PROGRAMME EDUCATIONAL OBJECTIVES (PEO):
1. Enable students to appreciate, review and understand the foundations in computing systems and operations research.
2. Enable students to use optimization techniques to enhance systems and to manage enterprise resources using current tools, frameworks and reusable resources.
3. Prepare students to critically analyse existing literature in the area of specialization and develop innovative and research oriented solutions to tackle the identified problems.
4. Enable students to continuously pursue multidisciplinary learning as professional engineers and scientists, to effectively communicate technical information, to function productively in teams and to develop and apply engineering solutions within a global, societal and environmental context.

PROGRAMME OUTCOMES (PO):
On Successful completion of this program, the students will:

a. Have the capability to apply mathematical knowledge, algorithmic principles, and computer science theory in the modelling and design of computer based systems of varying complexity.

b. Critically analyse a problem, identify, formulate and solve problems in any engineering field using operations research principles, considering current and future trends.

c. Design a system, component or process to meet desired needs within the realistic constraints such as economic, environmental, social, ethical, health, safety and sustainability in the field of systems engineering.

d. Acquire leadership and managerial capabilities in decision making, analysing the alterable and managing the assets.

e. Acquire knowledge in the area of computer networks and database management systems with necessary practical experience.

f. Communicate effectively, both orally and by preparing quality technical documents, with wide range of audiences and function effectively in teams to accomplish common goals.

g. Critically analyse existing literature in the area(s) of specialization and develop innovative and research oriented methodologies to tackle the identified gaps.

h. Demonstrate an ability to engage in life-long learning for professional development.

i. Have ability to develop systems using software tools.

j. Demonstrate the knowledge gained in the selected areas of systems engineering and operations research.
**MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES**

A broad relation between the programme objective and the outcomes is given in the following table:

<table>
<thead>
<tr>
<th>PROGRAM EDUCATIONAL OBJECTIVES</th>
<th>PROGRAM OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>2</td>
<td>√</td>
</tr>
<tr>
<td>3</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>√</td>
</tr>
</tbody>
</table>
### Semester I

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Category</th>
<th>Contact Periods</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MA7153</td>
<td>Advanced Mathematics for Computing</td>
<td>FC</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>SO7101</td>
<td>Data Structures and Algorithms</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>CP7155</td>
<td>Networking Technologies</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>SO7102</td>
<td>Linear Programming and Applications</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>SO7103</td>
<td>Principles of Systems Engineering</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>SO7111</td>
<td>Data Structures and Algorithms Lab</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>22</strong></td>
<td>16</td>
<td>0</td>
<td>6</td>
<td>19</td>
</tr>
</tbody>
</table>

### Semester II

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Category</th>
<th>Contact Periods</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SO7251</td>
<td>Advanced Database Management Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>SO7201</td>
<td>Supply Chain Management</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>CP7153</td>
<td>Advances in Operating Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>CP7254</td>
<td>Security Principles and Practices</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>Elective I</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>Elective II</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>SO7211</td>
<td>Advanced Database Management Systems Lab</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>CP7162</td>
<td>Professional Practices</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>24</strong></td>
<td>18</td>
<td>0</td>
<td>6</td>
<td>21</td>
</tr>
</tbody>
</table>
### III SEMESTER

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>SO7301</td>
<td>Non Linear Programming</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Elective III</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Elective IV</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Elective V</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>SO7311</td>
<td>Project Work Phase I</td>
<td>EEC</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>26</td>
<td>0</td>
<td>14</td>
<td>19</td>
</tr>
</tbody>
</table>

### IV SEMESTER

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>SO7411</td>
<td>Project Work Phase II</td>
<td>EEC</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td>24</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>

**TOTAL NO. OF CREDITS: 71**
<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MA7151</td>
<td>Advanced Mathematics for Computing</td>
<td>FC</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SO7101</td>
<td>Data Structures and Algorithms</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>SO7102</td>
<td>Linear Programming and Applications</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>SO7111</td>
<td>Data Structures and Algorithms Lab</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td></td>
<td>16</td>
<td>10</td>
<td>0</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

**II SEMESTER**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SO7251</td>
<td>Advanced Database Management Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>SO7201</td>
<td>Supply Chain Management</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CP7153</td>
<td>Advances in Operating Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>SO7211</td>
<td>Advanced Database Management Systems Lab</td>
<td>PC</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td></td>
<td>13</td>
<td>9</td>
<td>0</td>
<td>4</td>
<td>11</td>
</tr>
</tbody>
</table>

**III SEMESTER**

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SO7103</td>
<td>Principles of Systems Engineering</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CP7155</td>
<td>Networking Technologies</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elective I</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>CP7162</td>
<td>Professional Practices</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TOTAL</td>
<td></td>
<td>11</td>
<td>9</td>
<td>0</td>
<td>2</td>
<td>10</td>
</tr>
</tbody>
</table>
### IV SEMESTER

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>CP7254</td>
<td>Security Principles and Practices</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Elective II</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Elective III</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>9</td>
<td>9</td>
<td>0</td>
<td>0</td>
<td>9</td>
</tr>
</tbody>
</table>

### V SEMESTER

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>THEORY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>SO7301</td>
<td>Non Linear Programming</td>
<td>PC</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Elective IV</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Elective V</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>SO7311</td>
<td>Project Work Phase I</td>
<td>EEC</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>23</td>
<td>9</td>
<td>0</td>
<td>14</td>
<td>16</td>
</tr>
</tbody>
</table>

### VI SEMESTER

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRACTICALS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>SO7411</td>
<td>Project Work Phase II</td>
<td>EEC</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td></td>
<td></td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>

TOTAL NO. OF CREDITS: 71
## FOUNDATION COURSES (FC)

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>Advanced Mathematics for Computing</td>
<td>FC</td>
<td>4</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

## PROFESSIONAL CORE (PC)

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>Data Structures and Algorithms</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Advances in Operating System</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Linear Programming and Applications</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Principles of Systems Engineering</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>Networking Technologies</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td>Data Structures and Algorithms Lab</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td>Advanced Database Management Systems</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td></td>
<td>Supply Chain Management</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td></td>
<td>Advanced Database Technologies Lab</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10.</td>
<td></td>
<td>Non-Linear Programming</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>11.</td>
<td></td>
<td>Security Principles and Practices</td>
<td>PC</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
## PROFESSIONAL ELECTIVES (PE)

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CP7251</td>
<td>Cloud Computing Technologies</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>SO7007</td>
<td>Parallel Programming</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>CP7076</td>
<td>Data Mining Techniques</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>SO7005</td>
<td>Java and Web Technology</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>5.</td>
<td>SO7001</td>
<td>Adhoc and Wireless Sensor Networks</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>6.</td>
<td>CP7093</td>
<td>Soft Computing</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>CP7072</td>
<td>Big Data Analytics</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>CP7154</td>
<td>Multi Core Architectures</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>9.</td>
<td>SO7008</td>
<td>System Modelling and Simulation</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>10.</td>
<td>SW7251</td>
<td>Software Testing and Quality Assurance</td>
<td>PE</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>11.</td>
<td>SO7004</td>
<td>Dynamic Programming</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>12.</td>
<td>SO7003</td>
<td>Design Patterns</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>13.</td>
<td>SO7006</td>
<td>Mobile Web Application Development</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>14.</td>
<td>CP7077</td>
<td>Database Administration and Tuning</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>15.</td>
<td>SO7002</td>
<td>Business Process Management</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>16.</td>
<td>CP7083</td>
<td>Internet of Things in the Cloud</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>17.</td>
<td>CP7089</td>
<td>Real Time Systems Design</td>
<td>PE</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>

## EMPLOYABILITY ENHANCEMENT COURSES (EEC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>CONTACT PERIODS</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td></td>
<td>Professional Practices</td>
<td>EEC</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Project Work Phase I</td>
<td>EEC</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Project Work Phase II</td>
<td>EEC</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>24</td>
<td>12</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To understand the basics of random variables and standard distributions
- To understand the arrival process and various queueing and server models
- To appreciate the use of simulation techniques
- To apply testing of hypothesis to infer outcome of experiments
- To apply mathematical linear programming techniques to solve constrained problems.

UNIT I  RANDOM VARIABLES  12

UNIT II  QUEUING MODELS  12

UNIT III  SIMULATION  12
Discrete Event Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to Queueing systems.

UNIT IV  TESTING OF HYPOTHESIS  12
Sampling distributions – Estimation of parameters - Statistical hypothesis – Tests based on Normal, t, Chi-square and F distributions for mean, variance and proportion.

UNIT V  LINEAR PROGRAMMING  12

TOTAL :60 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Identify the type of random variable and distribution for a given operational conditions/scene
- Study and Design appropriate queuing model for a given problem/system situation
- Simulate appropriate application/distribution problems
- Differentiate/infer the merit of sampling tests.
- Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.

REFERENCES:
OBJECTIVES:
- To acquire knowledge in data structures and algorithms.
- To apply appropriate data structures and algorithm in program designs.

UNIT I  BASICS OF C++ PROGRAMMING  9

UNIT II  OBJECT ORIENTED DESIGN USING C++  9

UNIT III  ALGORITHMS  9

UNIT IV  STACKS AND QUEUES  9
Stacks – Array based Stack implementation – Recursion and Function call implementations – Queues – Array based Queue implementation – Search data structures – Search and Sorting algorithms.

UNIT V  LINKED LISTS AND APPLICATIONS  9

TOTAL = 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Acquire the ability to select better algorithms based on complexity and efficiency.
- Master a variety of advanced data structures and their implementations.
- Apply and implement learned algorithm design techniques and data structures to solve problems.

REFERENCES
OBJECTIVES

- To learn about integrated and differentiated services architectures
- To understand the working of wireless network protocols
- To study the evolution made in cellular networks
- To get familiarized with next generation networks

UNIT I NETWORK ARCHITECTURE AND QoS


UNIT II WIRELESS NETWORKS


UNIT III CELLULAR NETWORKS


UNIT IV 4G NETWORKS


UNIT V SOFTWARE DEFINED NETWORKS


OUTCOMES:

Upon completion of this course, the student should be able to

- Identify the different features of integrated and differentiated services
- Demonstrate various protocols of wireless and cellular networks
- Discuss the features of 4G and 5G networks

REFERENCES:

OBJECTIVES
- To introduce the basic concepts and tools in optimization.
- To explore the advanced concepts vertically to get clear understanding and to apply the concepts in engineering and scientific applications.

UNIT I INTRODUCTION

UNIT II ADVANCED LINEAR PROGRAMMING

UNIT III SENSITIVITY ANALYSIS
Sensitivity Analysis or Post Optimality Analysis – Changes in the Right hand side – Objective function – Changes affecting feasibility – Changes affecting optimality.

UNIT IV INTEGER PROGRAMMING

UNIT V CASE STUDIES AND TOOLS
Case Studies – Production Planning – Manpower planning – Solving LP problems using TORA/LINDO/LINGO.

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Conceptually understand and emerge toward optimization.
- Optimize effectively through LP methods and tools.

REFERENCES:
OBJECTIVES:
• To introduce the concepts related to systems engineering with design, analysis, game theory and decision making analysis.

UNIT I SYSTEMS ENGINEERING PROCESSES 9

UNIT II ANALYSIS OF ALTERNATIVES 9

UNIT III STRUCTURAL MODEL & SYSTEM DYNAMICS 9

UNIT IV OPERATIONS RESEARCH AND SYSTEMS ENGINEERING 9

UNIT V DECISION MAKING AND DECISION ANALYSIS 9

OUTCOMES:
Upon completion of the course, the students will:
• Have the capability to design and analyze the system.
• Acquire decision making ability.
• Be familiar in system engineering design.

REFERENCES:
SO7111 DATA STRUCTURES AND ALGORITHM LAB

OBJECTIVES
- To acquire the knowledge of object oriented programming.
- To learn the usage of stack and queues.
- To understand the usage of linked list structures for stack and queues.
- To learn the working of various searching and sorting algorithms.

EXPERIMENTS USING C++:
1. Implementation of multi-dimensional structures such as matrices, triangular matrices, diagonal matrices, etc into a one dimensional array (at least two).
2. Implementation of the following Object-oriented principles:
   a. Inheritance.
   b. Multiple Inheritance.
3. Implementation of the following using Arrays:
   a. Stack.
   b. Queue.
4. Implementation of the following using Linked List:
   a. Stack.
   b. Queue.
5. Implementation of recursion and function call implementation using stacks.
7. Implementations of Searching techniques.
8. Implementations of the following Sorting algorithms:
   a. Quick Sort.
   b. Merge Sort.

TOTAL : 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Design and implement data structures extensively.
- Design algorithms using abstract data structure and various searching and sorting algorithms to solve real-life problems.
- Design and develop efficient algorithms with minimum complexity.

SO7251 ADVANCED DATABASE MANAGEMENT SYSTEMS

OBJECTIVES:
- To understand the underlying principles of Relational Database Management System.
- To understand and implement the advanced features of DBMS.
- To develop database models using distributed databases.
- To implement and maintain an efficient database system using emerging trends.

UNIT I RELATIONAL MODEL
UNIT II  PARALLEL AND DISTRIBUTED DATABASES  9
Centralized and Client-Server Architectures – Parallel Systems – Distributed Systems – Parallel
Databases – I/O Parallelism – Inter- and Intra-Query Parallelism – Inter- and Intra-operation
Parallelism – Distributed Database Concepts: – Distributed Data Storage – Distributed
Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing.

UNIT III  XML DATABASES  9
Open Database Connectivity.

UNIT IV  MULTIMEDIA DATABASES  9
Databases – Audio Databases – Multimedia Database Design.

UNIT V  CURRENT ISSUES  9
Active Databases – Deductive Databases – Data Warehousing – Data Mining – Database Tuning
– Database Security
TOTAL = 45 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to:
• Design and implement relational databases, distributed databases, XML databases and
multi media databases.
• Implement the concept of database connectivity with the applications.

REFERENCES
2. Thomas Cannolly and Carolyn Begg, “Database Systems, A Practical Approach to Design,
4. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth

SO7201  SUPPLY CHAIN MANAGEMENT  L T P C
3 0 0 3

OBJECTIVES:
• To familiarize the management of supply chain assembly and role of IT in it.
• To learn about the capability of Inventory management, planning and decision making.

UNIT I  INTRODUCTION  9
Introduction to SCM – Development chain – Global Optimization – Managing uncertainty and risk –
Complexity.

UNIT II  FORECASTING  9
Demand forecasting – Role of forecasting-Characteristics – Basic Approach – Time series method
– Measures of forecast error – Aggregate planning in SCM – Aggregate planning using Linear
Programming – Excel – Supply and demand planning in supply chain – Managing supply –
Demand – Implementing solution.
UNIT III INVENTORY MANAGEMENT AND RISK POOLING

UNIT IV NETWORK PLANNING AND PROCUREMENT STRATEGY

UNIT V INFORMATION TECHNOLOGY IN SUPPLY CHAIN
Enabling supply chain through IT – ERP vendor platforms – Service oriented architecture (SOA) – RFID

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Explain the management of supply chain assembly and role of IT in it.
- Capability of Inventory management, planning and decision making

REFERENCES:

CP7153 ADVANCES IN OPERATING SYSTEMS

OBJECTIVES
- To understand the concepts of distributed systems
- To get an insight into the various issues and solutions in distributed operating systems
- To learn about mobile and real-time operating systems
- To gain knowledge on the design concepts of mainframe operating systems

UNIT I BASICS OF OPERATING SYSTEMS

UNIT II DISTRIBUTED OPERATING SYSTEMS

UNIT III DISTRIBUTED RESOURCE MANAGEMENT

**UNIT IV MOBILE AND REAL TIME OPERATING SYSTEMS**


**UNIT V MAINFRAME AND LINUX OPERATING SYSTEMS**


**OUTCOMES**

Upon completion of this course, the student should be able to

- Demonstrate the various protocols of distributed operating systems
- Identify the different features of mobile and real-time operating systems
- Discuss the various features of mainframe operating systems

**REFERENCES**


**CP7254 SECURITY PRINCIPLES AND PRACTICES**

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

**OBJECTIVES**

- To understand the mathematical foundations of security principles
- To appreciate the different aspects of encryption techniques
- To understand the role played by authentication in security
- To appreciate the current trends of security practices

**Attended**

**Salima**

Centre For Academic Courses
Anna University, Chennai 600 025.
### UNIT I  CLASSICAL CIPHERS  
9  
Classical Cryptography- Shift Cipher - Substitution Cipher - Affine Cipher – Cryptanalysis - Cryptanalysis of the Affine Cipher - Cryptanalysis of the Substitution Cipher - Cryptanalysis of the Vigenere sew Cipher - Shannon’s Theory

### UNIT II  SYMMETRIC CIPHERS AND HASH FUNCTIONS  
9  

### UNIT III  PUBLIC-KEY ENCRYPTION TECHNIQUES  
9  
Introduction to Public–key Cryptography - Number theory - RSA Cryptosystem - Attacks on RSA – El-Gamal Cryptosystem - Shanks’ Algorithm - Elliptic Curves over the Reals - Elliptical Curves Modulo a Prime - Signature Scheme – Digital Signature Algorithm

### UNIT IV  KEY MANAGEMENT  
9  
Identification Scheme and Entity Attenuation - Challenge and Response in the Secret-key Setting - Challenge and Response in the Public key Setting - Schnorr Identification Scheme - Key distribution - Diffie-Hellman Key - Pre-distribution - Unconditionally Secure key Pre-distribution - Key Agreement Scheme - Diffie-Hellman Key agreement - Public key infrastructure - PKI, Certificates, Trust Models

### UNIT V  SECURITY PRACTICES  
9  

**TOTAL : 45 PERIODS**

**OUTCOMES:**  
Upon completion of this course, the student should be able to  
- Use the mathematical foundations in security principles  
- Identify the features of encryption and authentication  
- Use available security practices

**REFERENCES:**  

**SO7211 ADVANCED DATABASE MANAGEMENT SYSTEM LAB**  
<table>
<thead>
<tr>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>4</td>
<td>2</td>
</tr>
</tbody>
</table>

**OBJECTIVES:**  
SOFTWARE:
Oracle 10 G or Higher / Equivalent

TOPICS TO BE COVERED:
1. Data Definition Language
   - Create, Alter, Drop, Truncate, Comment, Rename
   - Command Enforcing Integrity
   - Constraints Views, Synonyms, Sequences, Indexes
2. DML Operations
3. Joining Data from Multiple Tables in Queries
   - The join Condition / The Cartesian Product Equijoin, Self-join, Outer joins
4. Set Operations
5. Aggregate Functions and the GROUP By Clause
6. Using Sub-queries
7. Analytic Functions
8. Introduction to Procedures and Functions
   - Creating stored PL / SQL objects, procedures, functions
9. Creating Packages
10. Creating package specifications and bodies
11. Creating DML Triggers
    - Triggering events, Trigger behavior
    - Correlation identifiers, Multi-statement triggers
    - Trigger firing behavior, Enabling / Disabling triggers
12. Distributed Database Implementation

TOTAL = 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Design and implement relational database.
- Perform all the query manipulation operations and procedural querying language.
- Design and develop active and distributed databases.

CP7162
PROFESSIONAL PRACTICES
L  T  P  C
0  0  2  1

OBJECTIVES:
- To facilitate analysis, design and problem solving skills
- To have a thorough domain knowledge
- To understand the best Industry practices by reading case studies
- To kindle innovative and professional thinking
- To explore possible alternative solutions
- To estimate feasibility, cost, risk and ROI

Identify an application (may be of social relevance) – Understand customer requirements – analyze and understand customers and stakeholders – value additions – innovations and research component – preparing plan / SRS document indicating feasibility, cost, risk, ROI and related design – suggest implementation methodology – perform risk assessment and management

TOTAL : 30 PERIODS

OUTCOMES:
Upon completion of this course, the student should be able to
- Identify and formulate the problem
- Describe the background of the problem
- Assess the needs of stakeholders
- Make estimates like cost, risk, ROI etc., to justify the business opportunity.
• Describe the industry standards and procedures
• Predict the business opportunity
• Suggest system implications

SO7301 NON LINEAR PROGRAMMING  L T P C
3 0 2 4

OBJECTIVES
• To introduce and familiarize non-linear approaches in optimization.
• To conceptualize the real life applications in terms of non-linearity and also to learn MATLAB for solving the same.

UNIT I  INTRODUCTION  9

UNIT II  ONE DIMENSIONAL OPTIMIZATION  9

UNIT III  MULTI-DIMENSIONAL OPTIMIZATION  9

UNIT IV  UNCONSTRAINED OPTIMIZATION FOR CONSTRAINED PROBLEMS  9

UNIT V  EVOLUTIONARY PROGRAMMING  9

OUTCOMES:
Upon Completion of the course, the students will be able to:
• Applying the concepts of non-linear programming in real life scenarios.
• Provide instant results through MATLAB.

REFERENCES:
OBJECTIVES:
- To understand the concepts of cloud and utility computing
- To understand the various issues in cloud computing
- To familiarize themselves with the lead players in cloud
- To appreciate the emergence of cloud as the next generation computing paradigm
- To be able to set up a private cloud

UNIT I INTRODUCTION

UNIT II VIRTUALIZATION

UNIT III VIRTUALIZATION INFRASTRUCTURE

UNIT IV PROGRAMMING MODEL
Map Reduce Hadoop Distributed File Systems – Hadoop I/O – Developing Map Reduce Applications – Working of Map Reduce – Types and Formats – Setting up Hadoop Cluster

UNIT V CLOUD INFRASTRUCTURE AND SECURITY

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the student should be able to
- Articulate the main concepts, key technologies, strengths and limitations of cloud computing
- Identify the architecture, infrastructure and delivery models of cloud computing
- Explain the core issues of cloud computing such as security, privacy and interoperability
- Choose the appropriate technologies, algorithms and approaches for the related issues

REFERENCES:
4. Jim Smith, Ravi Nair, "Virtual Machines: Versatile Platforms for Systems and Processes"
OBJECTIVES:
- To understand the principles of parallel programming.
- To design and develop efficient parallel algorithms.

UNIT I INTRODUCTION TO PARALLEL PROGRAMMING
Introduction to parallel programming - Data parallelism - Functional parallelism - Pipelining - Flynn’s taxonomy - Parallel algorithm design - Task/channel model - Foster’s design methodology - Case studies: Boundary value problem - Finding the maximum - n-body problem - Speedup and efficiency - Amdahl’s law - Gustafson - Baris’s Law - Karp - Flatt Metric - Isoefficiency metric.

UNIT II MESSAGE PASSING INTERFACE
The message-passing model - The message-passing interface - MPI standard - Basic concepts of MPI: MPI_Init - MPI_Comm_size - MPI_Comm_rank - MPI_Send - MPI_Recv - MPI_Finalize - Timing the MPI programs: MPI_Wtime, MPI_Wtick - Collective communication: MPI_Reduce - MPI_Barrier - MPI_Bcast - MPI_Gather - MPI_Scatter - Case studies: The sieve of Eratosthenes - Floyd’s algorithm - Matrix-vector multiplication

UNIT III SHARED-MEMORY PROGRAMMING
Shared-memory model – Open MP standard - Parallel for loops - Parallel for pragma - Private variables - Critical sections - Reductions - Parallel loop optimizations - General data parallelism - Functional parallelism - Case studies: The sieve of Eratosthenes - Floyd’s algorithm - Matrix-vector multiplication - Distributed shared-memory programming - DSM primitives

UNIT IV PARALLEL ALGORITHMS – I
Monte Carlo methods - Parallel random number generators - Random number distributions - Case studies: Matrix multiplication - Row wise block - Stripped algorithm - Cannon’s algorithm - Solving linear systems - Back substitution - Gaussian elimination - Iterative methods - Conjugate gradient method

UNIT V PARALLEL ALGORITHMS – II
Sorting algorithms - Quick sort - Parallel quick sort - Hyper quick sort - Sorting by regular sampling - Fast Fourier transform - Combinatorial search - Divide and conquer - Parallel backtrack search - Parallel branch and bound - Parallel alpha-beta search

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will:
- Be able to design algorithms for parallel systems
- Acquire knowledge in parallel systems and associated concepts.

REFERENCES:
OBJECTIVES

- To understand data mining principles and techniques and introduce DM as a cutting edge business intelligence
- To expose the students to the concepts of data warehousing architecture and implementation
- To study the overview of developing areas – web mining, text mining and ethical aspects of data mining
- To identify business applications and trends of data mining

UNIT I INTRODUCTION TO DATA WAREHOUSING
Evolution of Decision Support Systems- Data warehousing Components – Building a Data warehouse, Data Warehouse and DBMS, Data marts, Metadata, Multidimensional data model, OLAP vs OLTP, OLAP operations, Data cubes, Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations

UNIT II DATA WAREHOUSE PROCESS AND ARCHITECTURE
Types of OLAP servers, 3–Tier data warehouse architecture, distributed and virtual data warehouses. Data warehouse implementation, tuning and testing of data warehouse. Data Staging (ETL) Design and Development, data warehouse visualization, Data Warehouse Deployment, Maintenance, Growth, Business Intelligence Overview- Data Warehousing and Business Intelligence Trends - Business Applications- tools-SAS

UNIT III INTRODUCTION TO DATA MINING
Data mining-KDD versus data mining, Stages of the Data Mining Process-task primitives, Data Mining Techniques -Data mining knowledge representation – Data mining query languages, Integration of a Data Mining System with a Data Warehouse – Issues, Data preprocessing – Data cleaning, Data transformation, Feature selection, Dimensionality reduction, Discretization and generating concept hierarchies-Mining frequent patterns- association-correlation

UNIT IV CLASSIFICATION AND CLUSTERING
Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Clustering techniques – , Partitioning methods- k-means- Hierarchical Methods – distance based agglomerative and divisible clustering, Density-Based Methods – expectation maximization -Grid Based Methods – Model-Based Clustering Methods – Constraint-Based Cluster Analysis – Outlier Analysis

UNIT V PREDICTIVE MODELING OF BIG DATA AND TRENDS IN DATAMINING

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the student should be able to
- Evolve multidimensional intelligent model from typical system
- Discover the knowledge imbibed in the high dimensional system
- Evaluate various mining techniques on complex data objects
REFERENCES
1. Jiawei Han, Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann, Third edition, 2011.

SO7005 JAVA AND WEB TECHNOLOGY

OBJECTIVES:
- To learn about the concepts of java and its features.
- To learn about the concept of networking, API and GUI in java.
- To learn the concept of advanced java and scripting languages.

UNIT I INTRODUCTION TO JAVA

UNIT II NETWORKING, APPLETS and GUI
RMI and RMI-IIOP - Custom sockets - Object serialization - Retrieving Data with URLs - Sockets for clients - Sockets for servers - Secure Sockets - UDP datagrams and sockets - Multicast Sockets - Applets - Developing GUI Applications.

UNIT III ENTERPRISE JAVA
Java Beans Enterprise - Java Beans - Distributed Object models – URL Connection class - Protocol Handlers - Content Handlers - Distributed garbage collection - Interface definition language.

UNIT IV SCRIPTING LANGUAGES
HTML - JavaScript and VB Script - Control Structures - Functions - Arrays - Objects - DHTML - Cascading style sheets - Object model and collections - Event model - Filters and Transitions - Data binding with tabular control - XML Technology

UNIT V SERVER SIDE PROGRAMMING
Servlets - Java Server Pages - JDBC - Case study: Deploying n-tier application.

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Write programs using java
- Develop web applications.
REFERENCES

SO7001 ADHOC AND WIRELESS SENSOR NETWORKS

OBJECTIVES:
- To learn about the issues in the design of wireless ad hoc networks
- To understand the working of protocols in different layers of mobile ad hoc and sensor networks
- To expose the students to different aspects in sensor networks
- To understand various security issues in ad hoc and sensor networks and solutions to the issues

UNIT I MAC & ROUTING IN AD HOC NETWORKS

UNIT II TRANSPORT & QOS IN AD HOC NETWORKS

UNIT III MAC & ROUTING IN WIRELESS SENSOR NETWORKS

UNIT IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS

UNIT V SECURITY IN AD HOC AND SENSOR NETWORKS

TOTAL : 45 PERIODS

Atul Garg
DIRECTOR
Centre For Academic Courses
Anna University, Chennai-600 025
OUTCOMES:
Upon completion of this course, the student should be able to
- Identify different issues in wireless ad hoc and sensor networks
- Analyze protocols developed for ad hoc and sensor networks
- Identify different issues in wireless ad hoc and sensor networks
- Identify and critique security issues in ad hoc and sensor networks

REFERENCES

CP7093
SOFT COMPUTING
L T P C
3 0 0 3

OBJECTIVES:
- To learn the key aspects of Soft computing and Neural networks
- To study the fuzzy logic components
- To gain insight onto neuro fuzzy modeling and control
- To know about the components and building block hypothesis of genetic algorithm
- To gain knowledge in machine learning through Support Vector Machines

UNIT I
INTRODUCTION TO SOFT COMPUTING
Evolution of Computing - Soft Computing Constituents – From Conventional AI to Computational Intelligence - Machine Learning Basics

UNIT II
GENETIC ALGORITHMS

UNIT III
NEURAL NETWORKS

UNIT IV
FUZZY LOGIC
UNIT V  NEURO-FUZZY MODELING

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the student should be able to
- Discuss on machine learning through neural networks
- Apply knowledge in developing a Fuzzy expert system
- Model Neuro Fuzzy system for clustering and classification
- Discover knowledge to develop Genetic Algorithm and Support vector machine based machine learning system

REFERENCES

CP7072  BIG DATA ANALYTICS
OBJECTIVES
- To understand big data analytics as the next wave for businesses looking for competitive advantage
- To understand the financial value of big data analytics and to explore tools and practices for working with big data
- To understand how big data analytics can leverage into a key component
- To learn about stream computing
- To know about the research that requires the integration of large amounts of data

UNIT I  INTRODUCTION TO BIG DATA

UNIT II  LAMBDA CALCULUS AND DATA ANALYSIS
methods - analytic tools – Cognos – Microstrategy - Pentaho. Analysis approaches – Statistical significance – business approaches

UNIT III  STREAM COMPUTING

UNIT IV  PREDICTIVE ANALYTICS AND VISUALIZATION

UNIT V  FRAMEWORKS AND APPLICATIONS

TOTAL : 45 PERIODS

OUTCOMES
Upon completion of this course, the student should be able to

- Use Hadoop, Map Reduce Framework
- Suggest areas to apply big data to increase business outcome
- Contextually integrate and correlate large amounts of information automatically to gain faster insights

REFERENCES
CP7154  MULTI CORE ARCHITECTURES  L T P C  3 0 0 3

OBJECTIVES
- To introduce the students to the recent trends in the field of Computer Architecture and identify performance related parameters
- To understand the different multiprocessor issues
- To expose the different types of multicore architectures
- To understand the design of the memory hierarchy

UNIT I  FUNDAMENTALS OF COMPUTER DESIGN AND ILP

UNIT II  MEMORY HIERARCHY DESIGN

UNIT III  MULTIPROCESSOR ISSUES

UNIT IV  MULTICORE ARCHITECTURES

UNIT V  VECTOR, SIMD AND GPU ARCHITECTURES

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of this course, the student should be able to
- Identify the limitations of ILP and the need for multicore architectures
- Discuss the issues related to multiprocessing and suggest solutions
- Point out the salient features of different multicore architectures and how they exploit parallelism
- Critically analyze the different types of interconnection networks
- Design a memory hierarchy and optimize it

REFERENCES:
OBJECTIVES:
- To obtain sufficient knowledge to model any given system.
- To simulate the modeled system for performance study.

UNIT I  INTRODUCTION
System definition - Types and characteristics - Need for modeling and simulation - Types of Simulation - Introduction to discrete event simulation - Single server - Multiserver Exercises - System modeling - Simple Petrinets

UNIT II  MODELLING APPROACHES
Modeling concurrent systems - Analysis of Petrinets - Finite state Automata and Regular Expressions - Relationship - FSA with silent transitions - Pumping lemma for regular sets - Analysis using DFS and model checking.

UNIT III  QUEUING MODELS
Characteristics of queuing systems - Notations - Types of Queues - Markovian model - Non-Markovian model - Queuing Networks - Applications of queuing systems.

UNIT IV  SIMULATION DATA
Methods for generating random numbers - Testing of random numbers - Methods of generating random variants - Problem formulation - input modeling - Verification and Validation - Output1ZX Analysis.

UNIT V  CASE STUDY
NS2 - Simulation of Computer Systems - Simulation of Computer Networks - Simulation of Mobile Networks - Simulation of Manufacturing and Material Handling Systems

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Modeling any given system with rationality.
- Predicting the behavior through fine grained analysis.

REFERENCES:
OBJECTIONS
The student should be able to
- Know what is software and the usage of different types of softwares.
- Know the Quality Metrics of various Softwares.
- Know the methodologies in making Software.
- Test the product finally to check the product Quality.

UNIT I  INTRODUCTION  9

UNIT II  TESTING METHODOLOGIES  9

UNIT III  TEST STRATEGIES  9

UNIT IV  TEST AUTOMATION AND MANAGEMENT  9

UNIT V  SQA IN PROJECT MANAGEMENT  9

TOTAL : 45 + 30 = 75 PERIODS

OUTCOMES
At the end the student will be able to
- Analyze the product Quality.
- Use various testing methods.
- Assess Quality standards.

REFERENCES
OBJECTIVES:
- To make more specific linear and non-linear approaches that suits both stochastic and deterministic applications.
- To analyze systems to ensure optimal and faster results.

UNIT I INTRODUCTION AND APPLICATIONS OF DYNAMIC PROGRAMMING

UNIT II DETERMINISTIC DYNAMIC PROGRAMMING

UNIT III PROBABILISTIC DYNAMIC PROGRAMMING

UNIT IV DYNAMIC PROGRAMMING IN MARKOV CHAINS

UNIT V RISK AND UNCERTAINTY

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
- Discriminate the concepts of various optimization approaches.
- Choosing appropriate dynamic programming concept for a model.

REFERENCES:
OBJECTIVES:
- To understand the concept of patterns
- To learn various design patterns.
- To learn the usage of design patterns to keep code quality high.

UNIT I  INTRODUCTION
History and Origin of Patterns – Introduction to OOAD - Apply Design Patterns – Prototype – Testing.

UNIT II  DESIGN PATTERNS
Kinds of Pattern – Quality and Elements – Patterns and Rules – Creativity and Patterns – Creational Patterns – Structural Patterns – Behavioural Patterns, Factory Patterns.

UNIT III  FRAMEWORKS
State and Strategy of Patterns. Singleton, Composite, Functions and the Command Patterns, Adaptor, Proxy Pattern, Decorator Pattern – Pattern Frameworks and Algorithms

UNIT IV  CATALOGS
Pattern Catalogs and Writing Patterns, Anti-Patterns, Pattern Community, Pattern Based Software Development.

UNIT V  CASE STUDIES
A7E - case study in utilizing architectural structures, WWW - case study in interoperability, Air Traffic Control – case study in designing for high availability, Celsius Tech – case study in product line development

OUTCOMES:
Upon successful completion of the course, the student will be able to
- Comprehend most important design patterns
- Apply design patterns to design innovative software.
- Familiarize real time applications developed with case studies.

REFERENCES

OBJECTIVES:
- To develop applications for current and emerging mobile computing devices
- To performing tasks at all stages of the software development life-cycle from inception through to implementation and testing
- To understand the impact of user characteristics, device capabilities, networking infrastructure and the deployment environment, on the specified requirements of a software project.
UNIT I  INTRODUCTION  

UNIT II  MOBILE USER INTERFACE DESIGN  

UNIT III  MOBILE WEB APPLICATION DEVELOPMENT  

UNIT IV  APPLICATION DEVELOPMENT  

UNIT V  MESSAGING, NETWORKING, LOCATION BASED SERVICES  
SMS Messaging, Sending E-mail – Networking – Downloading Binary Data, Text Files- Accessing Web Services – Performing Asynchronous Calls – Location Based Services – Displaying Maps – Getting Location Data – Creating your own services – Communicating between a service and an activity – Binding activities to Services

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:
• To identify the limitations and challenges of working in a mobile and wireless environment as well as the commercial and research opportunities presented by these technologies.
• To apply the different types of application models/architectures used to develop mobile software applications.
• To design, implement and deploy mobile applications using an appropriate software development environment.
• To work within the capabilities and limitations of a range of mobile computing devices.

REFERENCES:
4. Lyza Danger Gardner and Jason Grigsby, Head First Mobile Web, O'Relliy 2012.
OBJECTIVES

- To design and implement relational database solutions for general applications
- To develop database scripts for data manipulation and database administration
- To understand and perform common database administration tasks such as database monitoring, performance tuning, data transfer, and security
- To balance the different types of competing resources in the database environment so that the most important applications have priority access to the resources

UNIT I INTRODUCTION TO DATABASE ADMINISTRATION

Database Administration - DBA Tasks - DBMS Release Migration - Types of DBAs - Creating the Database Environment – Defining the organizations DBMS strategy - Installing the DBMS - Upgrading DBMS Versions and Releases

UNIT II DATABASE SECURITY, BACKUP AND RECOVERY


UNIT III FUNDAMENTALS OF TUNING


UNIT IV INDEX TUNING AND QUERY OPTIMIZATION


UNIT V TROUBLESHOOTING


OUTCOMES:

Upon completion of this course, the student should be able to

- Understand advanced features of databases in design, administration, and applications
- Provide techniques to improve the performance of a database
- Optimize the use of existing resources within the database environment

REFERENCES:

OBJECTIVES:

- To learn business process structure, framework and management.

UNIT I  ORGANIZATIONAL STRUCTURE  

UNIT II  BUSINESS PROCESS MANAGEMENT  

UNIT III  THE FRAMEWORK - I  

UNIT IV  THE FRAMEWORK - II  

UNIT V  BPM AND THE ORGANIZATION  
BPM maturity – BPM maturity model – Application of the BPMM model – Embedding BPM within the organization – Knowledge management and information technology – Process Modeling and formulation using a BPM suite in an organization as a case study.

OUTCOMES:

Upon Completion of the course, the students will be able to:

- Understand the life cycle of a business process in an organization.
- Model and optimize the business process flow in an organization.

REFERENCES:

OBJECTIVES:
- To understand the basics of Internet of things and protocols
- To get an idea of some of the application areas where Internet of Things can be applied
- To understand the middleware for Internet of Things
- To understand the concepts of Web of Things
- To understand the concepts of Cloud of Things with emphasis on Mobile cloud computing

UNIT I  INTRODUCTION

UNIT II  IOT PROTOCOLS

UNIT III  WEB OF THINGS

UNIT IV  INTEGRATED

UNIT V  APPLICATIONS
The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronisation and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging

OUTCOMES:
Upon completion of this course, the student should be able to
- Identify and design the new models for market strategic interaction
- Design business intelligence and information security for WoB
- Analyze various protocols for IoT
- Design a middleware for IoT
- Analyze and design different models for network dynamics

REFERENCES
4. Olivier Hersent, Omar Elloumi and David Boswarthick, “The Internet of Things: Applications to

CP7089  REAL TIME SYSTEMS DESIGN

OBJECTIVES:

- To learn real time operating system concepts and the associated issues & techniques.
- To understand design and synchronization problems in Real Time System.
- To understand the evaluation techniques present in Real Time System.

UNIT I  REAL TIME SPECIFICATION AND DESIGN TECHNIQUES


UNIT II  SOFTWARE REQUIREMENTS ENGINEERING


UNIT III  INTERTASK COMMUNICATION AND MEMORY MANAGEMENT


UNIT IV  REAL TIME DATABASES

Real time Databases – Basic Definition, Real time Vs General Purpose Databases, Main Memory Databases, Transaction priorities, Transaction aborts, Concurrency control issues, Disk Scheduling Algorithms, Two – phase Approach to improve Predictability – Maintaining Serialization Consistency – Databases for Hard Real Time Systems

UNIT V  PROGRAMMING LANGUAGES


TOTAL : 45 PERIODS

OUTCOMES

Upon completion of this course, the student should be able to

- Understand principles of real time systems design.
- Make use of architectures and behavior of real time operating systems and database in real time applications.

REFERENCES