VISION AND MISSION

VISION OF THE DEPARTMENT

The Department of Computer Science and Engineering strives to create computing professionals, researchers, and entrepreneurs, with high technical knowledge, communication skills, values and ethics. It collaborates with academia, industry and community to set high standards in academic excellence and in fulfilling societal responsibilities.

MISSION OF THE DEPARTMENT

The mission of the Department of Computer Science and Engineering is to

- Provide motivated faculty and state of the art facilities for education and research, both in foundational aspects and of relevance to emerging computing trends.
- Develop knowledgeable, industry-ready students with pertinent competencies.
- Inculcate responsibility through sharing of knowledge and innovative computing solutions that benefit the society-at-large.
- Engage in collaborative research with academia and industry for seamless transfer of knowledge resulting in patentable solutions.
- Generate adequate resources for research activities from sponsored projects and consultancy.
ANNA UNIVERSITY, CHENNAI
UNIVERSITY DEPARTMENTS
M.E. SOFTWARE ENGINEERING
REGULATIONS – 2019
CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES:

1. Demonstrate the ability to develop software systems of varying size and complexity using appropriate theory, principles and practices of Software Engineering.
2. Empower students to critically analyze current trends and future issues from a system perspective at multiple levels of detail and abstraction using appropriate tools, technologies and best practices.
3. Prepare students to critically analyze and identify gaps in the existing literature and propose innovative and appropriate solutions needed to the industry.
4. Ability to improve and expand skills through lifelong multidisciplinary learning as professional engineers, participation in professional activities and development of managerial and leadership skills.
5. Enable students to effectively communicate technically, function effectively on teams, and apply Software solutions within a global, societal, and environmental context by following ethical practices.

PROGRAM OUTCOMES (POs):

<table>
<thead>
<tr>
<th>PO #</th>
<th>Graduate Attribute</th>
<th>Programme Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Research Aptitude</td>
<td>An ability to independently carry out research / Investigations, identify problems and develop solutions to solve practical problems.</td>
</tr>
<tr>
<td>2.</td>
<td>Technical documentation</td>
<td>An ability to write and present a substantial technical report/ document.</td>
</tr>
<tr>
<td>3.</td>
<td>Technical competence</td>
<td>Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program</td>
</tr>
<tr>
<td>4.</td>
<td>Handle complex problems</td>
<td>Use research based knowledge, methods, appropriate techniques, resources and tools to solve complex engineering issues with an understanding of the limitations.</td>
</tr>
<tr>
<td>5.</td>
<td>Environmental Sustainability and societal Ethics</td>
<td>Ensure development of socially relevant and eco friendly indigenous products by applying technical knowledge, ethical principles and, sound engineering practices</td>
</tr>
<tr>
<td>6.</td>
<td>Life-long learning</td>
<td>Recognize the need for independent, life-long learning and engage in the broadest context of technological change.</td>
</tr>
</tbody>
</table>

PROGRAM SPECIFIC OUTCOMES (PSO):

1. To acquire deep understanding of the concepts and practices for analyzing and synthesizing various Software Engineering Applications.
2. To ensure software quality and usage of standards.
3. Integrate ideas, design and develop applications using innovative approaches for real world complex problems.
MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

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

<table>
<thead>
<tr>
<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>YEAR</th>
<th>SEMESTER</th>
<th>COURSE TITLE</th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SEM1</td>
<td>Advanced Mathematics for Scientific Computing</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data structures and Algorithms</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Software Architecture</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Software Requirements Engineering</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Research Methodology and IPR</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Audit Course – I*</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data structures and Algorithms Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Software Development Process Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advanced Databases</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advanced Operating Systems</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advanced Software Engineering</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Program Elective I</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Program Elective II</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Audit Course –II</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>SEM2</td>
<td>Advanced Databases Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Advanced Software Engineering Laboratory</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>YEAR</td>
<td>SEMESTER</td>
<td>COURSE TITLE</td>
<td>PO1</td>
<td>PO2</td>
<td>PO3</td>
<td>PO4</td>
<td>PO5</td>
<td>PO6</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>----------------------------</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Professional Practices</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>YEAR 2</td>
<td>SEM3</td>
<td>Program Elective III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Program Elective IV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Program Elective V</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Open Elective</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dissertation I</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SEM4</td>
<td></td>
<td>Dissertation II</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
</tbody>
</table>
# ANNA UNIVERSITY, CHENNAI
# UNIVERSITY DEPARTMENTS
# M.E. SOFTWARE ENGINEERING
# REGULATIONS – 2019
# CHOICE BASED CREDIT SYSTEM
# CURRICULUM AND SYLLABUS

## SEMESTER I

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>MA5153</td>
<td>Advanced Mathematics for Scientific Computing</td>
<td>FC</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>CP5151</td>
<td>Data Structures and Algorithms</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>SE5101</td>
<td>Software Architecture</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>SE5102</td>
<td>Software Requirements Engineering</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>RM5151</td>
<td>Research Methodology and IPR</td>
<td>RMC</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>Audit Course – I*</td>
<td></td>
<td>AC</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>CP5161</td>
<td>Data Structures and Algorithms Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>SE5111</td>
<td>Software Development Process Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
<td>1</td>
<td>8</td>
</tr>
</tbody>
</table>

*Audit course is optional

## SEMESTER II

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
</tr>
<tr>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>OR5251</td>
<td>Advanced Databases</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>CP5251</td>
<td>Advanced Operating Systems</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>SE5201</td>
<td>Advanced Software Engineering</td>
<td>PCC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>Program Elective I</td>
<td></td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>Program Elective II</td>
<td></td>
<td>PEC</td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>Audit Course – II*</td>
<td></td>
<td>AC</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>OR5261</td>
<td>Advanced Databases Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>SE5211</td>
<td>Advanced Software Engineering Laboratory</td>
<td>PCC</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>CP5262</td>
<td>Professional Practices</td>
<td>EEC</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

*Audit course is optional
### SEMESTER III

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>THEORY</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td>Program Elective III</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td>Program Elective IV</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td>Program Elective V</td>
<td>PEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>Open Elective</td>
<td>OEC</td>
<td>3 0 0</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>SE5311</td>
<td>Dissertation I</td>
<td>EEC</td>
<td>0 0 12</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>12 0 14</td>
<td>26</td>
<td>19</td>
</tr>
</tbody>
</table>

**TOTAL NO. OF CREDITS: 71**

### SEMESTER IV

<table>
<thead>
<tr>
<th>S. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>TOTAL CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>PRACTICALS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>SE5411</td>
<td>Dissertation II</td>
<td>EEC</td>
<td>0 0 24</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td>0 0 24</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>L</th>
<th>T</th>
<th>P</th>
<th>CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>MA5153</td>
<td>Advanced Mathematics for Scientific Computing</td>
<td>FC</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>
### PROGRAM CORE COURSES (PCC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>CP5151</td>
<td>Data structures and Algorithms</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3 0</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>SE5101</td>
<td>Software Architecture</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3 0</td>
<td>3</td>
</tr>
<tr>
<td>3.</td>
<td>SE5102</td>
<td>Software Requirements Engineering</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3 0</td>
<td>3</td>
</tr>
<tr>
<td>4.</td>
<td>CP5161</td>
<td>Data structures and Algorithms Laboratory</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4 4</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>SE5111</td>
<td>Software Development Process Laboratory</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4 4</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>OR5251</td>
<td>Advanced Databases</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3 0</td>
<td>3</td>
</tr>
<tr>
<td>7.</td>
<td>CP5251</td>
<td>Advanced Operating Systems</td>
<td>PCC</td>
<td>3 0 0</td>
<td>3 0</td>
<td>3</td>
</tr>
<tr>
<td>8.</td>
<td>SE5201</td>
<td>Advanced Software Engineering</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4 4</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>OR5261</td>
<td>Advanced Databases Laboratory</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4 4</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>SE5211</td>
<td>Advanced Software Engineering Laboratory</td>
<td>PCC</td>
<td>0 0 4</td>
<td>4 4</td>
<td>2</td>
</tr>
</tbody>
</table>

### PROGRAM ELECTIVE COURSES (PEC)

<table>
<thead>
<tr>
<th>SL. NO.</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>CATEGORY</th>
<th>PERIODS PER WEEK</th>
<th>CONTACT PERIODS</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>SE5072</td>
<td>Fundamentals of Machine Learning</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>2.</td>
<td>CP5073</td>
<td>Cloud Computing Technologies</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>3.</td>
<td>CP5080</td>
<td>Ethical Hacking</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>4.</td>
<td>CP5085</td>
<td>Principles of Cryptography</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>5.</td>
<td>CP5083</td>
<td>Internet of Things</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>6.</td>
<td>CP5089</td>
<td>Web Content Design and Management</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>7.</td>
<td>SE5076</td>
<td>Software Testing and Quality Assurance</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>8.</td>
<td>IF5076</td>
<td>Deep Learning</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>9.</td>
<td>IF5090</td>
<td>Semantic Web</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>10.</td>
<td>IF5088</td>
<td>Mobile Application Development</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>11.</td>
<td>CP5075</td>
<td>Cryptocurrency and Blockchain Technologies</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>12.</td>
<td>SE5071</td>
<td>Multimedia Systems and Applications</td>
<td>PEC</td>
<td>3 0 2</td>
<td>5 5</td>
<td>4</td>
</tr>
<tr>
<td>Sl. No</td>
<td>Course Code</td>
<td>Course Title</td>
<td>Category</td>
<td>Periods Per Week</td>
<td>Contact Periods</td>
<td></td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
<td>--------------------------------------------------</td>
<td>----------</td>
<td>------------------</td>
<td>-----------------</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>OE5091</td>
<td>Business Data Analytics</td>
<td>OEC</td>
<td>3 0 0</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>OE5092</td>
<td>Industrial Safety</td>
<td>OEC</td>
<td>3 0 0</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>OE5093</td>
<td>Operations Research</td>
<td>OEC</td>
<td>3 0 0</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>OE5094</td>
<td>Cost Management of Engineering Projects</td>
<td>OEC</td>
<td>3 0 0</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>OE5095</td>
<td>Composite Materials</td>
<td>OEC</td>
<td>3 0 0</td>
<td>3 3</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>OE5096</td>
<td>Waste to Energy</td>
<td>OEC</td>
<td>3 0 0</td>
<td>3 3</td>
<td></td>
</tr>
</tbody>
</table>
AUDIT COURSES (AC)
Registration for any of these courses is optional to students

<table>
<thead>
<tr>
<th>SL. NO</th>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
<th>PERIODS PER WEEK</th>
<th>CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Lecture</td>
<td>Tutorial</td>
</tr>
<tr>
<td>1.</td>
<td>AX5091</td>
<td>English for Research Paper Writing</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2.</td>
<td>AX5092</td>
<td>Disaster Management</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>3.</td>
<td>AX5093</td>
<td>Sanskrit for Technical Knowledge</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>4.</td>
<td>AX5094</td>
<td>Value Education</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>5.</td>
<td>AX5095</td>
<td>Constitution of India</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>6.</td>
<td>AX5096</td>
<td>Pedagogy Studies</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>7.</td>
<td>AX5097</td>
<td>Stress Management by Yoga</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>8.</td>
<td>AX5098</td>
<td>Personality Development Through Life Enlightenment Skills</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>9.</td>
<td>AX5099</td>
<td>Unnat Bharat Abhiyan</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL CREDITS</strong></td>
<td></td>
<td></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>PERIODS PER WEEK</th>
<th>CONTACT PERIODS</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>CP5262</td>
<td>Professional Practices</td>
<td>EEC</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>SE5311</td>
<td>Dissertation I</td>
<td>EEC</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>3.</td>
<td>SE5411</td>
<td>Dissertation II</td>
<td>EEC</td>
<td>0</td>
<td>0</td>
<td>24</td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To apply mathematical linear programming techniques to solve constrained problems.
- To appreciate the use of simulation techniques.
- To enable them to estimate the value of the parameters involved in the specific distribution from a possible continuum of alternatives.
- To give an idea of testing the statistical hypothesis claimed based on a set of data points using standard sampling distributions.
- To impart knowledge of handling random vectors which represent random variables in multi-dimensional space.

UNIT I  LINEAR PROGRAMMING  12

UNIT II  SIMULATION  12
Discrete Event Simulation – Monte – Carlo Simulation – Stochastic Simulation – Applications to real time problems.

UNIT III  ESTIMATION THEORY  12

UNIT IV  TESTING OF HYPOTHESIS  12

UNIT V  MULTIVARIATE ANALYSIS  12

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, students will be able to
- Formulate and find optimal solution in the real life optimizing/allocation/assignment problems involving conditions and resource constraints.
- Simulate appropriate application/distribution problems.
- Obtain the value of the point estimators using the method of moments and method of maximum likelihood.
- Apply the concept of various test statistics used in hypothesis testing for mean and variances of large and small samples.
- Get exposure to the principal component analysis of random vectors and matrices.

REFERENCES:
OBJECTIVES:

- To extend the students’ knowledge of algorithms and data structures.
- To enhance their expertise in algorithmic analysis and algorithm design techniques.
- To understand various types of search and heap structures.
- To study various types of geometric, randomized and approximation algorithms.
- To extrapolate from them in order to apply those algorithms and techniques to solve problems.

UNIT I           FUNDAMENTALS

UNIT II           SEARCH STRUCTURES

UNIT III          HEAP STRUCTURES
Min/Max heaps – Deaps – Leftist Heaps – Binomial Heaps – Fibonacci Heaps – Skew Heaps – Lazy Binomial Heaps

UNIT IV           GEOMETRIC ALGORITHMS
Segment Trees – 1-Dimensional Range Searching – k-d Trees – Line Segment Intersection – Computing the Overlay of Two Subdivisions – Range Trees – Voronoi Diagram

UNIT V           ADDITIONAL TOPICS

TOTAL : 45 PERIODS

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

- Analyze algorithms.
- Determine algorithm correctness.
- Choose appropriate data structures for the problems to be solved.
- Design algorithms for problems from different domains.
- Identify various research strategies on algorithmic design.

REFERENCES:
OBJECTIVES:

- Understand the fundamentals of software architecture.
- Study the various software development methodologies.
- Learn the importance of architectural documentation and evaluation.
- Learn the various software architecture design components.
- Relate software architecture and software quality.

UNIT I INTRODUCTION

UNIT II DESIGN METHODOLOGIES
Structured design- Design practices-Stepwise refinement – Incremental design- Structured system analysis and design –Jackson structured programming – Jackson system Development.

UNIT III ARCHITECTURAL DESCRIPTION DOCUMENTATION AND EVALUATION

UNIT IV ARCHITECTURE DESIGN
Typical architectural design-Dataflow-Independent components-Call and return – Using styles in design – Architectural design space-Design space of architectural elements – Design space of architectural styles.

UNIT V IMPLEMENTATION AND CONFORMANCE TO ARCHITECTURE

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the student will be able to
- Develop Software applications starting from software architecture and design.
- Learn and evaluate existing software architectures.
- Realize importance of architectural documentation and document them.
- Employ various software architecture design components.
- Design methods for improving software quality from the perspective of software architecture.

REFERENCES:

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

SE5102 SOFTWARE REQUIREMENTS ENGINEERING L T P C 3 0 0 3

OBJECTIVES:
- Understand the basics of requirements engineering.
- Learn different techniques used for requirements elicitation.
- Know the role played by requirements analysis in requirement integration.
- Appreciate the use of various methodologies for requirements development.
- Study the current trends in requirements prioritization and validation.

UNIT I REQUIREMENTS ENGINEERING OVERVIEW 9
UNIT II REQUIREMENTS ELICITATION 9

UNIT III REQUIREMENTS ANALYSIS 9

UNIT IV REQUIREMENTS DEVELOPMENT 9

UNIT V REQUIREMENTS VALIDATION 9
Validation objectives – Analysis of requirements validation – Activities – Properties – Requirement reviews – Requirements testing – ISO 31000 – Case tools for requirements engineering.

OUTCOMES:
Upon completion of the course, the student will be able to
- Prepare SRS including the details of requirements engineering.
- Describe the stages of requirement elicitation.
- Analyze software requirements gathering.
- Integrate the requirements well during requirements analysis.
- Use various methodologies for requirements development.

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
OBJECTIVES:
To impart knowledge and skills required for research and IPR:
- Problem formulation, analysis and solutions.
- Technical paper writing/presentation without violating professional ethics
- Patent drafting and filing patents.

UNIT I RESEARCH PROBLEM FORMULATION
Meaning of research problem - Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations

UNIT II LITERATURE REVIEW
Effective literature studies approaches, analysis, plagiarism, and research ethics.

UNIT III TECHNICALWRITING/PRESENTATION
Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS (IPR)

UNIT V INTELLECTUAL PROPERTY RIGHTS (IPR)
Traditional knowledge Case Studies, IPR and IITs.

OUTCOMES:
1. Ability to formulate research problem
2. Ability to carry out research analysis
3. Ability to follow research ethics
4. Ability to understand that today's world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity
5. Ability to understand about IPR and filing patents in R & D.

REFERENCES:
OBJECTIVES:
- To familiarize various data structure implementations.
- To implement heap and various tree structures like AVL, Red-black, B-Tree and segment trees.
- To understand efficient implementation of line segment intersection.
- To understand various search structures.
- To get understanding of problem to program mapping.

LIST OF EXPERIMENTS:
1. Binary Search Trees
2. Min/Max Heap
3. Leftist Heap
4. AVL Trees
5. Red-Black Trees
6. B-Trees
7. Segment Trees
8. Line segment intersection

TOTAL : 60 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Achieve programming skill to convert a problem to a programming logic.
- Apply suitable data structure for the problem in hand.
- Implement heap and various tree structures like AVL, Red-black, B-Tree and segment trees.
- Understand the usage of data structures for geometric problems.
- Understand the importance of height balancing in search structures.

<table>
<thead>
<tr>
<th>CO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVES:
- To learn the stages of software development process.
- To carry out Planning.
- To understand the importance of documentation.
- To equip in preparing software project documentation.
- To use models developed, code and test.

SUGGESTED LIST OF EXERCISES:
Choose any one application for performing the following phases.

1. Program Analysis and Project Planning.
   Thorough study of the problem – Identify project scope, Objectives, Infrastructure – PROJECT PLAN DOCUMENTATION

2. Software Requirement Analysis
   Describe the individual Phases / Modules of the project, Identify deliverables – SRS DOCUMENTATION

3. Data Modeling
   Use work products – Data dictionary, Use case diagrams and activity diagrams, build and test class diagrams, Sequence diagrams, add interface to class diagrams. – DESIGN DOCUMENTATION

4. Software Development and Debugging
   Use technology of your choice to develop and debug the application– CODE DOCUMENTATION

5. Software Testing
   Perform validation testing, Coverage analysis, memory leaks, develop test case hierarchy and Site monitor. – TEST CASE DOCUMENTATION

TOTAL: 60 PERIODS

SUGGESTED LIST OF APPLICATIONS:
1. Inventory System.
2. Book Lending Application.
4. Online Help Portal.
5. Online Payment Portal.
6. Student Marks Analyzing System.
7. Quiz System.
8. Online Ticket Reservation System.
10. Course Registration System.

OUTCOMES:
Upon completion of the course, the student will be able to
- Prepare project plan.
- Prepare SRS as per standards.
- Prepare and use design document.
- Prepare and use code document.
- Prepare and use test case documentation at appropriate stages of software development process.
OR5251  ADVANCED DATABASES  L T P C  3 0 0 3

OBJECTIVES:
- To comprehend the underlying principles of Relational Database Management System.
- To develop database models using parallel and distributed databases.
- To understand the concepts of XML and Web databases.
- To apprehend the design and implementation of active temporal and deductive databases.
- To develop applications based on NoSQL database.

UNIT I  RELATIONAL MODEL  9

UNIT II  PARALLEL AND DISTRIBUTED DATABASES  9

UNIT III  XML AND WEB DATABASES  9

UNIT IV  ACTIVE TEMPORAL AND DEDUCTIVE DATABASES  9

UNIT V  NoSQL DATABASES  9
NoSQL database vs traditional RDBMS database – Migrating from RDBMS to NoSQL – MongoDB – Database creation and Querying – Web Application development using MongoDB

TOTAL: 45 PERIODS
OUTCOMES:
Upon completion of the course, the student will be able to

- Design and implement relational databases.
- Design and implement parallel and distributed databases.
- Design and implement XML databases, Active, Temporal and Deductive databases.
- Implement the concept of database connectivity with the applications.
- Apply various data mining techniques.

REFERENCES:
2. Han, Jiawei, Jian Pei, and Micheline Kamber. Data mining: concepts and Techniques. 2011.

<table>
<thead>
<tr>
<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
<th>PROGRAMME OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>1.</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>
<tr>
<td>5.</td>
<td>✓</td>
</tr>
</tbody>
</table>

CP5251 ADVANCED OPERATING SYSTEMS L T P C 3 0 0 3

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 real-time operating systems.
- To gain knowledge on the design concepts of mobile operating systems.
- To understand cloud operating systems.

UNIT I INTRODUCTION
UNIT II  DISTRIBUTED OPERATING SYSTEMS  9

UNIT III  DISTRIBUTED RESOURCE MANAGEMENT  9

UNIT IV  REAL TIME OPERATING SYSTEMS  9

UNIT V  MOBILE AND CLOUD OPERATING SYSTEMS  9

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Identify the features of distributed operating systems.
- Demonstrate the various protocols of distributed operating systems.
- Identify the different features of real time operating systems.
- Discuss the features of mobile operating systems.
- Discuss the features of cloud operating systems.

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
OBJECTIVES:
- Comprehend the different stages of Software Development Lifecycle.
- Comprehend the Process of developing Analysis models and map the Analysis models to Design Models.
- Comprehend the Design Issues related to Web applications and Mobile Apps.
- Comprehend the Quality Factors associated with Software Development.
- Comprehend the use of different Testing Strategies in Software Development.

UNIT I  PROCESS MODELS  9

UNIT II  REQUIREMENTS MODELING AND DESIGN CONCEPTS  9
Understanding Requirements–Scenario based methods–Class Based Methods–Behavior, Patterns and Web/Mobile Apps–The design process–Design concepts–The Design model

UNIT III  SOFTWARE DESIGN  9
Architectural design–Component level Design–User Interface Design–Pattern based design–Web App design– Mobile App design

UNIT IV  SOFTWARE QUALITY  9

UNIT V  SOFTWARE TESTING AND SOFTWARE CONFIGURATION MANAGEMENT  9

OUTCOMES:
Upon Completion of the Course, the Student will be able to
- Select Appropriate Process Model for Software Development.
- Develop Analysis Models and Map the Analysis Models to Design Models.
- Address the Design Issues related To Web Applications and Mobile Apps.
- Incorporate Appropriate Quality Factors and Standards during Software Development.

REFERENCES:

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

OR5261 ADVANCED DATABASES LABORATORY

OBJECTIVES:
- To learn the DDL and DML operations.
- To understand the use of various Joins.
- To acquire knowledge on creation of views and nested queries.
- To write and use functions, triggers, and stored procedures.
- To use distributed databases, heterogeneous databases and XML databases.

LIST OF EXPERIMENTS:
3. Set Operations – Creating Views – Creating Sequence – Indexing–Aggregate Functions – Analytic Functions – Nested Queries
4. Creating Triggers and Stored Procedures
5. Implementation of Distributed Databases
6. Connecting Heterogeneous Databases
7. XML Databases
8. Accessing and Updating a Relational Database using PHP
9. Accessing and Updating a Relational Database using JDBC
10. Accessing and Updating MongoDB using PHP

TOTAL: 60 PERIODS
OUTCOMES:
Upon completion of this course, the student should be able to

- Create and carry out all Data Manipulation operations.
- Create queries using various Joins appropriately.
- Create and use views and nested queries.
- Write and use functions, triggers, and stored procedures.
- Use distributed databases, heterogeneous databases and XML databases.

<table>
<thead>
<tr>
<th>PROGRAMME EDUCATIONAL OBJECTIVES</th>
<th>PROGRAMME OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
</tr>
<tr>
<td>1.</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>
<tr>
<td>5.</td>
<td></td>
</tr>
</tbody>
</table>

SE5211 ADVANCED SOFTWARE ENGINEERING LABORATORY L T P C
0 0 4 2

OBJECTIVES:

- To learn to prepare SRS for real time applications.
- To identify the entity relationship and data flow in the application.
- To learn modelling the requirements using various models.
- To use developed models for generating code from the model.
- To get equipped on various levels of testing the developed application.

LIST OF EXPERIMENTS:

1. Prepare SRS for a real time Application
2. Model Entity Relationship Diagram and Data Flow Diagram for the selected case study
3. Model the following UML Diagrams for the selected Case study
   a) Class Diagram
   b) Use Case Diagram
   c) Sequence Diagram
   d) Component diagram
   e) State Transition Diagram
   f) Activity Diagram
   g) Deployment Diagram
4. Code Generation from UML Diagram
5. Testing
   a) Unit Testing
   b) Integration Testing
OUTCOMES:
Upon completion of the course, the student will be able to

- Prepare SRS for real time applications.
- Identify the entity relationship and data flow in the application.
- Model the requirements for analysis as well as for design.
- Generate code from the model developed.
- Perform various levels of testing on the developed application.

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

CP5262 PROFESSIONAL PRACTICES

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.

SESSIONS BASED ON:

Identify an Application/Projects (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 the course, the student will 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.

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>6.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SE5072  FUNDAMENTALS OF MACHINE LEARNING  L T P C
3 0 2 4

OBJECTIVES:
- To understand the concepts of Machine Learning.
- To appreciate supervised learning and their applications.
- To appreciate the concepts and algorithms of unsupervised learning.
- To understand the theoretical and practical aspects of Probabilistic Graphical Models.
- To appreciate the concepts and algorithms of advanced learning.

UNIT I  INTRODUCTION  8+6
UNIT II  SUPERVISED LEARNING  10+6

UNIT III  UNSUPERVISED LEARNING  9+6

UNIT IV  PROBABILISTIC GRAPHICAL MODELS  9+6

UNIT V  ADVANCED LEARNING  9+6

TOTAL : 45+30 :75 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to

• Design a learning model appropriate to the application.
• Design a Neural Network for an application of your choice.
• Implement Probabilistic Discriminative and Generative algorithms for an application of your choice and analyze the results.
• Use a tool to implement typical Clustering algorithms for different types of applications.
• Design and implement an HMM for a Sequence Model type of application.
• Identify applications suitable for different types of Machine Learning with suitable justification.

REFERENCES:
OBJECTIVES:
- To understand the concept 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
Data Center Technology – Virtualization – Characteristics of Virtualized Environments - Taxonomy of Virtualization Techniques – Virtualization and Cloud Computing –Pros and Cons of Virtualization – Implementation Levels of Virtualization – Tools and Mechanisms: Xen, VMWare, Microsoft Hyper-V, KVM, Virtual Box

UNIT III  CLOUD COMPUTING MECHANISM
UNIT IV HADOOP AND MAP REDUCE 9+6
Apache Hadoop – HadoopMapReduce –Hadoop Distributed File System- Hadoop I/O- Developing a MapReduce Application – MapReduce Types and Formats – MapReduce Features– Hadoop Cluster Setup –Administering Hadoop.

UNIT V SECURITY IN THE CLOUD 9+6

OUTCOMES:
Upon completion of the course, the student will 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.
- Facilitate Service Level Agreements (SLA).

REFERENCES:
OBJECTIVES:
- To learn about the importance of information security.
- To learn different scanning and enumeration methodologies and tools.
- To understand various hacking techniques and attacks.
- To be exposed to programming languages for security professionals.
- To understand the different phases in penetration testing.

UNIT I  INTRODUCTION TO HACKING  9+6

UNIT II  SCANNING AND ENUMERATION  9+6

UNIT III  SYSTEM HACKING  9+6

UNIT IV  PROGRAMMING FOR SECURITY PROFESSIONALS  9+6

UNIT V  PENETRATION TESTING  9+6

TOTAL: 45+30:75 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Identify threats to computers.
- Defend hacking attacks.
- Protect data assets.
- Defend a computer against a variety of security attacks using various tools.
- Practice and use safe techniques on the World Wide Web.

REFERENCES:
CP5085  PRINCIPLES OF CRYPTOGRAPHY  L T P C  3 0 2 4

OBJECTIVES:

- To understand the mathematical foundations of security principles.
- To appreciate the different aspects of encryption techniques.
- To understand various attacks present over encryption and authentications techniques.
- To understand the role played by authentication in security.
- To appreciate the current trends of security practices.

UNIT I  CLASSICAL ENCRYPTION AND BLOCKCIPHERS  9+6

UNIT II  PSEUDO-RANDOM FUNCTIONS AND SYMMETRIC ENCRYPTION  9+6

UNIT III  HASH FUNCTIONS AND MESSAGE AUTHENTICATION  9+6

UNIT IV  NUMBER THEORY AND ASYMMETRIC ENCRYPTION  9+6

UNIT V  SECURITY PRACTICES AND ADVANCED TOPICS  9+6

TOTAL : 45 +30 : 75 PERIODS
OUTCOMES:
Upon completion of the course, the student will be able to

- Demonstrate the various classical encryption techniques and the adversary capabilities.
- Apply computational secrecy and semantic security to find out the probability of how strong are the security schemes.
- Illustrate the various MAC and HASH functions and apply the Birthday attack over Hash.
- Apply number theory in public key encryption techniques.
- Analyze the applications of cryptography for secure E-Commerce and other secret transactions.

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

CP5083 INTERNET OF THINGS L T P C
3 0 2 4

OBJECTIVES:

- To understand the different architectures for IoT.
- To learn various protocols at the different layers for IoT.
- To develop prototype systems using Arduino / Rasberry Pi.
- To apply the use of data analytics in IoT.
- To develop applications of IoT in Industrial contexts.

UNIT I ARCHITECTURES AND MODELS 9+6
UNIT II  CONNECTIVITY  9+6

UNIT III  SYSTEM DEVELOPMENT  9+6
Design Methodology – Case study – Basic blocks of IoT device – Raspberry Pi – Board, Interfaces, Linux, Setting up, Programming – Arduino – Other IoT Devices.

UNIT IV  DATA ANALYTICS AND IoT SECURITY  9+6

UNIT V  IoT IN INDUSTRY  9+6

TOTAL: 45+30: 75 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to

- Explain the underlying architectures and models in IoT.
- Analyse different connectivity technologies for IoT.
- Develop simple applications using Arduino / Raspberry Pi.
- Apply data analytics techniques to IoT.
- Study the needs and suggest appropriate solutions for Industrial applications.

REFERENCES:
CP5089 WEB CONTENT DESIGN AND MANAGEMENT L T P C 3 0 2 4

OBJECTIVES:

- Understand the design principles and interaction.
- To explore the detailed design practices, standards.
- To gain an insight into Content Management System for content design.
- To use any Content Management System tool for better content management.
- To get familiarized with Web Analytics for better management.

UNIT I PRINCIPLES OF WEB DESIGN 9+6

UNIT II ELEMENTS OF PAGE DESIGN 9+6

UNIT III WEB CONTENT DESIGN 9+6

UNIT IV WEB CONTENT MANAGEMENT 9+6

UNIT V WEB ANALYTICS 9+6

TOTAL : 45+60:75 PERIODS
OUTCOMES:
Upon completion of the course, the student will be able to
- Design web pages that follow standards and are usable.
- Design web sites that are appealing.
- To be able to use Content management System for designing web Content.
- To take advantage of Content Management System tools for managing content for large web sites.
- To be able to use analytics tools for better management.

REFERENCES:
OBJECTIVES:
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 used in developing Software.
- Test the product finally to check the product Quality.

UNIT I  INTRODUCTION  9+6

UNIT II  TESTING METHODOLOGIES  9+6

UNIT III  TEST STRATEGIES  9+6

UNIT IV  TEST AUTOMATION AND MANAGEMENT  9+6

UNIT V  SQA IN PROJECT MANAGEMENT  9+6

TOTAL: 45+30:75 PERIODS

OUTCOMES
Upon completion of the course, the student will be able to
- Develop Quality plans and use SQA components in project life cycle.
- Analyze the product Quality.
- Judge the use of infrastructure components and use configuration items for Quality control.
- Use various testing methods and verify.
- Assess Quality standards of various software products.

REFERENCES
IF5076  DEEP LEARNING  L T P C  3 0 2 4

OBJECTIVES:
- To understand the basic ideas and principles of Neural Networks
- To understand the basic concepts of Big Data and Statistical Data Analysis
- To familiarize the student with The Image Processing facilities like Tensorflow and Keras
- To appreciate the use of Deep Learning Applications
- To understand and implement Deep Learning Architectures

UNIT I  BASICS OF NEURAL NETWORKS  9
Basic concept of Neurons – Perceptron Algorithm – Feed Forward and Back Propagation Networks.

Suggested Activities:
- Discussion of role of Neural Networks.
- Practical – Installation of TensorFlow and Keras.

Suggested Evaluation Methods:
- Tutorial – Perceptron.
- Assignment problems on backpropagation networks.
- Quizzes on Neural Networks.

UNIT II  INTRODUCTION TO DEEP LEARNING  9

Suggested Activities:
- Discussion of role of Gradient Descent in Deep Learning.
- External learning – Feature extraction and feature learning.
- Discussion of Gradient Descent Problem.
Suggested Evaluation Methods

- Tutorial – Gradient descent in deep learning.
- Assignment problems in optimization.
- Quizzes on deep learning regularization and optimization.

UNIT III CONVOLUTIONAL NEURAL NETWORKS

CNN Architectures – Convolution – Pooling Layers – Transfer Learning – Image Classification using Transfer Learning

Suggested Activities:
- Discussion of role of Convolutional Networks in Machine Learning.
- External learning – Concept of convolution and need for Pooling.

Suggested Evaluation Methods:
- Tutorial – Image classification and recurrent nets.
- Assignment problems in image classification performances.
- Quizzes on Convolutional Neural Networks.

UNIT IV MORE DEEP LEARNING ARCHITECTURES


Suggested Activities:
- Discussion of role of Deep Learning architectures.
- External learning – Compression of features using Autoencoders.

Suggested Evaluation Methods:
- Tutorial – LSTM and Autoencoders.
- Assignment problems in deep generative models, Deep Belief Networks.
- Quizzes on deep learning architectures.

UNIT V APPLICATIONS OF DEEP LEARNING


Suggested Activities:
- Discussion of role of Deep Learning in Image and NLP applications.
- External learning – NLP concepts.

Suggested Evaluation Methods:
- Tutorial – Image segmentation.
- Assignment problems in parsing and sentiment analysis.
- Quizzes on deep learning architectures.

PRACTICAL EXERCISES:

1. Implement Simple Programs like vector addition in TensorFlow.
2. Implement a simple problem like regression model in Keras.
4. Implement a Feed-Forward Network in TensorFlow/Keras.
5. Implement an Image Classifier using CNN in TensorFlow/Keras.
6. Implement a Transfer Learning concept in Image Classification.
8. Implement a SimpleLSTM using TensorFlow/Keras.
9. Implement an Opinion Mining in Recurrent Neural network.
10. Implement an Object Detection using CNN.
11. Mini Project

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Understand the role of Deep learning in Machine Learning Applications.
2. To get familiar with the use of TensorFlow/Keras in Deep Learning Applications.
3. To design and implement Deep Learning Applications.
5. To design and implement Convolutional Neural Networks.
6. To know about applications of Deep Learning in NLP and Image Processing.

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>2.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>3.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>5.</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6.</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
UNIT I  THE QUEST FOR SEMANTICS
Building Models – Calculating with Knowledge – Exchanging Information – Semantic Web
Technologies – Layers – Architecture – Components – Types – Ontological Commitments –
Ontological Categories – Philosophical Background – Sample Knowledge Representation
Ontologies – Top Level Ontologies – Linguistic Ontologies – Domain Ontologies – Semantic Web
– Need – Foundation.

Suggested Activities:
• Flipped classroom on semantic web background and tutorial activity in class.
• Brainstorming session on various knowledge representation formats in class.

Suggested Evaluation Methods:
• Tutorial – Semantic web basics.
• Quizzes on knowledge representation formats.

UNIT II  LANGUAGES FOR SEMANTIC WEB AND ONTOLOGIES
Traditional Ontology Languages – LOOM – OKBC – OCML – Flogic Ontology Markup Languages –
SHOE – OIL – DAML+OIL – OWL.

Suggested Activities:
• Flipped classroom on comparison of various semantic web related languages and
tutorial activity in class.

Suggested Evaluation Methods:
• Quizzes on various ontology related languages.

UNIT III  ONTOLOGY LEARNING FOR SEMANTIC WEB
Taxonomy for Ontology Learning – Layered Approach – Phases of Ontology Learning –Importing
and Processing Ontologies and Documents – Ontology Learning Algorithms –Methods for
evaluating Ontologies.

Suggested Activities:
• Flipped classroom on natural language processing techniques like statistical text
analysis, term extraction, Word sense disambiguation, concept extraction and tutorial
activity in class.
• External reading – https://nlp.stanford.edu/fsnlp/

Suggested Evaluation Methods
• Tutorials – Language processing techniques.

UNIT IV  ONTOLOGY MANAGEMENT AND TOOLS
Overview – Need for management – Development process – Target Ontology – Ontology mapping
– Skills management system – Ontological class – Constraints – Issues – Evolution –Development
of Tools and Tool Suites – Ontology Merge Tools – Ontology based Annotation Tools.

Suggested Activities:
• Flipped classroom on study of various ontology related tools.

Suggested Evaluation Methods
• Tutorials – Ontology related tools like Protege, Ontolingua, Webonto.

Attested
DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
UNIT V APPLICATIONS


Suggested Activities:
- Flipped classroom on other applications of semantic web.

Suggested Evaluation Methods
- Quizzes on semantic web applications.

PRACTICAL EXERCISES:

1. Design of simple ontology on their domain of interest using Protege like tool.
2. Create RDF document using PHP library EasyRdf.
3. Use OWL language to represent relationships, properties and to provide inferences from created ontology.
4. Term extraction and Term disambiguation from corpus using Alchemy like API.
5. Use of any tool to apply SAPRQL queries and implement reasoning for avoiding inconsistencies.
7. Development of Simple application like chat bot, semantic search engine creation using Topic map data models extracted from Ontopia/Mappa.

OUTCOMES:
On completion of the course, the students will be able to:
1. Create ontology for a given domain.
2. Develop an application using ontology languages and tools.
3. Understand the concepts of semantic Web.
4. Use ontology related tools and technologies for application creation.
5. Design and develop applications using semantic web.
6. Understand the standards related to semantic web.

REFERENCES:
OBJECTIVES:

- To understand the need and characteristics of mobile applications.
- To design the right user interface for mobile application.
- To understand the design issues in the development of mobile applications.
- To understand the development procedures for mobile application.
- To develop mobile applications using various tools and platforms.

UNIT I  INTRODUCTION

Suggested Activities:
- Flipped classroom on survey on mobile application models.
- External learning - mobile application design using frameworks and tools.

Suggested Evaluation Methods:
- Quiz - questionnaire related to mobile application models.
- Assignment - evaluate using learning content management system like Moodle.

UNIT II  USER INTERFACE
Generic UI development – Designing the right UI – Multimodal and Multichannel UI – Gesture based UI – Screen Elements and Layouts – Voice XML.

Suggested Activities:
- Flipped classroom on discussion on UI for mobile application like voice and gestures.
- External learning - survey on different view elements for mobile application.

Suggested Evaluation Methods:
- Quiz - questionnaire related to user interface design for mobile applications.
- Assignment - evaluate using learning content management system like Moodle.
UNIT III APPLICATION DESIGN

Suggested Activities:
- Flipped classroom on discussion on memory constraints for mobile application design.
- External learning - survey on resource management and concurrent operations.

Suggested Evaluation Methods:
- Quiz - questionnaire related to memory constraints in design for mobile applications.
- Assignment - evaluate using learning content management system like Moodle.

UNIT IV APPLICATION DEVELOPMENT I

Suggested Activities:
- Simple Android application development like user account creation.
- Android application accessing the mobile database to view user data.

Suggested Evaluation Methods:
- Evaluation based on the demonstrated application functionality using emulators.

UNIT V APPLICATION DEVELOPMENT II

Suggested Activities:
- Application accessing Internet for communication like web application.
- Android application accessing GPS for location based service.

Suggested Evaluation Methods:
- Evaluation based on the demonstrated application functionality using emulators.

PRACTICAL EXERCISES:
1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Write an application that makes use of internet for communication (mobile web app).
7. Develop a native application that uses GPS location information.
8. Implement an application that writes data to the SD card.
9. Implement an application that creates an alert upon receiving a message.
10. Write a mobile application that creates alarm clock.

TOTAL: 75 PERIODS

OUTCOMES:
On completion of the course, the students will be able to:
1. Design the right user interface for mobile application.
2. Implement mobile application using UI toolkits and frameworks.
3. Design a mobile application that is aware of the resource constraints of mobile devices.
4. Develop web based mobile application that accesses internet and location data.
5. Implement android application to use telephony for SMS communication.
6. Implement android application with multimedia support.
REFERENCES:
2. Zigurd Mednieks, Laird Dornin, G. Blake Meike, Masumi Nakamura, “Programming
Android”, O’Reilly, 2011.

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>CO2</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CO3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>CO4</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CO5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>CO6</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

CP5075 CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES   L T P C
3    0    0    3

OBJECTIVES:
• To study the basic concepts of cryptocurrencies and blockchains.
• To explain the details of Bitcoin and its different components.
• To study the basics Hyperledger and Web3.
• To analyse the position of Web 3 and Hyperledger with different aspects of blockchain
technologies.
• To differentiate between alternate blockchains and their advantages in application areas.
• To understand the Ethereum development environment and the application development
process.

UNIT I INTRODUCTION
Cryptographic hash functions - hash pointers - digital signatures - public keys as identities - an
example cryptocurrency. Bitcoin, history of blockchain and Bitcoin - Types of Blockchain -
Consensus - Decentralization.

UNIT II BITCOIN
Bitcoin – Digital Keys and Addresses – Transactions, life cycle, data structure, types – Structure of
the blockchain - Mining – Bitcoin Networks and Payments - Wallets - Alternative coins - Smart
Contracts - Definition - Recardian contracts.

UNIT III WEB3 AND HYPERLEDGER
Web 3 Contract development - POST requests - Frontend - Development framework - Hyperledger

UNIT IV ALTERNATIVE BLOCKCHAINS AND APPLICATIONS
Alternative blockchains - Applications, Internet of Things, Government, Health, Finance -
Scaleability - Privacy.
UNIT V    ETHEREUM

Setting up Ethereum development tools - Solidity language. - Ethereum accounts, key pairs, working with Externally Owned Accounts (EOA), contract accounts - Smart contracts, structure, setting up and interaction, examples - Decentralised applications, implementation, case studies - Whisper protocol - Swarm architecture and concepts.

TOTAL : 45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:
- Explain cryptocurrencies and their relationship with the blockchain technology.
- Explain the different steps in the use of Bitcoins.
- Relate Web 3 and Hyperledger to concepts in blockchain technologies.
- Apply blockchains to different real-life problems
- Implement a simple application using Ethereum.

REFERENCES:
UNIT I  MULTIMEDIA ELEMENTS  9+6

UNIT II  MULTIMEDIA TOOLS and AUTHORING  9+6

UNIT III  MULTIMEDIA COMPRESSION  9+6

UNIT IV  MULTIMEDIA COMMUNICATION SYSTEMS  9+6

UNIT V  MULTIMEDIA APPLICATIONS  9+6
Applications for WWW.Multimedia databases – Indexing and Retrieval, Visualization, Virtual, Augmented and Mixed Reality, Interactive E-learning, HCI and UX design, Games and Animation, Real-Time video conferencing.

PRACTICAL EXERCISES:
1. Editing various images (Image restoration, Changing colour image to Grey scale and vice versa) and adding special effects to images using tools like Photoshop, Gimp and flash
2. Creating and Editing various video clippings and adding special effects using tools like Adobe Premier Pro
3. Creating and Editing various audio files and adding special effects using tools like SoundForge and Audacity
4. Creating three dimensional models and animations using tools like Blender, 3DS Max, Unity
5. Working on Text compression algorithms like Run length and Huffman
6. Implementation of transformations like DCT and FFT
   Designing User Interfaces and developing simple games using multimedia tools
7. Creating simple multimedia applications using any popular Authoring tools
8. Mini Project(4 Periods)

OUTCOMES:
On Completion of the course, the students should be able to:
- Handle the multimedia elements effectively
- Use Multimedia Hardware and Software for Editing and Authoring
- Implement Compression algorithms for various multimedia applications
- Develop effective strategies to deliver Quality-of-Experience in networked Multimedia applications
- Design and develop multimedia applications in various domains

TOTAL: 75 PERIODS
TEXTBOOKS:

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

CP5082 INFORMATION RETRIEVAL TECHNIQUES

OBJECTIVES:
- To understand the basics of information retrieval with pertinence to modeling, query operations and indexing.
- To understand the various applications of information retrieval giving emphasis to multimedia IR, web search.
- To learn measuring effectiveness and efficiency of information retrieval techniques.
- To get used to performing Parallel Information Retrieval.
- To understand the concepts of digital libraries.

UNIT I INTRODUCTION
UNIT II  RETRIEVAL MODELING

UNIT III  INDEXING

UNIT IV  EVALUATION AND PARALLEL INFORMATION RETRIEVAL

UNIT V  SEARCHING THE WEB

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Build an Information Retrieval system using the available tools.
- Identify and design the various components of an Information Retrieval system.
- Measure effectiveness and efficiency of information retrieval techniques.
- Use parallel Information Retrieval approaches in real world problems.
- Design an efficient search engine and analyze the Web content structure.

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

COPOPSO
OBJECTIVES:
- To understand the nature of threats and cyber security management goals and technology
- To understand the landscape of hacking and perimeter defense mechanisms
- To develop strategies for cyber security and protecting critical infrastructure
- To understand policies to mitigate cyber risks
- To understand the IT Act, scheme, amendments and emerging cyber law and desired cyber ecosystem capabilities

UNIT I  OVERVIEW OF CYBER SECURITY  9

UNIT II  ATTACKS AND COUNTERMEASURES  9

UNIT III  STRATEGIES FOR CYBER SECURITY  9

UNIT IV  POLICIES TO MITIGATE CYBER RISK  8

UNIT V  CRITICAL INFORMATION INFRASTRUCTURE PROTECTION  10

TOTAL: 45 Periods

OUTCOMES:
- Gain knowledge on the nature of threats and cyber security management goals and framework
- Knowledge on the landscape of hacking and perimeter defense mechanisms
- Ability to differentiate and integrate strategies for cyber security and protecting critical infrastructure
- Able to understand policies to mitigate cyber risks
- Knowledge on IT Act, and amendments, copy rights, IPR and cyber law to deal with offenses.
REFERENCES:
9. CGI, —Cyber security in Modern Critical Infrastructure Environments, 2014.

<table>
<thead>
<tr>
<th>CO</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>√</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>√</td>
<td></td>
<td>√</td>
<td>√</td>
<td>√</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SE5075 SOFTWARE SECURITY L T P C 3 0 0 3

OBJECTIVES:
- Know the importance and need of software security.
- Know about various attacks.
- Learn about secure software design.
- Understand risk management in secure software development.
- Know the working of tools related to software security.

UNIT I LOW LEVEL ATTACKS

Attested
DIRECTOR
UNIT II  SECURE DESIGN  

UNIT III  SECURITY RISK MANAGEMENT  

UNIT IV  SECURITY TESTING  

UNIT V  PENETRATION TESTING  

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Identify various vulnerabilities related to memory attack.
- Apply security principles in software development.
- Evaluate the extent of risks.
- Involve selection of testing techniques related to software security in testing phase of software development.
- Use tools for securing software.

REFERENCES:
<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>1.</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>2.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>√</td>
<td></td>
</tr>
</tbody>
</table>

**CP5088 USER INTERFACE DESIGN**

**OBJECTIVES:**
- To determine the necessity of user interaction by understanding usability engineering and user modeling.
- To learn the methodologies for designing interactive systems.
- To investigate the core and complex design issues for interaction.
- To examine the evaluation methodologies of design.
- To understand design issues for web and mobile platforms.

**UNIT I - INTRODUCTION** 9
Context of Interaction – Ergonomics - Designing Interactive systems – Understanding Users - cognition and cognitive frame works, User Centred approaches - Usability, Universal Usability, Understanding and conceptualizing interaction, Guidelines, Principles and Theories

**UNIT II - INTERACTION DESIGN** 9

**UNIT III - DESIGN AND EVALUATION** 9

**UNIT IV - MODELS AND THEORIES** 9
Cognitive Models, Socio-Organizational Issues And Stake Holder Requirements, Communication And Collaboration Modelstask Analysis, Dialog Notations and Design, Models of the System, Modeling Rich Interaction, Ubiquitous Computing

**UNIT V - DESIGNING INTERACTIONS FOR WEB AND MOBILE PLATFORMS** 9

**TOTAL : 45 PERIODS**
OUTCOMES:
Upon completion of the course, the student will be able to

- Understand the basics of human computer interactions via usability engineering and cognitive modeling.
- Understand the basic design paradigms, complex interaction styles.
- Understand the fundamental design issues.
- Examine the evaluate of interaction designs and implementations.
- Use models and theories for user interaction.
- Use above concepts for web and mobile applications.

REFERENCES:

<table>
<thead>
<tr>
<th>CO</th>
<th>PO</th>
<th>PSO</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1.</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>2.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>√</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>5.</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>6.</td>
<td>√</td>
<td>√</td>
</tr>
</tbody>
</table>
OBJECTIVES:

- Understand the basic concept of project management.
- Learn the various costing and life cycle management.
- Understand the role played by risk in software project.
- Appreciate the use of metrics for software project management.
- Know the challenges in people management.

UNIT I PROJECT MANAGEMENT & COSTING

UNIT II PROCESS MODELS & LIFECYCLE MANAGEMENT

UNIT III RISK MANAGEMENT

UNIT IV METRICS

UNIT V PEOPLE MANAGEMENT

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Identify the various elements of software management process framework.
- Use available open source estimation tools for cost estimation.
- Identify existing risk and perform risk assessment.
- Design a software metric for software project management.
- Modify the art of interviewing people for a given scenario.
REFERENCES:


<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PSO1</th>
<th>PSO2</th>
<th>PSO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>CO3</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>CO5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SE5074 SOFTWARE RELIABILITY METRICS AND MODELS L T P C 3 0 0 3

OBJECTIVES

The student should be able to
- Learn different definitions of software quality
- Know different notions of defects and classify them
- Understand the basic techniques of data collection and how to apply them
- Learn software metrics that define relevant metrics in a rigorous way.
- Gain confidence in ultra-high reliability

UNIT I INTRODUCTION TO SOFTWARE RELIABILITY 9


UNIT II SOFTWARE RELIABILITY MODELING 9

Reliability Concepts – Program – Environment and runs – Failure – Fault – General Model Characteristic – Historical development of Models –Model Classification scheme Markovian models-General poisson type models-Binomial type models-Poisson type models-Fault reduction factor for poisson type models.
UNIT III  COMPARISON OF SOFTWARE RELIABILITY MODELS

Comparison of software reliability models - Comparison criteria – Failure data – comparison of predictive validity of model groups – Recommended models– Comparison of time domains - Calendar time modeling-Limiting resource concept-Resource usage model-Resource utilization- Calendar time estimation and confidence intervals.

UNIT IV  FUNDAMENTALS OF MEASUREMENT

Measurements in software engineering–Software metrics- Scope of software metrics–Cost and effort estimation-Productivity models and measures-Quality models and measures-Structural and complexity metrics- Measurements theory-Software measurement validation-Evaluation of methods and tools

UNIT V  MEASURING SOFTWARE PRODUCT


OUTCOMES:

Upon completion of the course, the student will be able to

- Perform some simple statistical analysis relevant to software measurement data.
- Use from practical examples both the benefits and limitations of software metrics for quality control and assurance

REFERENCES:
3. John D. Musa, Anthony Iannino, KazuhiraOkumoto,"Software Reliability – Measurement,

SE5002  SOFTWARE TEST AUTOMATION

OBJECTIVES:
- Understand the basics of test automation.
• Appreciate the different aspects of test tool evaluation and test automation approach selection.
• Understand the role played by test planning and design in test execution.
• Appreciate the use of various testing tools for testing varied applications.
• Understand test automation using case studies.

UNIT I  INTRODUCTION
Automated Testing – Background on software testing – Automated test life cycle methodology (ATLM) – Test Maturity Model – Test Automation Development – Overcoming false expectations of automated testing – benefits – Test tool proposal

UNIT II  TEST FRAMEWORK AND AUTOMATION
Automated Test Tool Evaluation and selection – Organisation’s system engineering environment – tools that support the testing life cycle – Test Tool Research – Hands-on Tool evaluation -Test process analysis – Test tool consideration – Selecting the test automation approach - Test team management – Organization Structure of a Test Team – Test Program Tasks – Test Effort Sizing

UNIT III  TEST PLANNING AND DESIGN

UNIT IV  TESTING THE APPLICATIONS

UNIT V  CASE STUDIES

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the student will be able to
• Identify the different test tools.
• Use available testing tools to test some software applications.
• Modify existing test metrics based on functionality or features used.
• Design test cases and execute them.
• Implement test scripts for automating test execution.

REFERENCES:
OBJECTIVES:

- Understand the principles of verification and validation.
- Appreciate the different verification and validation techniques.
- Understand the various stages of testing.
- Appreciate the use of tools for verification and validation.
- Appreciate the benefits of using metrics for verification and validation.

UNIT I  INTRODUCTION

UNIT II  METHODS OF SOFTWARE VERIFICATION

UNIT III  TESTING

UNIT IV  TOOLS FOR SOFTWARE VERIFICATION

UNIT V  ADVANCED APPROACHES

TOTAL : 45 PERIODS
OUTCOMES:
Upon completion of the course, the student will be able to
- Identify the different techniques for verification and validation.
- Use available traceability analysis tools on sample requirements.
- Modify existing coverage analysers in terms of functionality or features used.
- Design system test cases.
- Use test case generators and test management tools.

REFERENCES:
UNIT III  SERVICE AND INFORMATION INTEGRATION ARCHITECTURE


UNIT IV  PROCESS AND APPLICATION INTEGRATION ARCHITECTURE


UNIT V  PATTERNS OF ENTERPRISE APPLICATION INTEGRATION


TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to

- Use object-oriented concepts for developing web applications.
- Demonstrate the enterprise application integration.
- Deploy the components of EIA with solutions.
- Apply pattern in Enterprise Application Integration.
- Identify appropriate technology for Process Integration.

REFERENCES:

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PSO1</th>
<th>PSO2</th>
<th>PSO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>CO3</td>
<td>√</td>
<td></td>
<td>√</td>
<td></td>
<td></td>
<td>√</td>
<td>√</td>
<td>√</td>
</tr>
<tr>
<td>CO4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>√</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

SE5005  SOFTWARE AGENTS

OBJECTIVES:

- Have an overview of the agent systems and software agents.
- Understand the basic concepts of intelligent software agents.
- Design and build a multiagent system.
- Have a basic understanding about software agent technology and to be familiar with some of the communicating languages, standardization and applications.
- Learn the use of software agents to represent and share information to coordinate activities of the agents for the purpose of group problem solving.

<table>
<thead>
<tr>
<th>UNIT I</th>
<th>AGENTS – OVERVIEW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agent Definition – Agent Programming Paradigms – Agent Vs Object – Aglet – Mobile Agents – Agent Frameworks – Agent Reasoning.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT II</th>
<th>JAVA AGENTS</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>UNIT III</th>
<th>MULTIAGENT SYSTEMS</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>UNIT IV</th>
<th>INTELLIGENT SOFTWARE AGENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Interface Agents – Agent Communication Languages – Agent Knowledge Representation – Agent Adaptability – Belief Desire Intension – Mobile Agent Applications. Introduction to Chat Bot</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>UNIT V</th>
<th>AGENTS AND SECURITY</th>
</tr>
</thead>
</table>

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the student will be able to
- Create / develop an agent based system for a particular task.
- Design an application that uses different security issues for intelligent agents.
- Effectively apply agent-based technologies in the development and application of distributed information systems that use software agents.
- Interface agents through Agent communication languages.
- Apply technologies for solving agent security issues.

REFERENCES:
OBJECTIVES:

- To gain knowledge about the current web development and emergence of social web.
- To study about the modeling, aggregating and knowledge representation of semantic web.
- To appreciate the use of machine learning approaches for web content mining.
- To learn about the extraction and mining tools for social networks.
- To gain knowledge on web personalization and web visualization of social networks.

UNIT I  CLUSTERING AND CLASSIFICATION  9+6

UNIT II  SOCIAL MEDIA MINING  9+6

UNIT III  EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS  9+6

UNIT IV  HUMAN BEHAVIOR ANALYSIS AND PRIVACY ISSUES  9+6

UNIT V  VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS  9+6
Graph Theory – Centrality – Clustering – Node-Edge Diagrams – Matrix representation – Visualizing Online Social Networks – Visualizing Social Networks with Matrix-Based Representations – Node-Link Diagrams – Hybrid Representations – Applications – Covert
OUTCOMES:
Upon completion of the course, the student will be able to

- Apply knowledge of current web development in the era of social web.
- Model, aggregate and represent knowledge for semantic web.
- Use machine learning approaches for web content mining.
- Design extraction and mining tools for social networks.
- Develop personalized web sites and visualization for social networks.

REFERENCES:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PSO1</th>
<th>PSO2</th>
<th>PSO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

SE5073 SENTIMENT ANALYSIS

OBJECTIVES:
- To understand the need for sentiment analysis.
- To explore the various methodologies involved in text sentiment classification.
- To learn the fusion of Natural Language processing with sentiment analysis.
- To explore available sentiment summarization methods.
- To learn the various tools used for sentiment analysis.

UNIT I INTRODUCTION
Need for Sentiment Analysis – Problem of Sentiment Analysis - Subjectivity – Stance – Words to Discourse – Pragmatics – Natural Language Processing issues – Opinion Definition – Sentiment.
**UNIT II DOCUMENT SENTIMENT CLASSIFICATION**

- Sentiment Classification Using Supervised Learning – Unsupervised Learning – Rating Prediction
- Cross-Domain Sentiment Classification – Cross-Language Sentiment Classification – Sentence Subjectivity And Classification – Subjectivity Classification – Sentence Sentiment Classification – Conditional Sentences - Sarcastic Sentences – Cross-Language Subjectivity and Sentiment Classification – Discourse Information for Sentiment Classification.

**UNIT III ASPECT BASED SENTIMENT ANALYSIS**


**UNIT IV OPINION SUMMARIZATION**


**UNIT V TOOLS FOR SENTIMENT ANALYSIS**


**TOTAL: 45 PERIODS**

**OUTCOMES:**

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

- Apply the various algorithms to perform opinion mining and classification.
- Learn various supervised and unsupervised machine learning methods for sentiment analysis.
- Generate sentiment lexicons by applying NLP techniques.
- Solve problems on opinion summarization.
- Learn to use tools for sentiment analysis.

**REFERENCES:**

OBJECTIVES:

- To understand the basics of business analytics and its life cycle.
- To gain knowledge about fundamental business analytics.
- To learn modeling for uncertainty and statistical inference.
- To understand analytics using Hadoop and Map Reduce frameworks.
- To acquire insight on other analytical frameworks.

UNIT I OVERVIEW OF BUSINESS ANALYTICS


Suggested Activities:
- Case studies on applications involving business analytics.
- Converting real time decision making problems into hypothesis.
- Group discussion on entrepreneurial opportunities in Business Analytics.

Suggested Evaluation Methods:
- Assignment on business scenario and business analytical life cycle process.
- Group presentation on big data applications with societal need.
- Quiz on case studies.

UNIT II ESSENTIALS OF BUSINESS ANALYTICS


Suggested Activities:
- Solve numerical problems on basic statistics.
- Explore chart wizard in MS Excel Case using sample real time data for data visualization.
- Use R tool for data visualization.
Suggested Evaluation Methods:
- Assignment on descriptive analytics using benchmark data.
- Quiz on data visualization for univariate, bivariate data.

UNIT III  MODELING UNCERTAINTY AND STATISTICAL INFERENCE

Suggested Activities:
- Solving numerical problems in sampling, probability, probability distributions and hypothesis testing.
- Converting real time decision making problems into hypothesis.

Suggested Evaluation Methods:
- Assignments on hypothesis testing.
- Group presentation on real time applications involving data sampling and hypothesis testing.
- Quizzes on topics like sampling and probability.

UNIT IV  ANALYTICS USING HADOOP AND MAPREDUCE FRAMEWORK

Suggested Activities:
- Practical – Install and configure Hadoop.
- Practical – Use web based tools to monitor Hadoop setup.
- Practical – Design and develop MapReduce tasks for word count, searching involving text corpus etc.

Suggested Evaluation Methods:
- Evaluation of the practical implementations.
- Quizzes on topics like HDFS and extensions to MapReduce.

UNIT V  OTHER DATA ANALYTICAL FRAMEWORKS
Overview of Application development Languages for Hadoop – PigLatin – Hive – Hive Query Language (HQL) – Introduction to Pentaho, JAQL – Introduction to Apache: Sqoop, Drill and Spark, Cloudera Impala – Introduction to NoSQL Databases – Hbase and MongoDB.

Suggested Activities:
- Practical – Installation of NoSQL database like MongoDB.
- Practical – Demonstration on Sharding in MongoDB.
- Practical – Install and run Pig
- Practical – Write PigLatin scripts to sort, group, join, project, and filter data.
- Design and develop algorithms to be executed in MapReduce involving numerical methods for analytics.

Suggested Evaluation Methods:
- Mini Project (Group) – Real time data collection, saving in NoSQL, implement analytical techniques using Map-Reduce Tasks and Result Projection.

TOTAL: 45 PERIODS
OUTCOMES:
On completion of the course, the student will be able to:

- Identify the real world business problems and model with analytical solutions.
- Solve analytical problem with relevant mathematics background knowledge.
- Convert any real world decision making problem to hypothesis and apply suitable statistical testing.
- Write and Demonstrate simple applications involving analytics using Hadoop and MapReduce
- Use open source frameworks for modeling and storing data.
- Apply suitable visualization technique using R for visualizing voluminous data.

REFERENCES:

<table>
<thead>
<tr>
<th></th>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>CO2</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CO3</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>CO4</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CO5</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>CO6</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

OE5092 INDUSTRIAL SAFETY LT P C 3 0 0 3

OBJECTIVES:
- Summarize basics of industrial safety
- Describe fundamentals of maintenance engineering
- Explain wear and corrosion
- Illustrate fault tracing
- Identify preventive and periodic maintenance

UNIT I INTRODUCTION
Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.
UNIT II  FUNDAMENTALS OF MAINTENANCE ENGINEERING  9
Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.

UNIT III WEAR AND CORROSION AND THEIR PREVENTION  9

UNIT IV FAULT TRACING  9
Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment’s like, i. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.

UNIT V PERIODIC AND PREVENTIVE MAINTENANCE  9
Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: i. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1: Ability to summarize basics of industrial safety
CO2: Ability to describe fundamentals of maintenance engineering
CO3: Ability to explain wear and corrosion
CO4: Ability to illustrate fault tracing
CO5: Ability to identify preventive and periodic maintenance

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

REFERENCES:
OBJECTIVES:
- Solve linear programming problem and solve using graphical method.
- Solve LPP using simplex method
- Solve transportation, assignment problems
- Solve project management problems
- Solve scheduling problems

UNIT I  LINEAR PROGRAMMING  9
Introduction to Operations Research – assumptions of linear programming problems - Formulations of linear programming problem – Graphical method

UNIT II  ADVANCES IN LINEAR PROGRAMMING  9
Solutions to LPP using simplex algorithm- Revised simplex method - primal dual relationships – Dual simplex algorithm - Sensitivity analysis

UNIT III  NETWORK ANALYSIS – I  9
Transportation problems -Northwest corner rule, least cost method, Voges’s approximation method - Assignment problem -Hungarian algorithm

UNIT IV  NETWORK ANALYSIS – II  9
Shortest path problem: Dijkstra’s algorithms, Floyds algorithm, systematic method -CPM/PERT

UNIT V  NETWORK ANALYSIS – III  9
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models

TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:
CO1: To formulate linear programming problem and solve using graphical method.
CO2: To solve LPP using simplex method
CO3: To formulate and solve transportation, assignment problems
CO4: To solve project management problems
CO5: To solve scheduling problems

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

REFERENCES:
OBJECTIVES:
- Summarize the costing concepts and their role in decision making
- Infer the project management concepts and their various aspects in selection
- Interpret costing concepts with project execution
- Develop knowledge of costing techniques in service sector and various budgetary control techniques
- Illustrate with quantitative techniques in cost management

UNIT I  INTRODUCTION TO COSTING CONCEPTS  9
Objectives of a Costing System; Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost; Creation of a Database for operational control.

UNIT II  INTRODUCTION TO PROJECT MANAGEMENT  9
Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities, Detailed Engineering activities, Pre project execution main clearances and documents, Project team: Role of each member, Importance Project site: Data required with significance, Project contracts.

UNIT III  PROJECT EXECUTION AND COSTING CONCEPTS  9
Project execution Project cost control, Bar charts and Network diagram, Project commissioning: mechanical and process, Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis, Various decision-making problems, Pricing strategies: Pareto Analysis, Target costing, Life Cycle Costing.

UNIT IV  COSTING OF SERVICE SECTOR AND BUDGETERY CONTROL  9
Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis, Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets.

UNIT V  QUANTITATIVE TECHNIQUES FOR COST MANAGEMENT  9
Linear Programming, PERT/CPM, Transportation problems, Assignment problems, Learning Curve Theory.

OUTCOMES:
Students will be able to:
CO1: Understand the costing concepts and their role in decision making
CO2: Understand the project management concepts and their various aspects in selection
CO3: Interpret costing concepts with project execution
CO4: Gain knowledge of costing techniques in service sector and various budgetary control techniques
CO5: Become familiar with quantitative techniques in cost management

<table>
<thead>
<tr>
<th>PO1</th>
<th>PO2</th>
<th>PO3</th>
<th>PO4</th>
<th>PO5</th>
<th>PO6</th>
<th>PO7</th>
<th>PO8</th>
<th>PO9</th>
<th>PO10</th>
<th>PO11</th>
<th>PO12</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
REFERENCES:
2. Charles T. Horngren and George Foster, Advanced Management Accounting, 1988

OE5095 COMPOSITE MATERIALS L T P C 3 0 0 3

OBJECTIVES:
- Summarize the characteristics of composite materials and effect of reinforcement in composite materials.
- Identify the various reinforcements used in composite materials.
- Compare the manufacturing process of metal matrix composites.
- Understand the manufacturing processes of polymer matrix composites.
- Analyze the strength of composite materials.

UNIT I INTRODUCTION
Definition – Classification and characteristics of Composite materials - Advantages and application of composites - Functional requirements of reinforcement and matrix - Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.

UNIT II REINFORCEMENTS
Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers - Properties and applications of whiskers, particle reinforcements - Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures - Isostrain and Isostress conditions.

UNIT III MANUFACTURING OF METAL MATRIX COMPOSITES

UNIT IV MANUFACTURING OF POLYMER MATRIX COMPOSITES

UNIT V STRENGTH
Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.

TOTAL: 45 PERIODS
OUTCOMES:
Students will be able to:
- CO1 - Know the characteristics of composite materials and effect of reinforcement in composite materials.
- CO2 – Know the various reinforcements used in composite materials.
- CO3 – Understand the manufacturing processes of metal matrix composites.
- CO4 – Understand the manufacturing processes of polymer matrix composites.
- CO5 – Analyze the strength of composite materials.

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

REFERENCES:

OE5096 WASTE TO ENERGY L T P C 3 0 0 3

OBJECTIVES:
- Interpret the various types of wastes from which energy can be generated
- Develop knowledge on biomass pyrolysis process and its applications
- Develop knowledge on various types of biomass gasifiers and their operations
- Invent knowledge on biomass combustors and its applications on generating energy
- Summarize the principles of bio-energy systems and their features

UNIT I INTRODUCTION TO EXTRACTION OF ENERGY FROM WASTE 9
Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digestors

UNIT II BIOMASS PYROLYSIS 9
Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods - Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.

UNIT III BIOMASS GASIFICATION 9

UNIT IV BIOMASS COMBUSTION 9
Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.

[Signature]
DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025

Attested
UNIT V  BIO ENERGY
Properties of biogas (Calorific value and composition), Biogas plant technology and status - Bio energy system - Design and constructional features - Biomass resources and their classification - Biomass conversion processes - Thermo chemical conversion - Direct combustion - biomass gasification - pyrolysis and liquefaction - biochemical conversion - anaerobic digestion - Types of biogas Plants – Applications - Alcohol production from biomass - Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.
TOTAL: 45 PERIODS

OUTCOMES:
Students will be able to:

CO1 – Understand the various types of wastes from which energy can be generated
CO2 – Gain knowledge on biomass pyrolysis process and its applications
CO3 – Develop knowledge on various types of biomass gasifiers and their operations
CO4 – Gain knowledge on biomass combustors and its applications on generating energy
CO5 – Understand the principles of bio-energy systems and their features

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

REFERENCES:

AUDIT COURSES (AC)

AX5091  ENGLISH FOR RESEARCH PAPER WRITING  L T P C  2 0 0 0
OBJECTIVES

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

UNIT I  INTRODUCTION TO RESEARCH PAPER WRITING  6
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness

UNIT II  PRESENTATION SKILLS  6
UNIT III TITLE WRITING SKILLS 6
Key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check

UNIT IV RESULT WRITING SKILLS 6
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions

UNIT V VERIFICATION SKILLS 6
Useful phrases, checking Plagiarism, how to ensure paper is as good as it could possibly be the first-time submission

OUTCOMES
CO1 – Understand that how to improve your writing skills and level of readability
CO2 – Learn about what to write in each section
CO3 – Understand the skills needed when writing a Title
CO4 – Understand the skills needed when writing the Conclusion
CO5 – Ensure the good quality of paper at very first-time submission

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

TOTAL: 30 PERIODS

REFERENCES

AX5092 DISASTER MANAGEMENT L T P C 2 0 0 0

OBJECTIVES
- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches

UNIT I INTRODUCTION 6
Disaster: Definition, Factors and Significance; Difference between Hazard And Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.
UNIT II  REPERCUSSIONS OF DISASTERS AND HAZARDS


UNIT III  DISASTER PRONE AREAS IN INDIA

Study of Seismic Zones; Areas Prone To Floods and Droughts, Landslides And Avalanches; Areas Prone To Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics

UNIT IV  DISASTER PREPAREDNESS AND MANAGEMENT

Preparedness: Monitoring Of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological And Other Agencies, Media Reports: Governmental and Community Preparedness.

UNIT V  RISK ASSESSMENT

Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People’s Participation in Risk Assessment. Strategies for Survival

TOTAL : 30 PERIODS

OUTCOMES

CO1: Ability to summarize basics of disaster
CO2: Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
CO3: Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
CO4: Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
CO5: Ability to develop the strengths and weaknesses of disaster management approaches

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

REFERENCES

OBJECTIVES

- Illustrate the basic sanskrit language.
- Recognize sanskrit, the scientific language in the world.
- Appraise learning of sanskrit to improve brain functioning.
- Relate sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power.
- Extract huge knowledge from ancient literature.

UNIT I
ALPHABETS
Alphabets in Sanskrit

UNIT II
TENSES AND SENTENCES
Past/Present/Future Tense - Simple Sentences

UNIT III
ORDER AND ROOTS
Order - Introduction of roots

UNIT IV
SANSKRIT LITERATURE
Technical information about Sanskrit Literature

UNIT V
TECHNICAL CONCEPTS OF ENGINEERING
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics

OUTCOMES

- CO1 - Understanding basic Sanskrit language.
- CO2 - Write sentences.
- CO3 - Know the order and roots of Sanskrit.
- CO4 - Know about technical information about Sanskrit literature.
- CO5 - Understand the technical concepts of Engineering.

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

REFERENCES

1. “Abhyaspustakam” – Dr. Vishwas, Samskrita-Bharti Publication, New Delhi
2. “Teach Yourself Sanskrit” Prathama Deeksha-Vempati Kutumbhashatri, Rashtriya Sanskrit Sansthanam, New Delhi Publication
UNIT I

UNIT II

UNIT III

UNIT IV

OUTCOMES
Students will be able to:
- Knowledge of self-development.
- Learn the importance of Human values.
- Developing the overall personality.

Suggested reading

AX5095 CONSTITUTION OF INDIA

OBJECTIVES
Students will be able to:
- Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
- To address the growth of Indian opinion regarding modern Indian intellectuals’ constitutional
duty.
- Role and entitlement to civil and economic rights as well as the emergence nation hood in the early years of Indian nationalism.
- To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

UNIT I HISTORY OF MAKING OF THE INDIAN CONSTITUTION:
History, Drafting Committee, (Composition & Working)

UNIT II PHILOSOPHY OF THE INDIAN CONSTITUTION:
Preamble, Salient Features

UNIT III CONTOURS OF CONSTITUTIONAL RIGHTS AND DUTIES:

UNIT IV ORGANS OF GOVERNANCE:
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions.
UNIT V   LOCAL ADMINISTRATION:

UNIT VI   ELECTION COMMISSION:
Election Commission: Role and Functioning, Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.

OUTCOMES
Students will be able to:
• Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
• Discuss the intellectual origins of the framework of argument that informed the conceptualization
• of social reforms leading to revolution in India.
• Discuss the circumstances surrounding the foundation of the Congress Socialist Party[CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
• Discuss the passage of the Hindu Code Bill of 1956.

SUGGESTED READING:
1. The Constitution of India,1950(Bare Act),Government Publication.

AX5096   PEDAGOGY STUDIES

OBJECTIVES
Students will be able to:
• Review existing evidence on there view topic to inform programme design and policy
• Making under taken by the DfID, other agencies and researchers.
• Identify critical evidence gaps to guide the development.

UNIT I   INTRODUCTION AND METHODOLOGY:
Aims and rationale, Policy background, Conceptual framework and terminology - Theories of learning, Curriculum, Teacher education - Conceptual framework, Research questions - Overview of methodology and Searching.

UNIT II   THEMATIC OVERVIEW
Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries - Curriculum, Teacher education.
UNIT III  EVIDENCE ON THE EFFECTIVENESS OF PEDAGOGICAL PRACTICES
Methodology for the in depth stage: quality assessment of included studies - How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? - Theory of change - Strength and nature of the body of evidence for effective pedagogical practices - Pedagogic theory and pedagogical approaches - Teachers’ attitudes and beliefs and Pedagogic strategies.

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

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

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to understand:
- What pedagogical practices are being used by teachers informal and informal classrooms in developing countries?
- What is the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners?
- How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy?

SUGGESTED READING:

AX5097  STRESS MANAGEMENT BY YOGA  

L T P C  2 0 0 0

OBJECTIVES
- To achieve overall health of body and mind
- To overcome stress

UNIT I
Definitions of Eight parts of yoga (Ashtanga)

UNIT II
Yam and Niyam - Do’s and Don’ts in life - i) Ahinsa, satya, astheya, bramhacharya and aparigraha, ii) Ahinsa, satya, astheya, bramhacharya and aparigraha.

[Signature]
DIRECTOR
Centre for Academic Courses
Anna University, Chennai-600 025
UNIT III
Asan and Pranayam - Various yog poses and their benefits for mind & body - Regularization of breathing techniques and its effects-Types of pranayam

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to:
- Develop healthy mind in a healthy body thus improving social health also
- Improve efficiency

SUGGESTED READING
1. “Yogic Asanas for Group Tarining-Part-I”:Janardan Swami Yoga bhyasi Mandal, Nagpur
2. “Rajayoga or conquering the Internal Nature” by Swami Vivekananda, Advaita Ashrama (Publication Department), Kolkata

AX5098
PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT SKILLS

OBJECTIVES
- To learn to achieve the highest goal happily
- To become a person with stable mind, pleasing personality and determination
- To awaken wisdom in students

UNIT I
Neetisatakam-holistic development of personality - Verses- 19,20,21,22 (wisdom) - Verses -29,31,32 (pride & heroism) – Verses- 26,28,63,65 (virtue) - Verses- 52,53,59 (dont’s) - Verses- 71,73,75,78 (do’s)

UNIT II
Approach to day to day work and duties - Shrimad Bhagwad Geeta: Chapter 2-Verses 41, 47,48 - Chapter 3-Verses 13, 21, 27, 35 Chapter 6-Verses 5,13,17,23, 35 - Chapter 18-Verses 45, 46, 48.

UNIT III
Statements of basic knowledge - Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 - Personality of role model - shrimad bhagwad geeta - Chapter2-Verses 17, Chapter 3-Verses 36,37,42 - Chapter 4-Verses 18, 38,39 Chapter 18 – Verses 37,38,63

TOTAL: 30 PERIODS

OUTCOMES
Students will be able to
- Study of Shrimad-Bhagwad-Geeta will help the student in developing his personality and achieve the highest goal in life
- The person who has studied Geeta will lead the nation and mankind to peace and prosperity
- Study of Neet is hatakam will help in developing versatile personality of students.

SUGGESTED READING
1. Gopinath, Rashtriya Sanskrit Sansthanam P, Bhartrihari’s Three Satakam, Niti-sringar-vairagya, New Delhi,2010