science and Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8401</td>
<td>Food Science and Nutrition</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8402</td>
<td>Hydraulic Engineering for Agricultural</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>AI 8403</td>
<td>Principles and Practices of Crop Production</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>AI 8452</td>
<td>Hydrology and Water Resources Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8411</td>
<td>Fluid Mechanics Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>AI 8412</td>
<td>Soil Science and Water Quality Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>18</td>
<td>3</td>
<td>6</td>
<td>25</td>
</tr>
</tbody>
</table>

**SEMESTER V**

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8501</td>
<td>Design and Drawing of Agricultural Machinery</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>AI 8502</td>
<td>Groundwater and Well Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8503</td>
<td>Irrigation Engineering for Agricultural Engineers</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8504</td>
<td>Remote Sensing and Geographical Information System</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8505</td>
<td>Unit Operations and Post Harvest Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8551</td>
<td>Integrated Water Resources Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
## PRACTICAL

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>AI 8511</td>
<td>Irrigation Drawing</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>AI 8512</td>
<td>Irrigation Field Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>18</strong></td>
<td><strong>1</strong></td>
<td><strong>6</strong></td>
<td><strong>23</strong></td>
</tr>
</tbody>
</table>

## SEMESTER VI

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8601</td>
<td>Dairy and Food Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8602</td>
<td>Principles of Management for Agricultural Engineers</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8603</td>
<td>Tractor and Farm Equipments</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - I</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective – II</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HS 8561</td>
<td>Employability Skills</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>AI 8611</td>
<td>CAD for Agricultural Engineering</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>AI 8612</td>
<td>Food Engineering Laboratory</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>15</strong></td>
<td><strong>0</strong></td>
<td><strong>9</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

## SEMESTER VII

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8701</td>
<td>Agricultural Economics</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8702</td>
<td>Bio-Energy Resource Technology</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8703</td>
<td>Soil and Water Conservation Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>AI 8751</td>
<td>Participatory Water Resources Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective – III</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - IV</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective - V</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8711</td>
<td>Creative and Innovative Project</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>AI 8712</td>
<td>Industrial Training (4 weeks)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>21</strong></td>
<td><strong>0</strong></td>
<td><strong>3</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>
### SEMESTER VIII

<table>
<thead>
<tr>
<th>CODE NO.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8801</td>
<td>Sustainable Agriculture and Food Security</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Elective – VI</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td><strong>PRACTICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AI 8811</td>
<td>Project work</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td>6</td>
<td>0</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>

**TOTAL: 181 CREDITS**

### ELECTIVES FOR AGRICULTURAL AND IRRIGATION ENGINEERING

<table>
<thead>
<tr>
<th>S.NO</th>
<th>CODE No.</th>
<th>COURSE TITLE</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AI 8001</td>
<td>Agricultural Business Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>AI 8002</td>
<td>Drainage Engineering and Land Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>AI 8003</td>
<td>Environment and Agriculture</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>AI 8004</td>
<td>Farm Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>AI 8005</td>
<td>Geology for Agricultural and Irrigation Engineers</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>AI 8006</td>
<td>Irrigation Equipment Design</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>AI 8007</td>
<td>Irrigation Water Quality and Modeling</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>AI 8008</td>
<td>IT in Agricultural Systems</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>AI 8009</td>
<td>Minor Irrigation and Command Area Development</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>AI 8010</td>
<td>Seed Technology Applications</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>AI 8011</td>
<td>Systems Analysis in Irrigation Engineering</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>MA 8356</td>
<td>Probability and Statistics</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>13</td>
<td>GE8751</td>
<td>Engineering Ethics and Human Values</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>MG8654</td>
<td>Total Quality Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>GI 8071</td>
<td>Geoinformatics for Agriculture and Forestry</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>ME 8080</td>
<td>Refrigeration and Air Conditioning</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>17</td>
<td>ME 8651</td>
<td>Heat and Mass Transfer</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>18</td>
<td>GE 8072</td>
<td>Disaster Management</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>19</td>
<td>GE 8073</td>
<td>Human Rights</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- To enable all students of engineering and technology develop their basic communication skills in English.
- To give special emphasis to the development of speaking skills amongst the students of engineering and technology students.
- To ensure that students use the electronic media such as internet and supplement the learning materials used in the classroom.
- To inculcate the habit of reading for pleasure.

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

Listening - Watching videos / documentaries and responding to questions based on them; Speaking - Responding to questions - Different forms of interviews - Speaking at different types of interviews; Reading - Making inference from the reading passage - Predicting the content of a reading passage; Writing - Interpreting visual materials (line graphs, pie charts etc.) - Essay writing – Different types of essays; Grammar - Adverbs – Tenses – future time reference; Vocabulary - Single word substitutes - Use of abbreviations & acronyms; E-materials - Interactive exercises for Grammar and Vocabulary - Sample interviews - film scenes - dialogue writing.
UNIT V

9 + 3

Listening - Listening to different accents, Listening to Speeches/Presentations, Listening to broadcast & telecast from Radio & TV; Speaking - Giving impromptu talks, Making presentations on given topics; Reading - Email communication - Reading the attachment files having a poem/joke/proverb - Sending their responses through email Writing - Creative writing, Poster making; Grammar - Direct and indirect speech; Vocabulary - Lexical items (fixed / semi fixed expressions); E-materials - Interactive exercises for Grammar & Vocabulary - Sending emails with attachment – Audio / video excerpts of different accents, - Interpreting posters.

TOTAL: 60 PERIODS

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

TEXTBOOKS:

REFERENCES:

EXTENSIVE READERS:

Website Resources
1. www.uefap.com
2. www.eslcafe.com
3. www.listen-to-english.com
4. www.owl.english.purdue.edu
5. www.chompchomp.com
MA 8151 MATHEMATICS – I L T P C 3 1 0 4

OBJECTIVES:

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

UNIT I MATRICES


UNIT II INFINITE SERIES


UNIT III FUNCTIONS OF SEVERAL VARIABLES


UNIT IV IMPROPER INTEGRALS

Improper integrals of the first and second kind and their convergence – Evaluation of integrals involving a parameter by Leibnitz rule – Beta and Gamma functions – Properties – Evaluation of integrals using Beta and Gamma functions – Error functions

UNIT V MULTIPLE INTEGRALS


TOTAL: 60 PERIODS

OUTCOMES:

- This course equips students to have basic knowledge and understanding in one fields of materials and integral

TEXTBOOKS:

REFERENCES:

PH8151 ENGINEERING PHYSICS
(Common to all branches of B.E / B.Tech programmes) 3 0 0 3

OBJECTIVE:
- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

UNIT I PROPERTIES OF MATTER 9

UNIT II ACOUSTICS AND ULTRASONICS 9

UNIT III THERMAL PHYSICS 9

UNIT IV APPLIED OPTICS 9
UNIT V  SOLID STATE PHYSICS
Nature of bonding - growth of single crystals (qualitative) - crystal systems - crystal planes and directions - expressions for interplanar distance - coordination number and packing factor for simple structures: SC, BCC, FCC and HCP - structure and significance of NaCl, ZnS, diamond and graphite - crystal imperfections: point defects, dislocations and stacking faults - unit cell, Bravais space lattices - miller indices.

TOTAL: 45 PERIODS

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

TEXTBOOKS:

REFERENCES:

UNIT I  CHEMICAL THERMODYNAMICS
Second law: Entropy - entropy change for an ideal gas, reversible and irreversible processes; entropy of phase transitions; Clausius inequality. Free energy and work function: Helmholtz and Gibbs free energy functions; Criteria of spontaneity; Gibbs-Helmholtz equation; Clausius-Clapeyron equation; Maxwell relations – Van’t Hoff isotherm and isochore. Chemical potential; Gibbs-Duhem equation – variation of chemical potential with temperature and pressure.

UNIT II  POLYMER CHEMISTRY
Introduction: Classification of polymers – Natural and Synthetic; Thermoplastic and Thermosetting. Functionality – Degree of polymerisation. Types and mechanism of polymerisation: Addition (Free Radical, cationic, anionic and living); condensation and copolymerisation. Properties of polymers: Tg, Tacticity, Molecular weight – weight average, number average and polydispersity index. Techniques of polymerisation: Bulk, emulsion, solution and suspension.
UNIT III KINETICS AND CATALYSIS


UNIT IV PHOTOCHEMISTRY AND SPECTROSCOPY


UNIT V NANOCHEMISTRY


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

TEXTBOOKS:

REFERENCES:

GE8151 COMPUTING TECHNIQUES

OBJECTIVES: The students should be made to:
- Learn the organization of a digital computer.
- Be exposed to the number systems.
- Learn to think logically and write pseudo code or draw flow charts for problems.
- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.
UNIT I  INTRODUCTION 8

UNIT II  C PROGRAMMING BASICS 10

UNIT III  ARRAYS AND STRINGS 9

UNIT IV  FUNCTIONS AND POINTERS 9

UNIT V  STRUCTURES AND UNIONS 9
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.

TOTAL: 45 PERIODS

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

TEXTBOOKS

REFERENCES

GE 8152  ENGINEERING GRAPHICS  L T P C
                        2 0 3 4

OBJECTIVES:
• To develop in students, graphic skills for communication of concepts, ideas and design of engineering products
• To expose them to existing national standards related to technical drawings.
CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I  PLANE CURVES AND FREE HAND SKETCHING  5+9

Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three Dimensional objects – Layout of views - Free hand sketching of multiple views from pictorial views of objects

UNIT II  PROJECTION OF POINTS, LINES AND PLANE SURFACES  5+9
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III  PROJECTION OF SOLIDS  5+9
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method and auxiliary plane method.

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

UNIT V  ISOMETRIC AND PERSPECTIVE PROJECTIONS  6+9
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method and vanishing point method.

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

TOTAL (L:30+P:45):75 PERIODS

OUTCOMES: On Completion of the course the student will be able to

- perform free hand sketching of basic geometrical constructions and multiple views of objects.
- do orthographic projection of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- prepare isometric and perspective sections of simple solids.
- demonstrate computer aided drafting.

TEXTBOOK:
REFERENCES:

Publication of Bureau of Indian Standards:

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

PH 8161 PHYSICS LABORATORY
(Common to all branches of B.E. / B.Tech. Programmes) 0 0 2 1

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

1. Torsional pendulum Determination of rigidity modulus of wire and moment of inertia of disc
2. Non–uniform bending Determination of young’s modulus
3. Lee’s disc Determination of thermal conductivity of a bad conductor
4. Potentiometer Determination of thermo e.m.f. of thermocouple
5. Air wedge Determination of thickness of a thin sheet of paper
6. i. Optical fibre Determination of Numerical Aperture and acceptance angle
   ii. Compact disc Determination of width of the groove using laser
7. Acoustic grating Determination of velocity of ultrasonic waves in liquids
8. Post office box Determination of Band gap of a semiconductor
9. Spectrometer Determination of wavelength using grating
10. Viscosity of liquids Determination of co-efficient of viscosity of a liquid by Poiseuille’s flow

TOTAL: 30 PERIODS
OUTCOMES:
- The hands on exercises undergone by the students will help them to apply physics principles of optics and thermal physics to evaluate engineering properties of materials.

CY 8161 CHEMISTRY LABORATORY (Common to all branches of Engineering and Technology) 0 0 2 1

OBJECTIVES:
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by vacometry.
1. Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler’s method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1,10-phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
14. Determination of CMC.
15. Phase change in a solid.

TOTAL: 30 PERIODS

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

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

LIST OF EXPERIMENTS:
1. Search, generate, manipulate data using MS office/Open office
2. Presentation and visualization - graphs, charts, tables, 2D, 3D.
5. String manipulations in C
7. Solving numerical problems using C
8. Using Structures and Unions in C

LABORATORY REQUIREMENTS FOR BATCH OF 30 STUDENTS
Hardware: 30 Terminals
Software:
- MS Office / Open Office software
- C-Compiler
- MATLAB 7 / Octave 3 / Scilab 5
- Processing 1.5

TOTAL: 45 PERIODS

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

GROUP – A (CIVIL & ELECTRICAL)
1. CIVIL ENGINEERING PRACTICE

Plumbing
Basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings. Preparation of plumbing line sketches.
Laying pipe connection to the suction side of a pump – inlet. Laying pipe connection to the delivery side of a pump – outlet.
Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.

**Wood Work**
Sawing, planning and making common joints: T-Joint, Mortise and Tennon joint, Dovetail joint.

**Study**
Study of joints in door panels, wooden furniture Study of common industrial trusses using models.

2. **ELECTRICAL ENGINEERING PRACTICE**
Basic household wiring using switches, fuse, indicator – lamp etc., Preparation of wiring diagrams
Staircase light wiring
Tube – light wiring

Study of iron-box, fan with regulator, emergency lamp

**GROUP – B (MECHANICAL AND ELECTRONICS)**

3. **MECHANICAL ENGINEERING PRACTICE**

**Welding**
Arc welding of butt joints, lap joints, tee joints

Gas welding Practice. Basic Machining
Simple turning, drilling and tapping operations. Machine assembly Practice.
Study and assembling the following: Centrifugal pump, mixies and air conditioners. Demonstration on
Smithy operations like the production of hexagonal bolt. Foundry operation like mould preparation for grooved pulley.

4. **ELECTRONIC ENGINEERING PRACTICE**
Soldering simple electronic circuits and checking continuity. Assembling electronic components on a small PCB and testing.
Study of Telephone, FM radio, low-voltage power supplies.

**TOTAL: 45 PERIODS**

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

**HS 8251**
**TECHNICAL ENGLISH – II**
(For all branches of B.E / B.Tech programmes)

**OBJECTIVES:**
- To make the students acquire listening and speaking skills meant for both formal and informal contexts
- To help them develop their reading skills by exposing them to different types of reading strategies
- To equip them with writing skills needed for academic as well as workplace situations
- To make them acquire language skills at their own pace by using e-materials and language lab component
UNIT I 9 + 3
Listening - Listening to informal conversations and participating; Speaking - Opening a conversation (greetings, comments on something, weather) - Turn taking - Closing a conversation (excuses, general wish, positive comment, thanks); Reading - Developing analytical skills, Deductive and inductive reasoning - Extensive reading; Writing - Effective use of SMS for sending short notes and messages - Using 'emoticons' as symbols in email messages; Grammar - Regular & irregular verbs - Active and passive voice; Vocabulary - Homonyms (e.g. 'can') - Homophones (e.g. 'some', 'sum'); E-materials - Interactive exercise on Grammar and vocabulary – blogging; Language Lab - Listening to different types of conversation and answering questions.

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

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

UNIT IV 9 + 3
Listening - Listening to a telephone conversation, Viewing a model interview (face-to-face, telephonic and video conferencing) and observing the practices; Speaking - Role play practice in telephone skills - listening and responding, -asking questions, -note taking – passing on messages, Role play and mock interview for grasping the interview skills; Reading - Reading the job advertisements and the profile of the company concerned – scanning; Writing - Applying for a job – cover letter - résumé preparation – vision, mission and goals of the candidate; Grammar - Numerical expressions - Connectives (discourse markers); Vocabulary - Idioms and their meanings – using idioms in sentences; E-materials - Interactive exercises on Grammar & Vocabulary - Different forms of résumés- Filling up a résumé / cover letter; Language Lab - Telephonic interview – recording the responses - e-résumé writing.

UNIT V 9 + 3
Listening - Viewing a model group discussion and reviewing the performance of each participant - Identifying the characteristics of a good listener; Speaking - Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/
agreement – assertiveness in expressing opinions – mind mapping technique; Reading - Note making skills – making notes from books, or any form of written materials - Intensive reading Writing - Types of reports – Feasibility / Project report – report format – recommendations / suggestions – interpretation of data (using charts for effective presentation); Grammar - Use of clauses; Vocabulary – Collocation; E-materials - Interactive grammar and vocabulary exercises - Sample GD - Pictures for discussion, Interactive grammar and vocabulary exercises - Pictures for discussion; Language Lab - Different models of group discussion

TOTAL: 60 PERIODS

OUTCOMES: Learners should be able to

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

TEXTBOOKS:


REFERENCES:


EXTENSIVE READERS:


WEB RESOURCES:

1. www.esl-lab.com
2. www.englishgrammar.org
3. www.englishclub.com
4. www.mindtools.com
5. www.esl.about.com
OBJECTIVES:

- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
- To acquaint the student with the concepts of vector calculus, needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow of electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT I DIFFERENTIAL EQUATIONS

Method of variation of parameters – Method of undetermined coefficients – Homogenous equation of Euler’s and Legendre’s type – System of simultaneous linear differential equations with constant coefficients.

UNIT II VECTOR CALCULUS

Gradient and directional derivative – Divergence and Curl – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral and volume integral - Green’s, Gauss divergence and Stoke’s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTION

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

UNIT IV COMPLEX INTEGRATION


UNIT V LAPLACE TRANSFORMS


TOTAL: 60 PERIODS

OUTCOMES:

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

REFERENCES:

PH8202 PHYSICS FOR AGRICULTURAL AND IRRIGATION ENGINEERING L T P C
3 0 0 3

OBJECTIVES:
• To introduce the essential principles of physics related to agriculture and irrigation engineering.

UNIT I SOIL PHYSICS

UNIT II PHOTOSYNTHESIS
Photosynthesis - Leaves and leaf structure - The nature of light - Chlorophyll and accessory pigments - The structure of the chloroplast and photosynthetic membranes - Stages of photosynthesis - The light reactions - Dark reaction - C-4 Pathway - The carbon cycle.

UNIT III BIOPHYSICS

UNIT IV REMOTE SENSING IN AGRICULTURE AND IRRIGATION
Electromagnetic spectrum: The photon and radiometric quantities - radiant energy - radiant flux density - radiant intensity - transmittance - absorptance - reflectance - distribution of radiant energies - spectral signatures - sensor technology - sensor types - passive and active - spatial resolution - processing and classification of remote sensed data - pattern recognition - approaches to data / image interpretation - use of remote sensing in agriculture and irrigation.
UNIT V  FOOD IRRADIATION AND PRESERVATION  9
Effects of ionizing radiation on biological organism - Effects of ionizing radiation on foods - applications of food irradiation - low dose - medium dose and high dose - Food irradiation using electron beams, X-rays - nuclear radiation - Processing of seeds, spices, fruits and vegetables.

TOTAL: 45 PERIODS

OUTCOMES:
• The students will have knowledge on the basics of physics related to soil physics, photo synthesis, biophysics etc.,
• they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

REFERENCES:

CY8251  CHEMISTRY FOR CIVIL AND AGRICULTURAL ENGINEERING  L T P C
3 0 0 3

OBJECTIVES:
• To develop an understanding about the chemistry of building materials.
• Brief elucidation on corrosion and its control.
• To develop sound knowledge about the water science and technology.
• To impart basic knowledge on adhesives, abrasives, refractories and composites.
• To understand the basic concepts of chemical and instrumental methods of analysis.

UNIT I  CHEMISTRY OF BUILDING MATERIALS  9

UNIT II  CORROSION AND ITS CONTROL  9

UNIT III  ADHESIVES AND COMPOSITES  9
UNIT IV  ABRASIVES, AND REFRACTORIES  9
Abrasives: definition, classification or types, grinding wheel, abrasive paper and cloth. Refractories: definition, characteristics, classification, properties – refractoriness and RUL, dimensional stability, thermal spalling, thermal expansion, porosity; Manufacture of refractories – general method; acidic refractories – fire clay, silica; basic refractories – magnesite, dolomite; neutral refractories – silicon carbide, zircon.

UNIT V  WATER AND INSTRUMENTAL ANALYSIS  9
Properties of water, sources, quality for different uses-significance of water quality parameter Ph, EC, TDS, Hardness, chloride, sulphate, iron, fluoride, nitrate, BOD, COD, and heavy metals (As, Hg, Cr, Pb) and their determination by titrimetry, electrometry, UV-visible, AAS, ICP-AES, softening of water by ion exchange method, municipal water treatment, principle, coagulations, and filtration, and disinfection. Desalination by reverse osmosis method.

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

TEXTBOOKS:

REFERENCES:

GE 8251  ENGINEERING MECHANICS  L T P C
3 1 0 4

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

UNIT I  BASICS AND STATICS OF PARTICLES  9 + 3
UNIT II EQUILIBRIUM OF RIGID BODIES 9 + 3
Free body diagram – Types of supports – Action and reaction forces – stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon’s theorem – Single equivalent force - Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions

UNIT III PROPERTIES OF SURFACES AND SOLIDS 9 + 3

UNIT IV DYNAMICS OF PARTICLES 9 + 3

UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 9 + 3
Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction - Rolling resistance – Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

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

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

TEXTBOOKS:

REFERENCES:
OBJECTIVE:

- To present the basic theory and practice for various areas of Agricultural Engineering, application of engineering to the problems of agricultural production.

UNIT I INTRODUCTION, SOIL & WATER CONSERVATION 6


UNIT II IRRIGATION ENGINEERING AND FARM STRUCTURES 12


Farm stead, Farm Roads, Cattle sheds, Stanchion barn, Poultry shed, Hog housing, Machinery and implement shed, Storage structures for food grain, feed & forage - Structures for Plant environment - Green houses, Poly houses – Shade net.

UNIT III FARM MACHINERY & EQUIPMENTS 7

Tractor and Power Tiller – Tillage equipments – Sowing, Planting, Fertilizer, application, Spraying, Mowing Equipments, Pumps

UNIT IV AGRICULTURAL PROCESS ENGINEERING 10

Post harvest of crops, Unit operations in agricultural processing, Packing of agricultural produces – Material handling equipments – Milk processing and dairy products.

UNIT V AGRO ENERGY 10


TOTAL: 45 PERIODS

OUTCOMES:

- The knowledge gained on soil water conservation, irrigation engineering and farm structures provide a strong platform to understand the concepts on these subjects for further learning

TEXTBOOKS:


OBJECTIVES:

- The students should be made to introduce different experiments to test basic understanding the applied chemistry concepts.
1. Determination of Iodine value.
2. Determination of Acid value of resin.
3. Estimation of aniline point.
5. Determination of Fe in Iron Ore.
6. Determination of Ca in Limestone.
7. Identification of functional groups in organic compounds.
8. Identification of monomers in polymers.
10. Determination of TGA of polymeric sample.

TOTAL: 60 PERIODS

OUTCOMES:
- The hands on exercises undergone by the students will help them to apply chemistry principles to evaluate agricultural engineering properties of materials

REFERENCES:

AGRICULTURAL AND IRRIGATION ENGINEERING PRACTICES

OBJECTIVE:
- Students should be able to understand the various aspects of agricultural and irrigation engineering studied in theory by performing basic experiments in lab.

AGROMETEOROLOGY 12
1. Meteorology – Precipitation – Rain gauges - recording and non-recording rain gauges - Automatic Weather Station (AWS)
2. Measurement of evaporation using recording and non-recording evaporimeter
3. Measurement of humidity, sunshine, solar radiation, wind direction and speed

SEEDS AND CROPS 12
4. Identification of food grains and crops
5. Estimation of germination rate for cereals, pulses and oilseeds by conventional method and using Seed Growth germinator
6. Estimation of biometric parameters of different food crops

SOIL AND WATER PARAMETERS 9
7. Soil Moisture estimation using Infra red moisturemeter
8. pH and EC measurement using electrode device

AGRICULTURAL MACHINERY 12
9. Demonstration of Agricultural machineries and equipments
10. Demonstration of Agricultural processing equipments

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course the student will be able to

- Use various aspects of agricultural and irrigation engineering practices like measurement of evaporation, humidity, soil moisture estimation and familiarize with agricultural processing equipments.

REFERENCES:
3. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.

MA8357 TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
3 1 0 4

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

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9+3
Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange’s Linear equation – Integral surface passing through a given curve – Classification of Partial Differential Equations – Solution of linear equations of higher order with constant coefficients – Linear non-homogeneous PDE.

UNIT II FOURIER SERIES 9+3
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval’s identity – Harmonic Analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATION 9+3
Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 9+3

UNIT V Z-TRANSFORM AND DIFFERENCE EQUATIONS 9+3

TOTAL: 60 PERIODS
OUTCOMES:
- The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.

TEX BOOK:

REFERENCES:

AI8301   SOIL SCIENCE AND ENGINEERING   L T P C
                    3 0 0 3

OBJECTIVE:
- To expose the students to the fundamental knowledge on Soil physical parameters, Permeability – Compaction, Bearing Capacity and types and methods of soil survey and interpretative groupings

UNIT I INTRODUCTION AND PHYSICAL PROPERTIES 9

UNIT II SOIL CLASSIFICATION AND SURVEY 9

UNIT III PHASE RELATIONSHIP AND SOIL COMPACTION 9
Phase relations- Gradation analysis- Atterberg Limits and Indices- Classification of soil – Soil compaction- factors affecting compaction- field and laboratory methods.

UNIT IV ENGINEERING PROPERTIES OF SOIL 9
Shear strength of cohesive and cohesion less - Mohr-Coulomb failure theory- Measurement of shear strength, direct shear, Triaxial and vane shear test-Compressibility- Assessment of seepage through flow net construction-Permeability- Coefficient of Permeability-Darcy’s law- field and lab methods.
UNIT V BEARING CAPACITY AND SLOPE STABILITY

Bearing capacity of soils - Factors affecting Bearing Capacity- Shallow and Pile foundations- Terzaghi’s formula - BIS standards - Slope stability-Analysis of infinite and finite slopes-friction circle method-slope protection measures.

TOTAL: 45 PERIODS

OUTCOMES:
- At the end of the course the student will be able to understand
- Fundamental knowledge of soil physical parameters.
- The procedures involved in soil survey, soil classification.
- The phase relationship and soil compaction.
- Concepts of bearing capacity and slope stability.

TEXTBOOKS:

REFERENCES:

AI8302 SURVEYING L T P C 3 0 0 3

OBJECTIVE:
- To introduce the principle of surveying, various methods and applications to Agricultural & Irrigation Engineering projects.

UNIT I FUNDAMENTALS AND CHAIN SURVEYING
Definition- Classifications - Basic principles – Equipment and accessories for ranging and chaining – Methods of ranging - well conditioned triangles – Errors in linear measurement and their corrections - Obstacles - Traversing – Plotting – applications- enlarging and reducing figures- Areas enclosed by straight lines - Irregular figures- digital Planimeter.

UNIT II COMPASS AND PLANE TABLE SURVEYING
UNIT III THEODOLITE AND MODERN SURVEYING
Theodolite - Types - Description - Horizontal and vertical angles - Temporary and Permanent adjustments – Heights and distances- Tangential and Stadia Tacheometry – Subtense methods - Stadia constants - Anallactic lens - Traversing - Gale’s table - Total Station- Global Positioning System (GPS).

UNIT IV LEVELLING
Level line - Horizontal line - Datum - Bench marks -Levels and staves - temporary and permanent adjustments – Methods of leveling - Fly levelling - Check levelling - Procedure in levelling - Booking -Reduction - Curvature and refraction - Reciprocal levelling - sources of errors in leveling- Precise levelling - Types of instruments - Adjustments - Field procedure.

UNIT V LEVELLING APPLICATIONS
Longitudinal and Cross-section-Plotting - Contouring - Methods – Characteristics and uses of contours- Plotting – Methods of interpolating contours – computation of cross sectional area and volumes - Earthwork calculations - Capacity of reservoirs - Mass haul diagrams

OUTCOMES:
- Students are expected to use all surveying equipments, prepare LS & CS, contour maps and carryout surveying works related to land and civil engineering projects.

TEXTBOOKS:

REFERENCES:

AI8303 THEORY OF MACHINES

OBJECTIVE:
- To introduce the students the theory of machines pertaining to agricultural engineering.

UNIT I TERMINOLOGY
Definitions - Kinematic links - Pairs - Chain - Machines and mechanism - Types and uses – Kinematic inversion of four bar chain and slider crank mechanism. Velocity and acceleration in simple mechanisms - Vector polygon and instantaneous centre methods – Coriolis component of acceleration.

UNIT II FRICTION AND APPLICATIONS
Sliding and rolling friction –friction in screw threads-Bearing and lubrication- Friction clutches- Belt drives- Friction aspects in brakes.

UNIT III MOTION OF CAM AND FOLLOWER
Cam and follower - types - application – displacement diagrams - profile layout for uniform velocity - Uniform acceleration and retardation - simple harmonic and cycloidal motion.
UNIT IV  GEAR AND GEAR TRAINS 9
Gears - classification - terminology -law of gearing - tooth profile - interference between rack and pinion. Gear trains - simple - compound reverted. Simple epicyclic gear trains

UNIT V  FLYWHEEL AND BALANCING 9

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to
- Basic knowledge on the friction applications, gear and gear trains.
- Learn the fundamentals related to motion of cam and follower and fly wheel balancing

TEXTBOOKS:

REFERENCES:

CE 8351  FLUID MECHANICS  L T P C
3 1 0 4

OBJECTIVES:
- To introduce the students to the mechanics of fluids through a thorough understanding of the properties of the fluids, behaviour of fluids under static conditions. The dynamics of fluids is introduced through the control volume approach which gives an integrated understanding of the transport of mass, momentum and energy.
- To expose to the applications of the conservation laws to a) flow measurements b) flow through pipes (both laminar and turbulent) and c) forces on vanes.

UNIT I  FLUIDS PROPERTIES AND FLUID STATICS 12
Scope of fluid mechanics - Definitions of a fluid - Methods of analysis - Dimensions and units - viscosity, density, perfect gas. vapour pressure and surface tension - Basic equation of fluid statics - Pressure measurements - Manometers. - Forces on plane and curved surfaces - Buoyancy and floatation - Stability of floating bodies - Relative equilibrium.

UNIT II  BASIC CONCEPTS OF FLUID FLOW 12
(a) Kinematics – Methods of describing fluid motion - Classification of flows - Streamline, streak-line and path-lines - Stream function and velocity potentials - Flow nets; (b) Dynamics - Dimensional Concepts of System and Control volume - Application of control volume to continuity, energy and momentum - Euler’s equation of motion along a stream line - Bernoulli’s equation - Applications to velocity and discharge measurements - Linear momentum equation and moment-of-momentum equations and their applications.
UNIT III DIMENSIONAL ANALYSIS AND MODEL STUDIES 12
Fundamental dimensions - dimensional homogeneity - Rayleigh’s method and Buckingham Pi-Theorem - Dimensionless parameters - Similitude and model studies - Distorted Models.

UNIT IV INCOMPRESSIBLE VISCOUS FLOW 12
Laminar flow between parallel plates, and pipes - Development of laminar and turbulent flows in pipes - Reynolds experiment - Darcy-Weisbach equation - Moody diagram - Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V BOUNDARY LAYERS AND TRANSPORT BY ADVECTION AND DIFFUSION 12
Definition of boundary layers - Displacement, momentum and energy thickness - Laminar and turbulent boundary layers - Momentum integral equation – Steady molecular diffusion and conduction – Turbulent transport equations – Channel diffusion and Dispersions and Applications.

TOTAL : 60 PERIODS

OUTCOMES:
- The students will be able to get a basic knowledge of fluids in static, kinematic and dynamic equilibrium.
- They will also gain the knowledge of the applicability of physical laws in addressing problems in hydraulics.

TEXTBOOKS :

REFERENCES :

CE8353 STRENGTH OF MATERIALS L T P C 3 0 0 3

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

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9
UNIT III   TORSION  
Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

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

UNIT V   THIN CYLINDERS, SPHERES AND THICK CYLINDERS  
Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lame's theory – Application of theories of failure.

TOTAL: 45 PERIODS

OUTCOMES:  
The students will have  
- Thorough understanding of the fundamental concepts of stress and strain in mechanics of solids and structures.  
- the ability to analyse determinate beams and trusses to determine shear forces, bending moments and axial forces.  
- a sufficient knowledge in designing shafts to transmit required power and also springs for its maximum energy storage capacities.

TEXTBOOKS:  

REFERENCES:  

AI8311   SURVEYING LABORATORY   L T P C  
0 0 4 2

OBJECTIVE :  
- To train the student to acquire skills in operating various surveying instruments and to obtain accurate results.

1) Chain Surveying  
a) Ranging, Chaining and Pacing b) Chain traversing
2) COMPASS SURVEYING  
a) Triangulation Problem b) Compass traversing  
3) PLANE TABLE SURVEYING  
a) Radiation  
b) Intersection - Triangulation problem c) Plane table traversing  
4) THEODOLITE SURVEYING  
a) Measurement of horizontal & vertical angles b) Tangential & Stadia Tacheometry  
5) LEVELLING  
a) Fly levelling using Dumpy level b) Fly levelling using Tilting level c) Check levelling  
d) Block Levelling  
e) Radial Contouring  
6) DEMONSTRATION OF TOTAL STATION AND GPS  

TOTAL: 60 PERIODS  

OUTCOMES:  
• Students completing this course would have acquired practical knowledge on handling basic survey instruments including leveling and development of contour map of given area.

CE 8362  
STRENGTH OF MATERIALS LABORATORY  
L T P C  
0 0 3 2  

OBJECTIVES:  
• To expose the students to the testing of different materials under the action of various forces and determination of their characteristics experimentally.

LIST OF EXPERIMENTS  
1. Tension test on mild steel rod  
2. Compression test on wood  
3. Double shear test on metal  
4. Torsion test on mild steel rod  
5. Impact test on metal specimen (Izod and Charpy)  
6. Hardness test on metals (Rockwell and Brinell Hardness Tests)  
7. Deflection test on metal beam  
8. Compression test on helical spring  
9. Deflection test on carriage spring  

TOTAL: 30 PERIODS  

OUTCOMES:  
• The students will have the required knowledge in the area of testing of materials and components of structural elements experimentally.

REFERENCES:  
2. IS 1786-2008 – Specification for cold worked steel high strength deformed bars for concrete reinforcement
OBJECTIVES:
• To provide the mathematical foundations of numerical techniques for solving linear system, eigenvalue problems, interpolation, numerical differentiation and integration and the errors associated with them;
• To demonstrate the utility of numerical techniques of ordinary and partial differential equations in solving engineering problems where analytical solutions are not readily available.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+3

UNIT II INTERPOLATION AND APPROXIMATION 9+3
Interpolation with unequal intervals - Lagrange interpolation – Newton's divided difference interpolation – Cubic Splines - Interpolation with equal intervals - Newton's forward and backward difference formulae – Least square method - Linear curve fitting.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3
Finite difference methods for solving two-point linear boundary value problems. Finite difference techniques for the solution of two dimensional Laplace’s and Poisson's equations on rectangular domain - One dimensional heat-flow equation by explicit and implicit (Crank-Nicholson) methods - One dimensional wave equation by explicit method.

TOTAL: 60 PERIODS

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

TEXTBOOKS:
REFERENCES:

GE8351 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

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

UNIT I ENIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14
Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.
Field study of common plants, insects, birds
Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.
Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting
and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV   SOCIAL ISSUES AND THE ENVIRONMENT  7

UNIT V   HUMAN POPULATION AND THE ENVIRONMENT  6

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXTBOOKS :

REFERENCES :
AI8401 FOOD SCIENCE AND NUTRITION  L T P C  3 0 0 3

OBJECTIVES
• To understand the food groups, constituents of food, energy from food and nutrition
• To expose the students to various food processing and preservation methods

UNIT I FOOD GROUPS AND FOOD SCIENCE  9
Food, Food groups and Food science – objectives - Quality attributes – size, shape, colour consistency, viscosity, texture, taste and flavour - Sensory evaluation of foods - Microorganisms in food spoilage - Food laws and standards - PFA, FPO, AGMARK, APEDA, BIS, International standards for export (CA and HACCP) - Food adulteration, common adulterants - effects - Methods for detection of food adulterants

UNIT II ENERGY FROM FOOD - CARBOHYDRATES, PROTEINS, LIPIDS  9
Energy – estimation of food energy, total energy needs of the body - BMR - Carbohydrates, classification, functions, digestion - absorption, Sources - Proteins – sources – digestion, absorption, assessing the quality of protein - AA score, BV, PER, NPR and NPU, protein deficiency - Lipids, classification, function, digestion and absorption - sources and requirements, saturated and unsaturated fatty acids, rancidity.

UNIT III VITAMINS, MINERALS & NUTRITION  9

UNIT IV BAKING, CONFECTIONARY & PRESERVATION BY SUGAR  9
Baking, Bread making, spoilage in bread – Preparation of cake, biscuits and cookies - Extrusion technology, extruders - Extruded products, vermicelli, macaroni, noodles and spaghetti - Confectionary - manufacture of crystalline and non-crystalline candies - cocoa products - Processing of fruits and vegetables - Preservation by sugar- Jam, Jelly, Marmalade, Squash

UNIT V PRESERVATION OF FOOD  9
Preservation by chemicals - Preservation by fermentation, wine, vinegar - Canning, spoilage - Drying and dehydration - beverages - Rules for setting up a fruit processing industry – Food packaging, definition, functions, requirements and methods of package.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course the student will be able to understand
• Various fundamentals of food groups and food science.
• Classifications of vitamins, minerals and nutrition.
• Various energy form food.

TEXTBOOKS:
1. Sunetra Roday, Food Science and Nutrition, Oxford University Press, New Delhi, 2008
REFERENCES:

AI8402 HYDRAULIC ENGINEERING FOR AGRICULTURAL ENGINEERS L T P C 3 1 0 4

OBJECTIVES:
- To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic pumps. At the completion of the course, the student should be able to relate the theory and practice of problems in hydraulic engineering.

UNIT I UNIFORM FLOW 9+3
Definition and differences between pipe flow and open channel flow - Types of Flow - Properties of open channel - Fundamental equations - Velocity distribution in open channel - Steady uniform flow: Chezy equation, Manning equation - Best hydraulic sections for uniform flow - Computation in Uniform Flow - Specific energy and specific force.

UNIT II VARIED FLOWS 9+3

UNIT III RAPIDLY VARIED FLOWS 9+3
Application of the energy equation for RVF - Critical depth and velocity - Critical, Sub-critical and Super-critical flow - Application of the momentum equation for RVF - Hydraulic jumps - Types - Energy dissipation - Surges and surge through channel transitions.

UNIT IV ROTODYNAMIC PUMPS 9+3
Centrifugal pumps - Minimum speed to start the pump - NPSH - Cavitations in pumps - Operating characteristics - Multistage pumps - Submersible pumps -Turbine Pumps.

UNIT V POSITIVE DISPLACEMENT PUMPS 9+3
Reciprocating pumps - Negative slip - Flow separation conditions - Air vessels, indicator diagrams and its variations - Savings in work done - Piston pumps - Rotary pumps: Gear pump - Jet pump - Air-lift pump - Hydraulic Ram.

OUTCOMES:
- The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.
- They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
- They will have knowledge in hydraulic machineries (pumps and turbines).

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

REFERENCES:

AI8403 PRINCIPLES AND PRACTICES OF CROP PRODUCTION L T P C
3 1 0 4

OBJECTIVES:
- To introduce the students to principles of agricultural and horticultural crop production and to introduce the production practices of crops.
- To delineate the role of agricultural and irrigation engineers in relation to various crop production practices.

UNIT I AGRICULTURE AND CROP PRODUCTION 9+3
Introduction to agriculture and its crop production sub-sectors - field crop production and horticulture; Factors affecting crop growth and production: genetic (internal) and environmental (external) factors; Crop management through environmental modification and adaptation of crops to the existing environment through crop cultural practices.

UNIT II CROP SELECTION AND ESTABLISHMENT 9+3
Regional and seasonal selection of crops; Systems of crop production; Competition among crop plants; Spacing and arrangement of crop plants; Field preparation for crops including systems of tillage; Establishment of an adequate crop stand and ground cover, including selection and treatment of seed, and nursery growing.

UNIT III CROP MANAGEMENT 9+3
Crop water Management; Crop nutrition management - need for supplementation to soil supplied nutrients, sources, generalized recommendations, methods and timing of application of supplemental nutrients; Crop protection including management of weeds, pests and pathogens; Integrated methods of managing water, nutrients and plant protection; Types and methods of harvest.

UNIT IV PRODUCTION PRACTICES OF AGRICULTURAL CROPS 9+3
Generalized management and cultivation practices for important groups of field crops in Tamil Nadu: cereal crops, grain legumes, oil seed crops, sugarcane, and fibre crops, and special purpose crops such as those grown for green manure.

UNIT V PRODUCTION PRACTICES OF HORTICULTURAL CROPS 9+3
Important groups of horticultural crops in Tamil Nadu such as vegetable crops, fruit crops, flower crops; Cultivation practices of representatives of each group; Special features of production of horticultural crops - green house cultivation.

TOTAL (L: 45 + T: 15): 60 PERIODS
OUTCOMES:
- Students completing this course would have acquired knowledge on crop selection, crop production, and crop management.
- The students will have the required knowledge in the area of production of agricultural and horticultural crops.

TEXTBOOKS:

REFERENCES:

AI 8452 HYDROLOGY AND WATER RESOURCES ENGINEERING

OBJECTIVE:
- To introduce the student to the concept of hydrological aspects of water availability and requirements and should be able to quantify, control and regulate the water resources.

UNIT I PRECIPITATION AND ABSTRACTIONS

UNIT II RUNOFF
Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Runoff estimation using empirical - Strange’s table and SCS methods – Stage discharge relationships-flow measurements- Hydrograph – Unit Hydrograph – IUH

UNIT III FLOOD AND DROUGHT
Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts- Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis-Drought Prone Area Programme (DPAP)

UNIT IV RESERVOIRS
Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve
UNIT V  GROUNDWATER AND MANAGEMENT

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas

TOTAL: 45 PERIODS

OUTCOMES:
- The students gain the knowledge needed on hydrologic cycle, hydrometeorology and formation of precipitation.
- The students are able to apply the various methods of field measurements and empirical formulae for estimating the various losses of precipitation, stream flow, flood and flood routing.
- The students will know the basics of groundwater and hydraulics of subsurface flows

TEXTBOOKS:

REFERENCES:

FLUID MECHANICS LABORATORY

AI8411

OBJECTIVE:
- Students should be able to verify the principles studied in theory by performing the experiments in lab.

LIST OF EXPERIMENTS:
1. Flow Measurement
   1. Calibration of Rotometer
   2. Flow through Venturimeter
   3. Flow through a circular Orifice
   4. Determination of mean velocity by Pitot tube
   5. Verification of Bernoulli’s Theorem
   6. Flow through a Triangular Notch
   7. Flow through a Rectangular Notch

2. Losses in Pipes
   8. Determination of friction coefficient in pipes
   9. Determination of losses due to bends, fittings and elbows

3. Pumps
   10. Characteristics of Centrifugal pumps
   11. Characteristics of Submersible pump
   12. Characteristics of Reciprocating pump

4. Determination of Metacentric height
   13. Determination of Metacentric height of a ship

TOTAL: 45 PERIODS
OUTCOMES:

- The students will be able to measure flow in pipes and determine frictional losses.
- The students will be able to develop characteristics of pumps and turbines.

REFERENCES:


AI8412   SOIL SCIENCE AND WATER QUALITY LABORATORY L T P C 0 0 3 2

OBJECTIVE:

- Students should be able to verify various quality aspects of soil and water studied in theory by performing experiments in lab.

1. Identification of rocks and minerals 3
2. Conduct soil profile study 3
3. Collection and processing of soil samples 3
4. Determination of soil moisture, EC and pH 3
5. Field density determination by Core Cutter and Sand Replacement method 3
6. Specific gravity determination by Pycnometer 3
7. Textural analysis of soil by International Pipette method 3
8. Grain size analysis by using Mechanical shaker 3
9. Identification of soil colour using Munsell chart 3
10. Determination Organic carbon 3
11. Estimation of Gypsum requirements 3
12. Collection of irrigation water and analysis for EC, pH, CO, HCO, Ca, Mg, K 6
13. Computation of salts in irrigation water and classification. 6

TOTAL: 45 PERIODS

OUTCOMES:

- Students know the techniques to determine index properties and engineering properties such as shear strength, compressibility and permeability by conducting appropriate tests and water quality tests.

REFERENCES:

3. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.
OBJECTIVES:

- To introduce to the students about the basic concepts of design of agricultural machineries.
- To get through the detailed design & drawing of various components of agricultural machineries.

UNIT I  STRESSES IN MACHINE MEMBERS  9+3
Introduction to design process- factor influencing the machine design, selection of material based on mechanical properties- Direct, bending and torsional stress equations- calculation of Principal stresses for combined loading. Design of curved beams- factor of safety – theories of failure- stress concentration- design of variable loading- Soderberg and Goodman relations.

UNIT II  DESIGN OF TRANSMISSION SYSTEMS FOR FLEXIBLE ELEMENTS  9+3
Selection of V-Belts and pulleys- selection of flat belts and pulleys- wire ropes and pulleys- selection of transmission chains and sprockets. Design of pulleys and sprockets.

UNIT III  DESIGN OF SHAFTS AND COUPLINGS  9+3

UNIT IV  DESIGN OF ENERGY STORING ELEMENTS  9+3
Design of helical, leaf, disc and torsional springs under constant loads and varying loads – Concentric torsion springs.

UNIT V  DESIGN OF GEARS AND BEARINGS  9+3
Gears - spur gear and helical gear - terminology - strength of gear teeth - Lewis equation - Buckingham equation. - Failure of gear teeth.
Design of bearings – sliding contact and rolling contact types. – Cubic mean load – Design of journal bearings – Mckees equation – Lubrication in journal bearings – calculation of bearing dimensions.

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

(Note: Use of PSG Design Data book is permitted in the University examination)

OUTCOME:

- At the end of the course the student will have the knowledge on agricultural machineries and detailed design and drawing of various components.

TEXTBOOKS:

REFERENCES:

AI8502 GROUND WATER AND WELL ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- To introduce the concepts of groundwater, its availability, assessment and utilization
- To understand the theory behind well design, construction and management of wells.

UNIT I HYDROGEOLOGIC PARAMETERS

UNIT II WELL HYDRAULICS

UNIT III WELL DESIGN
Design characteristics – Design of wells - Well diameter, depth and Well screen design – Materials for well screens – Well casing – Design of collector wells and Infiltration gallery – Dug wells versus tube wells

UNIT IV WELL CONSTRUCTION AND MAINTENANCE

UNIT V SPECIAL TOPICS

TOTAL: 45 PERIODS

OUTCOMES:
- Students know the technical concept of determine , its availability, assessment and utilization
- Familiarize with the the theory behind well design, construction and management of wells.
TEXTBOOKS:

REFERENCES:

AI8503 IRRIGATION ENGINEERING FOR AGRICULTURAL ENGINEERS  L T P C
3 0 0 3

OBJECTIVE:
- To introduce the student to the concept of soil-plant characteristics and their water requirements. At the completion of the course the students should be able to understand the necessity of planning an irrigation system to provide water at the right time and right place.

UNIT I  CROP WATER REQUIREMENT  10

UNIT II  METHODS OF IRRIGATION  8

UNIT III  DIVERSION AND IMPOUNDING STRUCTURES  9

UNIT IV  CANAL IRRIGATION  9

UNIT V  IRRIGATION MANAGEMENT, CLIMATE CHANGE & ADAPTATION  9

TOTAL: 45 PERIODS

OUTCOMES:
- The students will able to understand the requirement of crop water.
- They will know about the classification of irrigation, location and climatic adaption.
- Concepts of design of impounding structures.
TEXTBOOKS:

REFERENCES:

AI8504 REMOTE SENSING AND GEOGRAPHICAL INFORMATION SYSTEM  L T P C
3 0 0 3

OBJECTIVES:
- To introduce the principles and basic concepts of Remote Sensing and GIS
- To introduce the remote sensing systems, data products and analysis
- To introduce the spatial data models, analysis and presentation techniques
- To study the applications of Remote Sensing and GIS in agriculture, soil and water resources

UNIT I  CONCEPTS OF REMOTE SENSING AND SATELLITES  9
Definition- Historical background - Components of remote sensing – Energy source, electromagnetic spectrum, radiation principle, platforms and sensors - Active and passive remote sensing interference - Atmospheric effects on remote sensing – Energy interaction with earth surface feature - Data acquisition - Reflectance, spectral signatures for water, soil and vegetation.- Satellites - Types - Sun synchronous - Geo synchronous remote sensing satellites - LANDSAT,SPOT & IRS - Resolution - Spectral, spatial, radiometric and Temporal resolution - Recent satellites with its applications

UNIT II  DATA PRODUCTS AND IMAGE ANALYSIS  9

UNIT III  CONCEPTS OF GIS  9
Definition – Map and their influences – Characteristics of Maps – Elements – Map scale, Projection, Coordinate systems – Sources of spatial data – History and development of GIS – Definition – Components – Hardware and Software.

UNIT IV  DATA INPUT AND ANALYSIS  9
UNIT V APPLICATION OF RS AND GIS

TOTAL: 45 PERIODS

OUTCOMES:
- The students will understand the remote sensing principles, remote sensing systems, satellite data processing and available data products.
- The students will understand decision making process using DBMS and utilization of these advanced techniques in addressing the real world problems.

TEXTBOOKS:

REFERENCES:

AI8505 UNIT OPERATIONS & POST HARVEST TECHNOLOGY

OBJECTIVES:
- To expose the students to the fundamentals of various unit operations of Agricultural Processing
- To expose the students to different Post Harvest operations and processing methods of harvested crops
- To introduce material handling equipments, storage and waste utilization.

UNIT I EVAPORATION AND SIZE REDUCTION

UNIT II MECHANICAL SEPARATION, CRYSTALLIZATION AND DISTILLATION
UNIT III

ENGINEERING PROPERTIES OF AGRICULTURAL MATERIALS

9


UNIT IV

THRESHING AND GRADING

9

Threshing - traditional methods - mechanical threshers - principles and operation –. Cleaning and grading – principles - air screen cleaner – separators (cylinder, spiral, magnetic, inclined belt) - effectiveness of separation and performance index - color sorter - Groundnut decorticator - Maize Sheller

UNIT V

PROCESSING OF CEREALS & PULSES, MATERIAL HANDLING AND STORAGE

10


TOTAL: 45 PERIODS

OUTCOMES:

At the end of the study the student will have knowledge on

- Material handling equipments
- Different Post Harvest operations and processing methods of harvested crops.
- fundamentals of various unit operations of Agricultural Processing.

TEXTBOOKS:


REFERENCES:


TOTAL: 45 PERIODS

OBJECTIVES:

- To introduce the students to the interdisciplinary analysis of water and design of intervention strategies.
- To develop knowledge base on capacity building on Integrated Water Resources Management (IWRM).
UNIT I  IWRM FRAMEWORK
Definition – meanings –objectives – evolution of IWRM- IWRM relevance in water resources management – Importance of paradigm shift in India: processes and prospective outcomes.

UNIT II  CONTEXTUALIZING IWRM
IWRM in Global and Regional water partnership - MDG goals - UN formulations- Institutional Transformation- bureaucratic reforms and inclusive development.

UNIT III  EMERGING ISSUES IN WATER MANAGEMENT

UNIT IV  IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA

UNIT V  ASPECTS OF INTEGRAL DEVELOPMENT
Capacity building - Solutions for effective Water Management. Case studies on conceptual framework of IWRM – IWRM and regional and global partnership – Emerging issues – IWRM and water resources development

TOTAL: 45 PERIODS

OUTCOME:
• At the completion of the course the student should be able to apply appropriate management techniques for planning, operating and maintaining the different components of integrated water resources and drainage system.

TEXTBOOKS:

REFERENCES:

AI8511  IRRIGATION DRAWING  L T P C
0 0 3 2

OBJECTIVE:
• To conceive, design and draw the irrigation structures in detail showing the plan, elevation and sections.

UNIT I  TANK COMPONENTS
Fundamentals of design - Tank bunds – Tank surplus weirs – Tank sluice with tower head - Drawings showing foundation details, plan and elevation.
UNIT II  IMPOUNDING STRUCTURES

Design principles - Earth dams – Gravity Dams - Arch dams – Spill ways – Drawing showing plan, elevation, half sections including foundation details.

UNIT III  CROSS DRAINAGE WORKS


UNIT IV  CANAL REGULATION STRUCTURES

General Principles - Canal head works – Direct Sluice - Canal regulator – Canal escape – Drawing showing detailed plan, elevation and foundation details.

TOTAL: 45 PERIODS

OUTCOME:
- At the end of the study, the student can able to design and draw the plan, elevation and sections of tank components, impounding structures, cross drainage works and canal regulation structures.

TEXTBOOKS:

REFERENCES:

AI8512  IRRIGATION FIELD LABORATORY  L T P C
0 0 3 2

OBJECTIVE:
- Students should be able to verify the principles studied in theory by performing the experiments in lab.

1. To study various instruments in the Meteorological Laboratory  3
2. Determination of infiltration rate using double ring infiltrometer  3
3. Determination of infiltration rate using digital infiltrometer  3
4. Determination of soil moisture wetting pattern for irrigation scheduling  3
5. Measurement of flow properties in open irrigated channels (flumes, notches)  9
6. Estimation of Leaf Area Index  3
7. Evaluation of surface irrigation  3
8. Determination of uniformity coefficient for drip irrigation system  6
9. Determination of uniformity coefficient for sprinkler system (catch can method) 6
10. To conduct experiment on canopy analyzer 3
11. To conduct experiment on disc filter for micro irrigation systems 3

TOTAL: 45 PERIODS

OUTCOME:
- On the completion of the course the student will have the knowledge on various meteorological instruments and understanding the concept of different irrigational systems in the laboratory tests.

REFERENCES:
3. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.

AI8601 DAIRY AND FOOD ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- To introduce the students to dairy industry, properties and processing of milk, manufacture of dairy products, sanitation and effluent treatment in dairy industry.
- To expose the students to the fundamental knowledge of food, its properties and different methods of food processing.

UNIT I PROPERTIES AND PROCESSING OF MILK 9

UNIT II DAIRY PRODUCTS 9

UNIT III FOOD AND ITS PROPERTIES, REACTION AND KINETICS 9
Constituents of food - thermal processing of foods - cooking, blanching, sterilization, pasteurization, canning - Interaction of heat energy on food components, reaction kinetics, Arrhenius equation, TDT curves - water activity, sorption behaviour of foods – isotherm models - monolayer value, BET isotherms, Raoult’s law, Norrish, Ross, Salwin - Slawson equations.

UNIT IV PROCESSING AND PRESERVATION OF FOODS 10
Coffee, Tea processing - Concentration of foods, freeze concentration - osmotic and reverse osmotic concentration - drying and dehydration of food - Tray, tunnel, belt, vacuum and
freeze dryers - rehydration of dehydrated foods - Fat and oil processing, sources, extraction, methods and equipments, refining of oils, hydrogenation, manufacture of margarine - Food preservation methods - preservation by irradiation, microwave and dielectric heating of food.

UNIT V QUALITY CONTROL
Quality control of processed food products - Factors affecting quality - Food packaging, importance, flexible pouches - restorable pouches - aseptic packaging, granules, powder and liquid packaging machines - nanotechnology – principles - applications in food processing – food plant location

OUTCOMES:
- The students will gain knowledge about Dairy and Food process engineering
- Understand the process of manufacturing of dairy products and thermal processing of food.
- Students will be understand the importance of quality control and food packaging.

TEXTBOOKS:

REFERENCES:

AI8602 PRINCIPLES OF MANAGEMENT FOR AGRICULTURAL ENGINEERS

OBJECTIVES:
- To learn the different principles and techniques of management in planning, organizing directing and controlling.
- To study the historic development of Management thoughts
- To learn the nature and purpose of planning, forecasting and decision making
- To learn the concepts of organizing, delegation of authority and HRD concepts

UNIT I HISTORICAL DEVELOPMENT OF MANAGEMENT THOUGHTS
Definition of Management – Management is Science or Art – Comparison of Management and Administration – Development of Management thoughts – Contribution of F.W.Taylor and H.Fayol – Types of Business Organisation
UNIT II  PLANNING  9

UNIT III  ORGANISING  9

UNIT IV  DIRECTING  9

UNIT V  CONTROLLING  9

TOTAL : 45 PERIODS

OUTCOME:
• On the completion of the coarse the student will have the knowledge on the managerial skills like organizing, planning, forecasting and decision making.

TEXT BOOKS:

REFERENCES:
OBJECTIVES:

- To introduce the students to the working principles of tractor, farm equipments, Power Tiller, makes of tractors and power tillers, tillage implements.
- To expose the students to farm mechanization benefits and constraints, identification of components of primary and secondary tillage implements.

UNIT I  
FARM MECHANIZATION  
Farm mechanization in India - benefits and constraints - status of power availability for crop production in India – Makes of tractors, power tillers, earth moving machinery - IC engines - constructional features and operation - valve actuation system - cooling systems - lubricating systems - fuel system - governing and electrical system. Fuels - combustion - chemical reaction - air fuel ratio - knocking.

UNIT II  
COMPONENTS OF TRACTORS  
Classification of tractors - transmission system - clutch - gear box – Differential and final drive - Steering systems and front axle - Brakes - Hydraulic system - working principles, three point linkage - draft control - weight transfer, theory of traction - PTO. Tractor fault diagnosis - Disassembly of tractor engine, transmission, steering, brakes, tyres, and hitch and hydraulics - their inspection - repair - assembly and adjustment.

UNIT III  
TILLAGE IMPLEMENTS  

UNIT IV  
INTERCULTURAL AND HARVESTING EQUIPMENTS  

UNIT V  
EARTH MOVING MACHINERIES AND COST ANALYSIS  
Earth moving machineries – dozers, hydraulic excavators, safety, operation and maintenance of farm machineries - cost of operation of farm machinery and implements - cost analysis of implements and tractors – Machineries for seed to seed - Identification of components of primary and secondary tillage implements, seed drill, intercultural implements, plant protection equipment.

OUTCOMES:

- The students will be able to understand the various equipments and mechanizations used in the farm.
- The students will have the knowledge on earth moving machinaries, tractor classification and tillage implements.

TEXTBOOKS:
REFERENCES:
2. Liljedhi, B.L. Tractors and their Power Units., John Willey and Sons, New Delhi, 2009.

HS8561 EMPLOYABILITY SKILLS (Lab / Practical Course) 0 0 2 1
(Common to all branches of Fifth or Sixth Semester B.E / B.Tech programmes)

OBJECTIVES:
• To enhance the employability skills of students with a special focus on Presentation skills, Group discussion skills and Interview skills
• To help them improve their soft skills, including report writing, necessary for the workplace situations
2. Creating effective PPTs – presenting the visuals effectively
3. Using body language with awareness – gestures, facial expressions, etc.
4. Preparing job applications - writing covering letter and résumé
5. Applying for jobs online - email etiquette
6. Participating in group discussions – understanding group dynamics - brainstorming the topic
7. Training in soft skills - persuasive skills – sociability skills - questioning and clarifying skills – mock GD
8. Writing reports – collecting, analyzing and interpreting data – drafting the report
9. Attending job interviews – answering questions confidently
10. Interview etiquette – dress code – body language – mock interview

Requirements for a class of 30 students
1. A PC or a lap top with one or two speakers
2. A Collar mike and a speaker
3. An LCD projector and a screen
4. CD’s and DVD’s on relevant topics
5. Individual chairs for conducting group discussions

OUTCOME:
• At the end of the course, the students will improve their soft skills, report writing and special focus on presentation skills, group discussion and interview skills.

REFERENCES:

EXTENSIVE READERS:

WEB RESOURCES:
1. www.humanresources.about.com
2. www.careerride.com

AI8611 CAD FOR AGRICULTURAL ENGINEERING

OBJECTIVE:
• To draft the agricultural engineering related machineries and structures manually and also by computer aided methods.

1. Design and Drawing of Underground pipeline system  8
2. Design and Drawing of Check dam  6
3. Design and Drawing of Mould board plough  8
4. Design and Drawing of Disk plough  8
5. Design and Drawing of Post harvest technology units (threshers and winnowers)  8
6. Design and Drawing of Biogas plant  6
7. Introduction & demonstration on solid modeling  8
8. Introduction & demonstration on Pro e  8

TOTAL: 60 PERIODS

OUTCOMES:
• The student will be able to understand the plan and layout of underground pipes, post harvesting units and check dams.
• The students also will be able to design and draw the components using computer aided methods

REFERENCES:
OBJECTIVE:
- To get hands on experience on various aspects of food science, post harvest technology and food process engineering.

A. Experiments on Food Spoilage 3
1. Total Plate Count, Total Coliforms and *E.coli* and Moulds in foods (Demonstration only)

B. Experiments on Food Adulteration 6
2. Test for adulterant in Ghee
   - Test for adulterants in oils and fats
3. Test for dye in tea
   - Test for Non-Permitted colours in foods

C. Experiments on Macro & Micro Nutrients 12
4. Estimation of protein in foods
   - Estimation of sugars in foods
   - Estimation of fat in foods
5. Estimation of Calcium, Sodium, Potassium and Iron in foods
6. Estimation of Fortificants in food

D. Experiments on Food Processing & Preservation 12
7. Gluten in Wheat Flour and Maida
8. Brix values of fruit products
9. Test for preservative in fruit products
   - Estimation of preservative in fruit products
10. Estimation of Vitamin C in fruit juice

E. Experiments on Post Harvest Technology 6
11. Determination of Moisture in food grains, spices and condiments
12. Microscopic examination of Mould infestation in food grains and nuts

F. Experiments on Food Process Engineering 6
13. Acid values and peroxide value of edible oils
14. Expansion and Oil Absorption characteristic of snacks on frying

TOTAL: 45 PERIODS

OUTCOME:
- On the completion of the course, the students will able to get experience on food processing engineering.

REFERENCES:
4. Laboratory Manual, Centre for Water Resources, Anna University, Chennai.
OBJECTIVES:
- To impart the fundamental knowledge and basic concepts of Economics.
- To understand Farm financial analysis, Investment and Budgeting for farms.

UNIT I  INTRODUCTION  9
Agricultural Economics – definition and scope - Importance of Agricultural Economics –
Branches of agricultural economics - Agricultural production economics- Meaning-
Definitions - Agricultural finance – Meaning – Definitions – micro vs macro finance –need for
agricultural finance-Agricultural marketing – meaning, definition, importance of agricultural
marketing.

UNIT II  BASIC CONCEPTS IN ECONOMICS  9
Basic terms and concepts in economics – Goods & Services – free and economic goods,
Utility – Cardinal and Ordinal approaches. Characteristics of utility – Forms of utility - Value –
Definition – Characteristics; Price – Meaning, Wealth – Meaning Attributes of wealth, Types
of wealth, Distinction between wealth and welfare - Demand Schedule, demand curve, Law
of demand - Supply – meaning, definition, law of supply, supply schedule, supply curve

UNIT III  LAWS OF ECONOMICS  9
Basic laws of economics – demand and supply concepts – Law of Diminishing Marginal
Utility – statement, assumptions of law, explanation, limitations of the law, Importance. Law of
Equiv- marginal Utility – Meaning, Assumptions, Explanation of the Law, Practical Importance,
Limitations. Consumer’s Surplus – Meaning, Assumptions, Explanation, Difficulties in measuring
Consumer’s Surplus, Importance - Economies of scale external and internal economies and

UNIT IV  COST CURVES  9
Principle of substitution – isoquant, isocline, expansion path, ridge line and least cost
combination of inputs-Product-product relationship – Production possibility curve, iso
revenue line and optimum combination of outputs – Cost curves –Optimum input and output
levels – Factor –factor relationship – Least cost combination of inputs – Estimation of cost of
cultivation and cost of production of crops - annual and perennial crops – Preparation of
interview schedule and farm visit for data collection.

UNIT V  FINANCIAL ANALYSIS  9
Farm financial analysis – Balance sheet – Income statement – Cash flow analysis – Farm
investment analysis – Time comparison principles – undiscounted measures – discounted
measures – sensitivity analysis - Public revenue – meaning, major and minor sources of public
revenue Tax – meaning, classification – direct and indirect taxes, methods of taxation -
proportional, progressive, regressive and degressive taxation, Agril taxation – other types of
taxation, VAT.

TOTAL: 45 PERIODS

OUTCOMES:
The students will have the knowledge on
- Basic concepts of economics and laws of economics.
- Familiarize with the cost curves and financial analysis.

TEXTBOOKS:
REFERENCES:

AI8702 BIO ENERGY RESOURCE TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:
- To impart the fundamental knowledge on the importance of Bio resources, Bio energy and reactors.
- Alcohol and ethanol production and
- Energy and Environment

UNIT I BIO RESOURCE AN INTRODUCTION

UNIT II BIO ENERGY
Slurry handling- enrichment and utilization – Biogas appliances- Biochemical characteristics of bio resources- Bioenergetics –Biocatalysis –Kinetics of product formation.

UNIT III BIO REACTORS AND FERMENTORS

UNIT IV ALCOHOL PRODUCTION

UNIT V ENERGY AND ENVIRONMENT

TOTAL: 45 PERIODS

OUTCOMES
- The students will be able to understand the concepts on bio energy source technology.
TEXT BOOKS:

REFERENCE:
1. Chawla O.P, Advances in Biogas Technology ICAR publication New Delhi 1986

AI8703 SOIL AND WATER CONSERVATION ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- To present the concepts of erosion so that students get a sound knowledge about the problems associated with it.
- To enable the students to make use of the principles and concepts to solve issues related to soil and water management.

UNIT I SOIL EROSION PRINCIPLES

UNIT II ESTIMATION OF SOIL EROSION

UNIT III EROSION CONTROL MEASURES

UNIT IV WATER CONSERVATION MEASURES

UNIT V SEDIMENTATION

TOTAL: 45 PERIODS
OUTCOME:

- The students will be able to gain fundamental knowledge on the concepts of erosion and sedimentation.
- They will have sufficient knowledge on water conservation measures and soil erosion measures.

TEXTBOOKS:

REFERENCES:

AI8751 PARTICIPATORY WATER RESOURCES MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:
- To gain an insight on local and global perceptions and approaches on participatory water resource management

UNIT I FUNDAMENTALS: SOCIOLOGY AND PARTICIPATORY APPROACH 6
Sociology – Basic concepts – Perspectives- Social Stratification – Irrigation as a Socio technical Process - Participatory concepts– Objectives of participatory approach

UNIT II UNDERSTANDING FARMERS PARTICIPATION 10

UNIT III ISSUES IN WATER MANAGEMENT 9
Multiple use of water – Issues in Inter-sectoral Water Allocation - domestic, irrigation, industrial sectors - modernization techniques – Rehabilitation – Command Area Development - Water delivery systems

UNIT IV PARTICIPATORY WATER CONSERVATION 10
UNIT V  PARTICIPATORY WATERSHED DEVELOPMENT

Concept and significance of watershed - Basic factors influencing watershed development – Principles of watershed management - Definition of watershed management – Identification of problems - Watershed approach in Government programmes — People’s participation – Entry point activities - Evaluation of watershed management measures.

TOTAL: 45 PERIODS

OUTCOMES:
- The students shall gain knowledge on the various processes involved in participatory water resource management.
- The students shall be aware of the issues related to water conservation

TEXTBOOKS:

REFERENCE:

AI8711  CREATIVE AND INNOVATIVE PROJECT  L T P C
(Activity Based – Subject Related) 0 0 3 2

OBJECTIVE:
- To use the knowledge acquired in Agricultural and Irrigation Engineering to do a mini project, which allows the students to come up with designs, fabrication or algorithms and programs expressing their ideas in a novel way.

STRATEGY:
To identify a topic of interest in consultation with Faculty/Supervisor. Review the literature and gather information pertaining to the chosen topic. State the objectives and develop a methodology to achieve the objectives. Carryout the design / fabrication or develop computer code. Demonstrate the novelty of the project through the results and outputs.

TOTAL: 60 PERIODS

OUTCOMES:
- The students would be able to synthesise from various courses studied in designing or fabrication or developing a system as applicable to his field of interest.
- The student will be able to test Innovative ideas through a project.
OBJECTIVE:

- To train the students in field work by attaching to any industry / organization so as to have a first hand knowledge of practical problems and to gain working experience and skills in carrying out engineering tasks related to various fields of agriculture.

The students individually undertake training in reputed engineering companies for the specified duration. At the end of the training, a report on the work done will be prepared and presented. The students will be evaluated through a viva-voce examination by a team of internal staff.

OBJECTIVES:

- To study the importance of sustainable agriculture for the growing population, various resources required and their sustainability.
- Importance of science, food security and ecological balance.

UNIT I  LAND RESOURCE AND ITS SUSTAINABILITY
Land Resources of India, Population and land, Land utilization, Net Area Sown, changes in cropping pattern, land degradation.

UNIT II  WATER RESOURCE AND ITS SUSTAINABILITY
Rainfall forecasting - Adequacy of Rainfall for crop growth – Rainfall, Drought and production instability – Irrigation potential – Available, created and utilized – River basins; Watersheds and Utilizable surface water – Utilizable water in future (Ground water & Surface water)

UNIT III  SUSTAINABLE AGRICULTURE
Agro-ecosystems - Impact of climate change on Agriculture, Effect on crop yield, effect on Soil fertility – Food grain production at State Level – Indicators of Sustainable food availability – Indicators of food production sustenance – Natural farming principles – Sustainability in rainfed farming.

UNIT IV  FOOD PRODUCTION AND FOOD SECURITY

UNIT V  POLICES AND PROGRAMMES FOR SUSTAINABLE AGRICULTURE AND FOOD SECURITY

TOTAL: 45 PERIODS
OUTCOMES:
- Upon completion of this course, the students will gain knowledge on the need for sustainable agriculture.
- They will be able to comprehend the need for food security on global level and the Nutritional Security.
- The students will be able to demonstrate how ecological balance is required for sustainability of agriculture.

TEXTBOOKS:

REFERENCES:

AI8811 PROJECT WORK

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

SYLLABUS:
The student works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The student will be evaluated based on the report and the viva voce examination by a team of examiners including one external examiner.

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

AI8001 AGRICULTURAL BUSINESS MANAGEMENT

OBJECTIVES:
- To introduce the importance of Agri-business management, its characteristics and principles.
- To impart knowledge on the functional areas of Agri-business like Marketing management, Product pricing methods and Market potential assessment.
UNIT I  CONCEPTS OF AGRICULTURAL BUSINESS
Agri-business - scope, characteristics, types. Management - importance, definition, management and administration, management thoughts, Small business - characteristics and stages of growth - Management functions - planning, organizing, leading.

UNIT II  AGRI – BUSINESS ORGANIZATION

UNIT III  AGRICULTURAL MARKETING
Functional areas of Agri-business - Production and Operations management - functions, planning physical facilities and managing quality. Agro-inputs and products inventory management - raw material procurement, inventory types, and costs. Marketing management- Marketing environment, marketing mix - Agricultural input marketing firms.

UNIT IV  AGRICULTURAL BUSINESS FINANCE

UNIT V  MARKET PROMOTION AND HUMAN RESOURCES

TOTAL: 45 PERIODS

OUTCOME:
- The students shall be exposed to various trends in agricultural business management.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To understand the basic concepts for planning, design and management of land drainage works in cultivated areas
- To study the various methods of land drainage and its impact on environment

UNIT I CONCEPTS OF DRAINAGE ENGINEERING  8

UNIT II SURFACE DRAINAGE  8

UNIT III SUBSURFACE DRAINAGE  11

UNIT IV WATER BALANCE AND DRAINAGE CRITEREA  9

UNIT V ENVIRONMENTAL ASPECTS OF DRAINAGE  9

TOTAL: 45 PERIODS

OUTCOME:
- The students shall be able to plan and design the drainage system in an efficient manner.

TEXTBOOKS:
REFERENCES:
2. Irrigation water Management, Training Manual No 6, Drainage of Irrigated Lands, Food and Agriculture Organisation, Rome 1996

AI8003 ENVIRONMENT AND AGRICULTURE L T P C
3 0 0 3

OBJECTIVES:
- To emphasize on the importance of environment and agriculture on changing global scenario and the emerging issues connected to it.

UNIT I ENVIRONMENTAL CONCERNS 8
Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT II ENVIRONMENTAL IMPACTS 9
Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT III CLIMATE CHANGE 8

UNIT IV ECOLOGICAL DIVERSITY AND AGRICULTURE 10

UNIT V EMERGING ISSUES 10
Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural environment policies and its impacts – Sustainable agriculture.

TOTAL: 45 PERIODS

OUTCOMES:
- Students will appreciate the role of environment in the current practice of agriculture and concerns of sustainability, especially in the context of climate change and emerging global issues.
- Ecological context of agriculture and its concerns will be understood.

TEXTBOOKS:
REFERENCES:
3. Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium, Bangkok, Thailand. 1989

Ai8004 FARM MANAGEMENT

OBJECTIVE:
- To expose the students to the basic concepts and fundamental knowledge in Farm Management
- Farm financial analysis investment and budgeting for farms.

UNIT I FARM MANAGEMENT
Farm management - need and analysis – scope – Definitions – objectives – Farm management and its relationship with other sciences – Farm management decisions – farm business organizations – factors influencing the size of the farm.

UNIT II FARMPLANNING AND BUDGETING

UNIT III FARM RECORDS AND ACCOUNTANCY

UNIT IV MANAGEMENT OF FARM RESOURCE

UNIT V APPLICATION OF TECHNIQUES TO FARM MANAGEMENT

TOTAL: 45 PERIODS
OUTCOME:
- Students are able to plan the financial aspects related to farm management in a cost effective manner.

TEXTBOOKS:

REFERENCES:

AI8005 GEOLOGY FOR AGRICULTURAL AND IRRIGATION ENGINEERS L T P C 3 0 0 3

OBJECTIVES:
- To expose the students to the different types of soils, rocks, their characteristics, identification.
- To impart the fundamental knowledge of hydrogeology and geological investigation

UNIT I MINEROGEOLOGY

UNIT II WEATHERING AND SOIL

UNIT III SOIL TYPES
UNIT IV HYDROGEOLOGY


UNIT V GEOLOGICAL INVESTIGATION

Remote sensing methods -Methods of geological investigation – Classification of geophysical methods- electrical resistively, seismic refraction, gravity, magnetic and acoustic prospecting for mineral and groundwater – Application of geophysics in groundwater and mineral study- Geophysical logging.

OUTCOMES:
The students completing this course

- Will be able to understand the importance of geology by understanding the various soil types.
- Will realize the importance of this knowledge in agriculture.

TEXTBOOKS:

REFERENCES:

AI8006 IRRIGATION EQUIPMENT DESIGN

OBJECTIVES:
- To expose the students to the fundamental knowledge in Pumps for Irrigation use
- To introduce the concept of micro-irrigation
- To design a Sprinkler & Drip irrigation system

UNIT I WATER LIFTS AND PUMPS
Pump classification Variable displacement pumps–Centrifugal pump- Submersible pump- Vertical Turbine pumps mixed flow – Jet and Airlift pumps-Pump selection and installation-Pump troubles and Remedies.

UNIT II PUMP VALVE
Types of valves- Pressure relief valve- Gate valve-Isolated valve- Non return valve-Butterfly valve- Solenoid valves- Automated control valve- selection, repair and maintenance.
UNIT III MICRO IRRIGATION CONCEPT AND APPLICATIONS


UNIT IV DRIP IRRIGATION DESIGN

Drip irrigation - Components - Dripper - types and equations governing flow through drippers - Wetting pattern - Chemigation application - Pump capacity - Installation - Operation and maintenance of Drip irrigation system. - Design of surface and sub-surface drip irrigation.

UNIT V SPRINKLER IRRIGATION DESIGN

Sprinkler irrigation - Components and accessories - Hydraulic design - Sprinkler selection and spacing - Capacity of sprinkler system - types - Sprinkler performance - Sprinkler discharge - Water distribution pattern - Droplet size, filtering unit, fertigation - System maintenance

OUTCOMES:

- At the completion of course the student will get the knowledge on micro irrigation concepts.
- The students shall able to understand the design concepts related to sprinkler irrigation.

TEXTBOOKS:


REFERENCES:


AI8007 IRRIGATION WATER QUALITY AND MODELING

OBJECTIVES:

- To introduce the water quality concepts, its estimation and evaluation for irrigation purposes, besides relevant environmental problems and modeling of non-point pollution sources.
- To understand the importance of water quality for irrigation, the collection and use of water quality data.
UNIT I WATER QUALITY PRINCIPLES
Water as a unique substance - Physical and chemical properties of water – Water quality parameters – Water cycle and water quality – Anthropogenic influences -Water quality problems..

UNIT II WATER QUALITY ESTIMATION

UNIT III EVALUATION OF WATER QUALITY

UNIT IV WATER QUALITY MODELS

UNIT V ENVIRONMENTAL ISSUES

TOTAL: 45 PERIODS

OUTCOMES:
- Students will understand the importance of water quality for beneficial uses, especially in irrigation and its management.
- Students will understand the role of environment in water quality and acquire skills in the use tools available for modelling water quality.

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To introduce the students to areas of agricultural systems in which IT and computers play a major role.
- To also expose the students to IT applications in precision farming, environmental control systems, agricultural systems management and weather prediction models.

UNIT I  PRECISION FARMING  9
Precision agriculture and agricultural management – Ground based sensors, Remote sensing, GPS, GIS and mapping software, Yield mapping systems, Crop production modeling.

UNIT II  ENVIRONMENT CONTROL SYSTEMS  9
Artificial light systems, management of crop growth in greenhouses, simulation of CO₂ consumption in greenhouses, on-line measurement of plant growth in the greenhouse, models of plant production and expert systems in horticulture.

UNIT III  AGRICULTURAL SYSTEMS MANAGEMENT  9
Agricultural systems - managerial overview, Reliability of agricultural systems, Simulation of crop growth and field operations, Optimizing the use of resources, Linear programming, Project scheduling, Artificial intelligence and decision support systems.

UNIT IV  WEATHER PREDICTION MODELS  9
Importance of climate variability and seasonal forecasting, Understanding and predicting world's climate system, Global climatic models and their potential for seasonal climate forecasting, General systems approach to applying seasonal climate forecasts.

UNIT V  E-GOVERNANCE IN AGRICULTURAL SYSTEMS  9
Expert systems, decision support systems, Agricultural and biological databases, e-commerce, e-business systems & applications, Technology enhanced learning systems and solutions, e-learning, Rural development and information society.

TOTAL: 45 PERIODS

OUTCOME:
- The students shall be exposed to IT applications in, environmental control systems, precision farming, agricultural systems management and weather prediction models.

TEXTBOOKS:

REFERENCES:
AI8009 MINOR IRRIGATION AND COMMAND AREA DEVELOPMENT L T P C 3 0 0 3

OBJECTIVES:
- To understand the fundamentals of minor irrigation, its types, operation and maintenance and people’s participation
- Command Area Development, On farm structures, policy, operation and maintenance

UNIT I MINOR IRRIGATION 8
Definition – Classification of minor irrigation- Minor irrigation through wells, tanks, ooranies and canals- Development of minor irrigation in India- Advantages.

UNIT II LIFT IRRIGATION 9
Dug well and Tube well irrigation – Construction, operation and maintenance- Conjunctive use of ground water with surface water - Ground water market- Ground water estimation-norms – case studies.

UNIT III TANK IRRIGATION 9
Concept of tank irrigation – Classification- components of tank irrigation- water distribution network- Cascade of tanks- People’s participation in tank irrigation system and its maintenance- Turn over – case studies.

UNIT IV COMMAND AREA DEVELOPMENT 9
Need for command area development- Definition – Importance of CAD in agricultural production - On Farm Development – organization, operation and maintenance- Farmers participation- Turn over- case studies.

UNIT V SPECIAL TOPICS 10
National water policy - Institutional aspects - Socio-economic perspective- Reclamation of salt affected soils- Seepage loss in command area- Irrigation conflicts- Water productivity – Water pricing.

TOTAL: 45 PERIODS

OUTCOMES:
- The students will have knowledge and skills on Planning, design, operation and management of reservoir system.
- The student will gain knowledge on different methods of irrigation including canal irrigation.

TEXTBOOKS:
OBJECTIVES:
- To expose the students to scope and importance of good quality seed production.
- To acquaint them with the principles and special techniques used in the process of production of good quality seed using specific examples.
- To familiarize them with planning, development and organization of seed programmes.

UNIT I INTRODUCTION
Definition and characteristics of seed and how it differs from grain; Propagation of crop plants through true seed and vegetative means; Features of good quality seed; Importance of seed in successful crop production; Floral biology: self and cross pollination; Methods of genetic improvement of crop plants such as selection, hybridization, mutation and polyploidy; Seed legislations promulgated in India from 1966 to date and the purpose of each of these legislations.

UNIT II SEED PRODUCTION AND CERTIFICATION
Multiplication of seed and seed material: systems of seed multiplication, classes of seed, multiplication models, multiplication ratio, field selection, planting ratio, isolation needs and rouging; Harvest and extraction of seed; Methods of hybrid seed production; Genetic deterioration during crop production cycles; Seed certification process: legal basis, pre-requisites for applicability, detailed description of the specific steps of the certification process (with particular emphasis on field inspection).

UNIT III SEED PROCESSING AND TESTING
Components of seed processing in a broader sense; Steps in seed processing in its narrower sense: preliminary cleaning, basic cleaning and grading, and equipment used in each of the steps; Seed treatment; Seed drying; Seed sampling; Seed testing: details of specific tests conducted for different purposes (service, certification and seed law enforcement); Standards prescribed for different crops.

UNIT IV DEVELOPING SEED PROGRAMMES
Types of organizations involved in seed production (public, quasi-governmental, private and cooperative), and their objectives and features; Organizational set up of a seed company; Steps involved in planning and developing a seed programme; Seed marketing activities, and analysis of seed demand and supply; Costing and pricing strategies; Economics of production of different crop seed; Seed packaging; Opportunities for Indian seed companies to have a greater share of world seed market; Visit to seed organizations; Preparing seed projects to obtain credit; Export procedures and formalities; Seed/plant quarantine methods.

UNIT V SEED PRODUCTION IN SPECIFIC CROPS
Principles and special techniques used for seed production in important horticultural crops by selecting representatives of vegetable / flower / fruit / spice / condiment / plantation crops.

OUTCOMES:
At the end of the course, students will be
- exposure to the biology of seed production and knowledge on seed legislation thorough with various aspects of multiplication of seeds and their certification acquiring knowledge on seed processing and testing methods.
- understand different seed programmes, special techniques for seed production and their cost economics.

TOTAL: 45 PERIODS
TEXTBOOKS:

REFERENCES:

AI8011 SYSTEMS ANALYSIS IN IRRIGATION ENGINEERING    L T P C
                                                      3 0 0 3

OBJECTIVES:
- To introduce the students to the application of systems concept to irrigation planning and management.
- Optimization technique for modeling water resources systems, irrigation management and advanced optimization techniques to cover the socio-technical aspects will be taught.

UNIT I SYSTEM CONCEPTS 9
Definition, classification, and characteristics of systems – Scope and steps in systems engineering – Need for systems approach to water resources and irrigation.

UNIT II LINEAR PROGRAMMING 9
Introduction to operations research – Linear programming, problem formulation, graphical solution, solution by simplex method – Sensitivity analysis, application to design and operation of reservoir, single and multipurpose development plans – Irrigation water allocation- Cropping pattern optimization.

UNIT III DYNAMIC PROGRAMMING 9
Bellman’s optimality criteria, problem formulation and solutions – Application to design and operation of reservoirs, Single and multipurpose reservoir development plans – Applications in Irrigation management.

UNIT IV SIMULATION 9

UNIT V ADVANCED OPTIMIZATION TECHNIQUES 9
Integer and parametric linear programming – Applications to Irrigation water management- Goal programming models with applications.

TOTAL: 45 PERIODS
OUTCOMES:
At the end of the course, students will have
- an understanding on systems approach methodology applied to water resources and irrigation
- able to apply the Linear programming, Dynamic Programming and Simulation for water resources and irrigation problems.

TEXTBOOKS:

REFERENCES:

MA8356 PROBABILITY AND STATISTICS

OBJECTIVES:
- To make the students acquire a sound knowledge in statistical techniques that model engineering problems.
- The students will have a fundamental knowledge of the concepts of probability.

UNIT I RANDOM VARIABLES
Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

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

UNIT III TESTING OF HYPOTHESIS

UNIT IV DESIGN OF EXPERIMENTS
Completely randomized design – Randomized block design – Latin square design - 22 - factorial design- Taguchi’s robust parameter design.
UNIT V  STATISTICAL QUALITY CONTROL

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

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

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

TEXTBOOKS:

REFERENCES:

GE8751  ENGINEERING ETHICS AND HUMAN VALUES  L T P C
3 0 0 3

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

UNIT I  HUMAN VALUES 10

UNIT II  ENGINEERING ETHICS 9

UNIT III  ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law – The Challenger Case Study
UNIT IV  SAFETY, RESPONSIBILITIES AND RIGHTS  9
Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing
Risk – The Three Mile Island and Chernobyl Case Studies Collegiality and Loyalty –
Respect for Authority – Collective Bargaining – Confidentiality– Conflicts of Interest –
Rights (IPR) – Discrimination

UNIT V  GLOBAL ISSUES  8
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons
Development – Engineers as Managers – Consulting Engineers – Engineers as Expert
Witnesses and Advisors – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

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

TEXTBOOK:
1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill,
New Delhi, 2003.

REFERENCES:
2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics –
Concepts and Cases”, Thompson Wadsworth, A Division of Thomson Learning
Inc., United States, 2000
Delhi, 2003
and Engineers”, Oxford University Press, Oxford, 2001

WEB SOURCES:
1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

MG8654  TOTAL QUALITY MANAGEMENT  L T P C
3 0 0 3

AIM:
• To provide comprehensive knowledge about the principles, practices, tools and
techniques of Total quality management.

OBJECTIVES:
• To understand the various principles, practices of TQM to achieve quality.
• To learn the various statistical approaches for Quality control.
• To understand the TQM tools for continuous process improvement.
• To learn the importance of ISO and Quality systems
UNIT I INTRODUCTION 9

UNIT II TQM PRINCIPLES 9
Quality statements - Customer focus –Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS & TECHNIQUES I 9

UNIT IV TQM TOOLS & TECHNIQUES II 9

UNIT V QUALITY SYSTEMS 9

TOTAL: 45 PERIODS

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

TEXTBOOK:

REFERENCES:

GI8071 GEOINFORMATICS FOR AGRICULTURE AND FORESTRY L T P C
3 0 0 3

OBJECTIVES:
- To enable the students to understand and apply Remote Sensing and GIS techniques in various fields of agriculture, soil, land and forest resources.
UNIT I CROPS

UNIT II SOILS

UNIT III LAND EVALUATION AND MANAGEMENT
Introduction - land use / land cover definition - land use / land cover classification - concepts and approaches of land evaluation - parametric methods - change detection in land uses - decision support system for land use planning - optimum land use planning for sustainable agriculture.

UNIT IV DAMAGE ASSESSMENT

UNIT V FORESTRY
Introduction - forest taxonomy - inventory of forests - forest type and density mapping - biomass assessment - timber volume estimation - factors for forest degradation - mapping degraded forests - deforestation and aorestation - forest fire mapping and damage assessment - sustainable development of forests.

TOTAL: 45 PERIODS

OUTCOMES: At the end of the course the student will be able to understand
- Characterization of crops using Remote Sensing tools
- The concepts of soil mapping through remote sensing
- The evaluation of land capability for better land use planning

TEXTBOOKS:

REFERENCES:
OBJECTIVES:
- To understand the underlying principles of operation in different Refrigeration & Air conditioning systems and components.
- To provide knowledge on design aspects of Refrigeration & Air conditioning systems

UNIT I  INTRODUCTION
Introduction to Refrigeration - Unit of Refrigeration and C.O.P. – Ideal cycles - Refrigerants Desirable properties – Classification - Nomenclature - ODP & GWP.

UNIT II  VAPOUR COMPRESSION SYSTEM

UNIT III  OTHER REFRIGERATION SYSTEMS
Working principles of Vapour absorption systems and adsorption cooling systems - Steam jet refrigeration- Ejector refrigeration systems- Thermoelectric refrigeration- Air refrigeration - Magnetic - Vortex and Pulse tube refrigeration systems.

UNIT IV  PSYCHROMETRIC PROPERTIES AND PROCESSES

UNIT V  AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION
Air conditioning loads: Outside and inside design conditions; Heat transfer through structure, Solar radiation, Electrical appliances, Infiltration and ventilation, internal heat load; Apparatus selection; fresh air load, human comfort & IAQ principles, effective temperature & chart, calculation of summer & winter air conditioning load; Classifications, Layout of plants; Air distribution system; Filters; Air Conditioning Systems with Controls: Temperature, Pressure and Humidity sensors, Actuators & Safety controls.

OUTCOMES:
- Upon completion of this course, the students can able to demonstrate the operations in different Refrigeration & Air Conditioning systems and also able to design Refrigeration & Air Conditioning systems.

TEXTBOOK:

REFERENCES:
OBJECTIVES:
- To understand the mechanisms of heat transfer under steady and transient conditions
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.

UNIT I  CONDUCTION  9+3
- General Differential equation of Heat Conduction– Cartesian and Polar Coordinates
- One Dimensional Steady State Heat Conduction — plane and Composite Systems
- Conduction with Internal Heat Generation — Extended Surfaces

UNIT II  CONVECTION  9+3
- Boundary Layer Concept — Forced Convection — External Flow — Flow over Plates, Cylinders Spheres and Bank of tubes
- Internal Flow — Entrance effects. Free Convection — Flow over Vertical Plate, Horizontal Plate, Inclined Plate, Cylinders and Spheres.

UNIT III  PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS  9+3

UNIT IV  RADIATION  9+3

UNIT V  MASS TRANSFER  9+3

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

OUTCOMES:
- Upon completion of this course, the students can able to understand and apply different heat and mass transfer principles of different applications.

TEXTBOOKS:

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

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

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

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

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

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

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

TEXTBOOK:

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

GE 8073 HUMAN RIGHTS

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

UNIT I 9

UNIT II 9

UNIT III 9
Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV 9
Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V 9

TOTAL : 45 PERIODS
OUTCOME:
- Engineering students will acquire the basic knowledge of human rights.

REFERENCES: