SCHEME AND SYLLABI

FOR

THIRD TO EIGHTH SEMESTERS

OF

BACHELOR OF TECHNOLOGY

IN

COMPUTER SCIENCE AND ENGINEERING

FROM 2009 ADMISSION ONWARDS

CALICUT UNIVERSITY (P.O), THENHIPALAM
## Scheme of Studies and Examination for B. Tech Degree Course
### 2009 Admission

**Computer Science and Engineering**

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>D/P</th>
<th>Internal</th>
<th>Semester-end duration-hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN09 101</td>
<td>Engineering Mathematics I</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 102</td>
<td>Engineering Mathematics II</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 103</td>
<td>Engineering Physics</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 103(P)</td>
<td>Physics Lab</td>
<td>1</td>
<td></td>
<td></td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>EN09 104</td>
<td>Engineering Chemistry</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 104(P)</td>
<td>Chemistry lab</td>
<td>1</td>
<td></td>
<td></td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>EN09 105</td>
<td>Engineering Mechanics</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 106</td>
<td>Basics of Civil and Mechanical Engineering</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 107</td>
<td>Basics of Electrical, Electronics and Communication Engineering</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 108</td>
<td>Engineering Graphics</td>
<td>3</td>
<td></td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 109(P)</td>
<td>Computer Programming in C</td>
<td>1</td>
<td>1</td>
<td></td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>EN09 110A(P)</td>
<td>Mechanical Workshop</td>
<td>2</td>
<td></td>
<td></td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>EN09 110B(P)</td>
<td>Electrical and Civil Workshops</td>
<td>2</td>
<td>1</td>
<td></td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>5</td>
<td>10</td>
<td></td>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>

### Semester III

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>L</th>
<th>T</th>
<th>D/P</th>
<th>Internal</th>
<th>Semester-end duration-hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EN09 301</td>
<td>Engineering Mathematics III</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>CS09 302</td>
<td>Data structures</td>
<td>4</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>CS09 303</td>
<td>Discrete Computational Structures</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>EN09 304</td>
<td>Humanities and Communication Skills</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>CS09 305</td>
<td>Electronic Circuits</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>CS09 306</td>
<td>Switching Theory and Logic Design</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
<td>70</td>
<td>3</td>
</tr>
<tr>
<td>CS09 307(P)</td>
<td>Electronic Circuits Lab</td>
<td>3</td>
<td></td>
<td></td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>CS09 308(P)</td>
<td>Programming Lab</td>
<td>3</td>
<td></td>
<td></td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>18</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>
### Semester IV

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Marks</th>
<th>Semester- end duration-hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>D/P</td>
<td>Internal</td>
</tr>
<tr>
<td>EN09 401B</td>
<td>Engineering Mathematics IV</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>EN09 402</td>
<td>Environmental Studies</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 403</td>
<td>Computer Organization and Design</td>
<td>4</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 404</td>
<td>Programming paradigms</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 405</td>
<td>Systems Programming</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 406</td>
<td>Microprocessor Based design</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 407(P)</td>
<td>Data Structures Lab</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>CS09 408(P)</td>
<td>Digital Systems Lab</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
<td><strong>6</strong></td>
<td><strong>6</strong></td>
<td><strong>28</strong></td>
<td></td>
</tr>
</tbody>
</table>

### Semester V

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Marks</th>
<th>Semester- end duration-hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>D/P</td>
<td>Internal</td>
</tr>
<tr>
<td>CS09 501</td>
<td>Software Architecture and Project Management</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 502</td>
<td>Industrial Economics and Principles of Management</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 503</td>
<td>Signal Processing</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 504</td>
<td>Operating Systems</td>
<td>4</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 505</td>
<td>Digital Data Communication</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 506</td>
<td>Theory of Computation</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 507(P)</td>
<td>Programming Paradigm Lab</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td>CS09 508(P)</td>
<td>Hardware Lab</td>
<td>3</td>
<td>50</td>
<td>50</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
<td><strong>6</strong></td>
<td><strong>6</strong></td>
<td><strong>28</strong></td>
<td></td>
</tr>
<tr>
<td>Code</td>
<td>Subject</td>
<td>Hours / Week</td>
<td>Marks</td>
<td>Semester-end duration-hours</td>
<td>Credits</td>
</tr>
<tr>
<td>----------</td>
<td>----------------------------------------------</td>
<td>--------------</td>
<td>-------</td>
<td>-----------------------------</td>
<td>---------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>D/P</td>
<td>Internal</td>
</tr>
<tr>
<td>CS09 601</td>
<td>Embedded Systems</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 602</td>
<td>Compiler Design</td>
<td>4</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 603</td>
<td>Computer Networks</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 604</td>
<td>Database Management Systems</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 605</td>
<td>Computer Graphics</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 606</td>
<td>Elective I</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 607(P)</td>
<td>Systems Lab</td>
<td>3</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>CS09 608(P)</td>
<td>Mini Project</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

Total Marks

<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Marks</th>
<th>Semester-end duration-hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>D/P</td>
<td>Internal</td>
</tr>
<tr>
<td>CS09 701</td>
<td>Wireless Networks and Mobile Communication Systems</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 702</td>
<td>Design and Analysis of Algorithms</td>
<td>4</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 703</td>
<td>Internet Technology</td>
<td>2</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 704</td>
<td>Cryptography and Network Security</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 705</td>
<td>Elective II</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 706</td>
<td>Elective III</td>
<td>3</td>
<td>1</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>CS09 707(P)</td>
<td>Compiler Lab</td>
<td>3</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>CS09 708(P)</td>
<td>Network Programming Lab</td>
<td>3</td>
<td></td>
<td></td>
<td>50</td>
</tr>
<tr>
<td>CS09 709(P)</td>
<td>Project</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>17</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
</tbody>
</table>

Total Marks
<table>
<thead>
<tr>
<th>Code</th>
<th>Subject</th>
<th>Hours / Week</th>
<th>Marks</th>
<th>Semester-end duration-hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS09 801</td>
<td>Computer Architecture and Parallel Processing</td>
<td>4 1 30 70 3 5</td>
<td></td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>CS09 802</td>
<td>Data mining and Warehousing</td>
<td>2 1 30 70 3 3</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>CS09 803</td>
<td>Elective IV</td>
<td>3 1 30 70 3 4</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>CS09 804</td>
<td>Elective V</td>
<td>3 1 30 70 3 4</td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>CS09 805(P)</td>
<td>Project</td>
<td>11</td>
<td></td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>CS09 806(P)</td>
<td>Seminar</td>
<td>3</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>CS09 807(P)</td>
<td>Viva – Voce</td>
<td>3</td>
<td></td>
<td></td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>12 4 14</td>
<td></td>
<td></td>
<td>28</td>
</tr>
</tbody>
</table>

**Total Marks**

<table>
<thead>
<tr>
<th>Code</th>
<th>Elective I</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS09 L01</td>
<td>Information Security</td>
</tr>
<tr>
<td>CS09 L02</td>
<td>Computational Intelligence</td>
</tr>
<tr>
<td>CS09 L03</td>
<td>Queueing Theory</td>
</tr>
<tr>
<td>CS09 L04</td>
<td>Object Oriented Modeling and Design</td>
</tr>
<tr>
<td>CS09 L05</td>
<td>Management Information Systems</td>
</tr>
<tr>
<td><strong>Electives for 7th and 8th semester</strong></td>
<td></td>
</tr>
<tr>
<td>CS09 L06</td>
<td>Artificial Neural Networks</td>
</tr>
<tr>
<td>CS09 L07</td>
<td>Distributed Systems</td>
</tr>
<tr>
<td>CS09 L08</td>
<td>Fuzzy Logic and Applications</td>
</tr>
<tr>
<td>CS09 L09</td>
<td>Speech and Language Processing</td>
</tr>
<tr>
<td>CS09 L10</td>
<td>Advanced Topics in Operating Systems</td>
</tr>
<tr>
<td>CS09 L11</td>
<td>Advanced Database Design</td>
</tr>
<tr>
<td>CS09 L12</td>
<td>Digital Image Processing</td>
</tr>
<tr>
<td>CS09 L13</td>
<td>VLSI Design</td>
</tr>
<tr>
<td>CS09 L14</td>
<td>Information Theory and Coding</td>
</tr>
<tr>
<td>CS09 L15</td>
<td>Multimedia</td>
</tr>
<tr>
<td>CS09 L16</td>
<td>Web Programming</td>
</tr>
<tr>
<td>CS09 L17</td>
<td>Graph Theory and Combinatorics</td>
</tr>
<tr>
<td>CS09 L18</td>
<td>Machine Learning</td>
</tr>
<tr>
<td>CS09 L19</td>
<td>Soft Computing</td>
</tr>
<tr>
<td>Course Code</td>
<td>Course Name</td>
</tr>
<tr>
<td>------------</td>
<td>-------------------------------------------------</td>
</tr>
<tr>
<td>CS09 L20</td>
<td>Information Retrieval</td>
</tr>
<tr>
<td>CS09 L21</td>
<td>Digital Design Using VHDL</td>
</tr>
<tr>
<td>CS09 L22</td>
<td>Computational Geometry</td>
</tr>
<tr>
<td>CS09 L23</td>
<td>Simulation and Modeling (Global Elective 1 from CSE)</td>
</tr>
<tr>
<td>CS09 L24</td>
<td>Computer Based Numerical Methods (Global Elective 2 from CSE)</td>
</tr>
<tr>
<td>CS09 L25</td>
<td>Pattern Recognition (Global Elective 3 from CSE)</td>
</tr>
<tr>
<td></td>
<td><strong>Global Electives from other departments</strong></td>
</tr>
<tr>
<td>EE09 L23</td>
<td>Process Control and Instrumentation</td>
</tr>
<tr>
<td>EE09 L25</td>
<td>Robotics &amp; Automation</td>
</tr>
<tr>
<td>ME09 L24</td>
<td>Marketing Management</td>
</tr>
<tr>
<td>AN09 L24</td>
<td>Project Management</td>
</tr>
<tr>
<td>EC09 L25</td>
<td>Biomedical Instrumentation</td>
</tr>
<tr>
<td>IC09 L23</td>
<td>Bio-Informatics</td>
</tr>
<tr>
<td>PE09 L23</td>
<td>Total Quality Management</td>
</tr>
<tr>
<td>CE09 L24</td>
<td>Remote Sensing and GIS</td>
</tr>
<tr>
<td>CE09 L25</td>
<td>Finite Element Methods</td>
</tr>
<tr>
<td>BT09 L24</td>
<td>Bio-ethics and Intellectual Property Rights</td>
</tr>
</tbody>
</table>
EN09 301: Engineering Mathematics III  
(Common for all branches)

**Teaching scheme**
3 hours lecture and 1 hour tutorial per week

**Credits:** 4

**Objectives**

- This course provides a quick overview of the concepts and results in complex analysis that may be useful in engineering.
- Also it gives an introduction to linear algebra and Fourier transform which has good wealth of ideas and results with wide area of application.

**Module I: Functions of a Complex Variable (13 hours)**
Functions of a Complex Variable – Limit – Continuity – Derivative of a Complex function – Analytic functions – Cauchy-Riemann Equations – Laplace equation – Harmonic Functions – Conformal Mapping – Examples: \(z^n\), \(\sin z\), \(\cos z\), \(\sinh z\), \(\cosh z\), \((z+1)/z\) – Mobius Transformation.

**Module II: Functions of a Complex Variable (14 hours)**

**Module III: Linear Algebra (13 hours)**
- Proofs not required

**Module IV: Fourier Transforms (14 hours)**

**Text Books**

**Module I:**
Sections: 12.3, 12.4, 12.5, 12.6, 12.7, 12.9

**Module II:**
Sections: 13.1, 13.2, 13.3, 13.4, 14.4, 15.1, 15.2, 15.3, 15.4

**Module III:**
Sections: 6.1, 6.2, 6.3, 6.4, 6.7, 6.8, Appendix.B.1

**Module IV:**
Sections: 9.1, 9.3, 9.5
**Reference books**


**Internal Continuous Assessment (Maximum Marks-30)**

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>Tests (minimum 2)</td>
</tr>
<tr>
<td>30%</td>
<td>Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.</td>
</tr>
<tr>
<td>10%</td>
<td>Regularity in the class</td>
</tr>
</tbody>
</table>

**University Examination Pattern**

**PART A:** *Short answer questions (one/two sentences)*

5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** *Analytical/Problem solving questions*

4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** *Descriptive/Analytical/Problem solving questions*

4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
CS09 302 : Data Structures

Teaching scheme
4 hours lecture and 1 hour tutorial per week

Credits: 5

Objectives

• To impart the basic concepts of continuous data structures
• To develop understanding about fundamental searching and sorting techniques..

Module I (11 hours)

Module II (18 hours)

Module III (18 hours)
Non Linear Structures - Graphs - Trees - Graph and Tree implementation using array and Linked List - Binary trees - Binary tree traversals - pre-order, in-order and postorder - Threaded binary trees - Binary Search trees - AVL trees - B trees and B+ trees - Graph traversals - DFS, BFS - shortest path - Dijkstra’s algorithm, Minimum spanning tree - Kruskal Algorithm, Prims algorithm

Module IV (18 hours)

Text Books

Reference Books
2. Wirth N, Algorithms + Data Structures = Programs, Prentice Hall.

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
# University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objectives

This course provides the mathematical foundations required in any stream of study in Computing. The material covered is essential for most of the subsequent semesters for a sound understanding of the various algorithms and methods. At the end of the course, the student is expected to be familiar with the essential proof techniques, logic and useful mathematical objects.

Module I (13 hours)

Module II (13 hours)

Module III (13 hours)

Module IV (13 hours)
Recurrence Relations - Introduction, Linear recurrence relations with constant coefficients - Homogeneous solutions - Particular solutions - Total solutions Generating Function - solutions of recurrence relations by the method of generating functions.

Text Books

Reference Books
**Internal Continuous Assessment** *(Maximum Marks: 30)*

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

**University Examination Pattern**

**PART A:**  *Short answer questions (one/two sentences)*

5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:**  *Analytical/Problem solving questions*

4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:**  *Descriptive/Analytical/Problem solving questions*

4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
EN09 304: Humanities and Communication Skills  
(Common for all branches)

**Objectives**

- To identify the most critical issues that confronted particular periods and locations in history
- To identify stages in the development of science and technology
- To understand the purpose and process of communication
- To produce documents reflecting different types of communication such as technical descriptions, proposals, and reports
- To develop a positive attitude and self-confidence in the workplace and
- To develop appropriate social and business ethics

**Module I (14 hours)**

Humanities, Science and Technology: Importance of humanities to technology, education and society- Impact of science and technology on the development of modern civilization.- Contributions of ancient civilizations: Chinese, Indian, Egyptian and Greek. -Cultural, Industrial, Transportation and Communication revolutions.

Advances in modern India: Achievements in information, communication and space technologies.

**Module II (16 hours)**

Concept of communication: The speaker/writer and the listener/reader, medium of communication, barriers to communication, accuracy, brevity, clarity and appropriateness

Reading comprehension: Reading at various speeds, different kinds of text for different purposes, reading between lines.

Listening comprehension: Comprehending material delivered at fast speed and spoken material, intelligent listening in interviews

Speaking: Achieving desired clarity and fluency, manipulating paralinguistic features of speaking, task oriented, interpersonal, informal and semi formal speaking, making a short classroom presentation.

Group discussion: Use of persuasive strategies, being polite and firm, handling questions and taking in criticisms on self, turn-taking strategies and effective intervention, use of body language.

**Module III (16 hours)**

Written Communication: Note making and taking, summarizing, notes and memos, developing notes into text, organization of ideas, cohesion and coherence, paragraph writing, ordering information in space and time, description and argument, comparison and contrast, narrating events chronologically. Writing a rough draft, editing, proof reading, final draft and styling text.


Project report: Reference work, General objective, specific objective, introduction, body, illustrations using graphs, tables, charts, diagrams and flow charts. Conclusion and references

Preparation of leaflets, brochure and C.V.

**Module IV (14 hours)**

Human relations and Professional ethics: Art of dealing with people, empathy and sympathy, hearing and listening. Tension and stress, Methods to handle stress

Responsibilities and rights of engineers- collegiality and loyalty – Respect for authority – Confidentiality – conflicts of interest – Professional rights, Rights of information, Social responsibility.

Senses of ethics – variety of moral issues – Moral dilemma – Moral autonomy – Attributes of an ethical personality – right action – self interest

**Teaching scheme**

2 hours lecture and 1 hour tutorial per week

**Credits:** 3
Reference Books
3. Subrayappa, *History of Science in India*, National Academy of Science, India
11. Encyclopedia Britannica, *History of Science, History of Technology*

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  \[5 \times 2 \text{ marks} = 10 \text{ marks}\]
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  \[4 \times 5 \text{ marks} = 20 \text{ marks}\]
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  \[4 \times 10 \text{ marks} = 40 \text{ marks}\]
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
CS09 305: Electronic Circuits

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To introduce the concepts and working principles of electronic circuits essential for the computing field.

Module I (14 hours)
Diode switch, clipping and clamping circuits – Types of Diodes - light emitting diodes - photo diode - opto coupler - laser diode - the schottky diode - varactor diodes - varistors - current-regulator diodes - step recovery diodes - back diodes - tunnel diodes - pin diodes – Transistors - Transistor switch and amplifier circuits – Bistable multivibrator - Schmitt trigger - Monostable and astable multivibrator

Module II (15 hours)

Module III (10 hours)
Logic levels - Concepts of SSI, MSI, LSI and VLSI - Logic families: NOT gate, TTL, ECL, CMOS logic - Interfacing - Comparison of logic families - TTL and, MOS flip-flops.

Module IV (13 hours)
Memories: Basic concepts - Read only memories - Programmable ROMs - Static and dynamic random access memories - Memory expansion - Magnetic bubble memories - Magnetic surface storage devices - CD-ROMs - Special memories -1 Sample and hold circuit - D/A converters - A/D converters - Timing circuits.

Text Books

Reference Books
2. Floyd T.L., *Digital Fundamentals*, Universal Book Stall

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
### University Examination Pattern

**PART A: Short answer questions (one/two sentences)**

5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B: Analytical/Problem solving questions**

4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C: Descriptive/Analytical/Problem solving questions**

4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objectives

- To introduce the principles, features and properties of digital devices and circuits. This provides the basic concepts of computations and logic designs of Arithmetic Logic Unit (ALU) of a Computer.

Module I (13 hours)
Number Systems and codes - Boolean algebra - Postulates and theorems - Constants, variables and functions - Switching algebra - Electronic gates and mechanical contacts Boolean functions and logical operations - Normal and canonical forms - Self-dual functions - Logical operations - Karnaugh map - prime cubes - Minimum sum of products and product of sums - Quine-McClusky algorithm.

Module II (13 hours)
Combinational Logic - Analysis and design of combinational logic circuits - Universal property of the NAND and NOR gates - Adders - Parallel adders and look-ahead adders - Comparators - Decoders and encoders - Code conversion - Multiplexers and demultiplexers - Parity generators and checkers - ROMs, PLAs.

Module III (13 hours)

Module IV (13 hours)
Counters and shift registers - SR, JK, D and T flip-flops - Excitation tables - Triggering of flipflops - Flip-flop applications - Latches - Ripple counters - Synchronous counters - Up-down counters - Design of sequential circuits - Counter decoding - Counter applications - Shift registers and their applications - Clock mode sequential machine - State tables and diagrams.

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Text Books

Reference Books
**Internal Continuous Assessment (Maximum Marks-30)**

- 60% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- 10% - Regularity in the class

<table>
<thead>
<tr>
<th>University Examination Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART A:</strong> Short answer questions (one/two sentences) 5 x 2 marks=10 marks</td>
</tr>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
<tr>
<td><strong>PART B:</strong> Analytical/Problem solving questions 4 x 5 marks=20 marks</td>
</tr>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
<tr>
<td><strong>PART C:</strong> Descriptive/Analytical/Problem solving questions 4 x 10 marks=40 marks</td>
</tr>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
</tr>
</tbody>
</table>

**Maximum Total Marks: 70**
Objective

- To give a hands on experience to students in the static and dynamic characteristics of the electronics components and systems.

1. Silicon, germanium and zener diode characteristics
2. Characteristics of UJT and UJT relaxation oscillator
3. Static transistor characteristics in CE and CB configurations
4. Clipping, clamping, differentiating and integrating circuits
5. Series voltage regulator
6. Frequency response of CE amplifier with and without feedback
7. Emitter follower: measurement of input and output impedance
8. RC phase shift oscillator
9. Op amp: inverting and non-inverting amplifier, voltage follower

Reference Books

2. Bhargava et al., Basic Electronic Circuits and Linear Circuits, Tata McGraw Hill

Internal Continuous Assessment (Maximum Marks-50)

- 60% - Laboratory practical and record
- 30% - Test/s
- 10% - Regularity in the class

Semester End Examination (Maximum Marks-50)

- 70% - Procedure, conducting experiment, results, tabulation, and inference
- 20% - Viva voce
- 10% - Fair record
Objectives

- To give a strong foundation for developing the art of programming to the students of computing streams. For adequacy this has to be complemented by exercises appearing in the references.

Set 1 (3 lab sessions)
HCF (Euclid's algorithm) and LCM of given numbers - Find mean, median and mode of a given set of numbers - Conversion of numbers from binary to decimal, hexadecimal, octal and back - Evaluation of functions like $e^x$, $\sin(x)$ and $\cos(x)$ for a given numerical precision using Taylor's series - Testing whether a given number is prime.

Set 2 (2 lab sessions)
String manipulation programs: sub-string search, deletion - Lexicographic sorting of a given set of strings - Generation of all permutations of the letters of a given string using recursion.

Set 3 (2 lab sessions)
Matrix operations: Programs to find the product of two matrices - Inverse and determinant (using recursion) of a given matrix - Solution to simultaneous linear equations using Jordan elimination.

Set 4 (3 lab sessions)
Files: Use of files for storing records with provision for insertion - Deletion, search, sort and update of a record.

Reference Books


Internal Continuous Assessment (Maximum Marks-50)
60% - Laboratory practical and record
30% - Test/s
10% - Regularity in the class

Semester End Examination (Maximum Marks-50)
70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record
EN09 401B: Engineering Mathematics IV
(Common for IC, EC, EE, AI, BM, CS, and IT)

Objectives

- To inculcate the students an adequate understanding of the basic concepts of probability theory to make them develop an interest in the area which may find useful to pursue their studies.
- To stimulate the students understanding of the Z-transform. A study of some important partial differential equations is also included to make the student get acquainted with the basics of PDE.

Module I – Probability Distributions - (13 hours)

Module II – Z transforms - (14 hours)

Module III - Series solutions of differential equations - (14 hours)

Module IV - Partial Differential Equations - (13 hours)
Introduction – Solutions of equations of the form \( F(p,q) = 0 \); \( F(x,p,q) = 0 \); \( F(y,p,q) = 0 \); \( F(z,p,q) = 0 \); \( F_1(x,q) = F_2(y,q) \); Clairaut’s form, \( z = px + qv + F(p,q) \); Legrange’s form, \( Pp + Qq = R \) – Classification of Linear PDE’s – Derivation of one dimensional wave equation and one dimensional heat equation – Solution of these equation by the method of separation of variables – D’Alembert’s solution of one dimensional wave equation.
Text Books

Module I:
Richard A Johnson, CB Gupta, *Miller and Freund's Probability and statistics for Engineers, 7e*, Pearson Education - Sections: 4.1, 4.2, 4.3, 4.4, 4.6, 4.8, 5.1, 5.2, 5.5, 5.7

Module II:
P Ramesh Babu, R Ananda Natarajan, *Signals and Systems, 2e*, Scitech Publications. Sections: 10.1, 10.2, 10.3, 10.4, 10.5.1, 10.5.2, 10.5.3, 10.5.4, 10.5.5, 10.5.6, 10.5.7, 10.5.8, 10.5.12, 10.5.13, 10.6, 10.10

Module III:

Module IV:

Reference books
Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: Short answer questions (one/two sentences) 5 x 2 marks=10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: Analytical/Problem solving questions 4 x 5 marks=20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: Descriptive/Analytical/Problem solving questions 4 x 10 marks=40 marks
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
EN09 402 : Environmental Studies

Objectives

- To understand the problems of pollution, loss of forest, solid waste disposal, degradation of environment, loss of biodiversity and other environmental issues and create awareness among the students to address these issues and conserve the environment in a better way.

Module I (8 hours)
The Multidisciplinary nature of environmental science, Definition-scope and importance-need for public awareness. Natural resources, Renewable and non-renewable resources:
Natural resources and associated problems-forest resources: Use and over exploitation, deforestation, case studies. Timber extraction, mining, dams and their defects on forests and tribal people.- water resources : Use and over utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems - Mineral resources: Use and exploitation,environmental effects of extracting and using mineral resources, case studies - Food resources: World food problems, changes caused by agriculture over grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging,salinity,case studies -Energy resources: Growing energy needs, renewable and non-renewable energy resources, use of alternate energy resources, Land resources: Land as a resource, land degradation, man induced land slides, soil erosion and desertification.

Module II (8 hours)
Ecosystems-Concept of an ecosystem-structure and function of an ecosystem – producers, consumers, decomposers-energy flow in the ecosystem-Ecological succession- Food chains, food webs and Ecological pyramids-Introduction, types, characteristics features, structure and function of the following ecosystem- Forest ecosystem- Grassland ecosystem –Desert ecosystem-Aquatic ecosystem(ponds, streams, lakes, rivers, oceans , estuaries)
Biodiversity and its consideration
Introduction- Definition: genetic , species and ecosystem diversity-Biogeographical; classification of India – value of biodiversity: consumptive use, productive use, social ethical , aesthetic and option values Biodiversity at Global, national , and local level-India at mega –diversity nation- Hot spot of biodiversity- Threats to biodiversity: habitat loss, poaching of wild life, man , wild life conflicts –Endangered and endemic species of India-Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Module III (10 hours)
Environmental pollution
Definition-Causes, effects and control measures of Air pollution-m Water pollution –soil pollution-Marine pollution-Noise pollution-Thermal pollution-Nuclear hazards-Solid waste management: Causes, effects and control measures of urban and industrial wastes-Role of an individual in prevention of pollution-pollution case studies-Disaster management: floods, earth quake, cyclone and landslides-Environmental impact assessment

Module IV (10 hours)
Environment and sustainable development-Sustainable use of natural resources-Conversion of renewable energy resources into other forms-case studies-Problems related to energy and Energy auditing-Water conservation, rain water harvesting, water shed management-case studies-Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust-Waste land reclamation-Consumerism and waste products-Reduce, reuse and recycling of products-Value education.
**Text Books**


**Reference Books**

4. *Down to Earth*, Centre for Science and Environment
5. Hawkins, R.E. *Encyclopedia of Indian Natural History*, Bombay Natural History Society, Bombay

**Internal Continuous Assessment (Maximum Marks-30)**

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

**University Examination Pattern**

**PART A:** *Short answer questions (one/two sentences)*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

5 x 2 marks = 10 marks

**PART B:** *Analytical/Problem solving questions*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

4 x 5 marks = 20 marks

**PART C:** *Descriptive/Analytical/Problem solving questions*

Two questions from each module with choice to answer one question.

4 x 10 marks = 40 marks

*Maximum Total Marks: 70*
CS09 403: Computer Organization and Design

Teaching scheme
4 hours lecture and 1 hour tutorial per week

Credits: 5

Objectives
- To lay the foundation for the study of hardware organization of digital computers. It brings out the interplay between various building blocks of computers, without being specific to any particular computer. At the end of the course, the student is expected to gain a fair idea about the functional aspects of each building block in computer design, in the general sense.

Module I (17 hours)
Computer abstraction and technology: Below your program - Under the covers - Historical perspective - Measuring performance - Relating the metrics - evaluating, comparing and summarizing performance - Case study: SPEC95 benchmark - Instructions - Operations and operands of the computer hardware - Representing instructions - Making decision - Supporting procedures - Beyond numbers - Other styles of addressing - Starting a program - Case study: 80x86 instructions.

Module II (15 hours)
Computer arithmetic - Signed and unsigned numbers - Addition and subtraction - Logical operations - Constructing an ALU - Multiplication and division - Floating point - Case study: floating point in 80x86

Module III (16 hours)

Module IV (17 hours)
Memory hierarchy - Caches - Cache performance - Virtual memory - Common framework for memory hierarchies - Case study - Pentium Pro memory hierarchy - input/output - I/O performance measures - Types and characteristics of I/O devices - Buses - Interfaces in I/O devices - Design of an I/O system

Text Books

Reference Books

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
# University Examination Pattern

<table>
<thead>
<tr>
<th>PART A: Short answer questions (one/two sentences)</th>
<th>5 x 2 marks=10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART B: Analytical/Problem solving questions</th>
<th>4 x 5 marks=20 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART C: Descriptive/Analytical/Problem solving questions</th>
<th>4 x 10 marks=40 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
<td></td>
</tr>
</tbody>
</table>

*Maximum Total Marks: 70*
Objectives

To introduce the different models of programming and the various constructs and their implementation to support on a bare machine.

Module I (15 hours)
Role of programming languages - high level languages - programming paradigms - language implementation on a machine - language Syntax description - notation for expressions, abstract syntax trees, lexical syntax, context free grammars, variants of grammars - Language Semantic description - introduction to synthesized attributes, attributed grammar, natural semantics, de-notational semantics

Imperative programming: Introduction - structured programming - constructs for structured control flow - syntactic concerns - handling special cases in loops - discussion based on C. Role of types: Basic types - compound types like arrays, records, union and variant records, sets - pointers and dynamic allocation - Types and error checking - discussion based on C. Introduction to procedures: parameter passing methods - scope rules - nested scopes - implementation - discussion based on C.

Module II (14 hours)
Object oriented programming: Introduction - grouping of data and operations - constructs for program structuring - information hiding - program design with modules - modules and defined types - illustration based on C++ on class declaration, dynamic allocation, templates, objects. Definition of object - object oriented thinking - Inheritance - derived classes and information hiding- illustration based on C++.

Module III (12 hours)
Functional Programming: Elements of Functional programming - Types: values and operations - Functional declaration- approaches to expression evaluation- lexical scopes - type checking. Functional programming with lists - introduction to scheme - structures of lists - list manipulation - simplification of expressions - storage allocation for lists.

Module IV (11 hours)

Text Books

Reference Books
5. Scott M.I.; *Programming Language Pragmatics*; Harcourt Asia(Morgan Kaufman).
6. Clocksin W F, Mellish C S; *Programming in PROLOG*. 
<table>
<thead>
<tr>
<th>Internal Continuous Assessment (Maximum Marks-30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>60% - Tests (minimum 2)</td>
</tr>
<tr>
<td>30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.</td>
</tr>
<tr>
<td>10% - Regularity in the class</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>University Examination Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>PART A: Short answer questions (one/two sentences) 5 x 2 marks=10 marks</td>
</tr>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
</tbody>
</table>

| PART B: Analytical/Problem solving questions 4 x 5 marks=20 marks |
| Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module. |

| PART C: Descriptive/Analytical/Problem solving questions 4 x 10 marks=40 marks |
| Two questions from each module with choice to answer one question. |

Maximum Total Marks: 70
CS09 405: Systems Programming

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To familiarize the students with the essentials of system software design. System software consists of programs necessary to make the hardware function properly.
- To equip the student with the right kind of tools for computer systems design and development.

Module I (15 hours)
Background - system software machine architecture - the simplified instructional computer - traditional machines - RISC machines - assemblers - basic assembler functions - machine dependent and machine independent - assembler features - assembler design - assembler design options - implementation examples - AIX Assembler.

Module II (13 hours)
Loaders and linkers - basic loader functions - machine dependent and machine independent loader features - loader design options and implementation examples - macro processors - basic macro processor functions - machine-independent macro processor features - macro processor design options and implementation examples.

Module III (14 hours)
Introduction to operating systems - basic principles - batch processing - multiprogramming - timesharing systems and real-time systems - parallel and distributed systems - computer system structure - computer system operation - I/O structure - structure - storage hierarchy - hardware protection - general system architecture - operating system structure - system components - OS services - system calls - system structure - virtual machines.

Module IV (10 hours)
General overview of the UNIX operating system - history of UNIX - system structure - user perspective - services - hardware assumptions - unix architecture - system concepts - kernel data structures - system administration process (concepts only)

Text Books
2. Bach M. J., The Design of the Unix Operating System, Prentice Hall India

Reference Books
**Internal Continuous Assessment (Maximum Marks-30)**

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

---

**University Examination Pattern**

**PART A:** Short answer questions (one/two sentences) \[5 \times 2 \text{ marks} = 10 \text{ marks}\]

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions \[4 \times 5 \text{ marks} = 20 \text{ marks}\]

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions \[4 \times 10 \text{ marks} = 40 \text{ marks}\]

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objectives

- To familiarize the student with the internals of a microprocessor with a wide range of processing capabilities.
- Also to give a fair idea of various interfacing methods and devices, along with a detailed treatment of important design issues.

Module I (12 hours)

Historical background of microprocessors - Inside the PC: Motherboard - Graphic adapters and monitors - Drive controllers - Floppy and hard disk drives - Streamers and other drives - Parallel interfaces and printers - Serial interfaces and modems - Network adapters and LANs - CMOS RAM and real clock - Keyboard, mouse and other rodents - The power supply - Operating system - BIOS and memory organization - 8086/8088 Hardware specification: Clock generator - Bus. buffering and latching - bus timing - Ready and wait states - Minimum and maximum modes - Advanced processors - Features of 80386, 80486 and Pentium processors.

Module II (13 hours)

Microprocessor architecture: Real mode and protected mode memory addressing - Memory paging - Addressing modes - Data addressing - Program memory addressing - Stack memory addressing - Data movement instructions - Arithmetic and logic instructions - Program control instructions - Programming the microprocessor: modular programming - Using keyboard and display - Data conversions - disk files - interrupt hooks.

Module III (12 hours)

Memory interface: Memory devices - Address decoding, 8 bit (8088), 16 bit (8086), 32 bit (80486) and 64 bit (Pentium) memory interfaces - Dynamic RAM. I/O interface - Port address decoding - PPI, 8279 interface - 8254 timer interface - 16550 UART interface - ADC/DAC interfaces.

Module IV (15 hours)


Text Books


Reference Books

### Internal Continuous Assessment *(Maximum Marks-30)*

- **60%** - Tests (minimum 2)  
- **30%** - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.  
- **10%** - Regularity in the class

### University Examination Pattern

<table>
<thead>
<tr>
<th>PART A: Short answer questions (one/two sentences)</th>
<th>5 x 2 marks = 10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART B: Analytical/Problem solving questions</th>
<th>4 x 5 marks = 20 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART C: Descriptive/Analytical/Problem solving questions</th>
<th>4 x 10 marks = 40 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
<td></td>
</tr>
</tbody>
</table>

*Maximum Total Marks: 70*
Objectives

- To give hands on experience in viewing data as the central resource in computing process and to visualize the importance of structuring data.
- To demonstrate the impact of organizing data on the efficiency of algorithms that process the data, including static and dynamic data structures as well as linear and nonlinear data structures.

1. Stack and Queue: Implementation using arrays and Linked lists
2. Searching Methods: Binary search and Hashing
3. Sorting: Recursive implementation of Quick Sort and Merge Sort
4. Binary Search Tree. Implementation with insertion, deletion and traversal
5. Infix Expression Evaluation: Using expression tree
6. Graph Search Algorithms: DFS and BFS on A connected directed graph
7. Minimal Spanning Tree. Implementation of Kruskal's and Prim's Algorithms
8. Shortest Path Algorithm. Dijkstra and Floyd Warshall Algorithm
9. Disjoint Set operations: Union and Find using rank and path compression
10. Applications of Heap: Priority Queue and Heap Sort.

Reference Books

Internal Continuous Assessment (Maximum Marks-50)
60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination (Maximum Marks-50)
70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record
Objectives

• To give a hands on experience on digital electronics components and systems; which are fundamental building blocks of the Computer systems.
• To deal extensively with the characteristic and features of indispensable digital electronic circuits and systems through structured experiments.

1. Verification of truth tables of AND, OR, NOT, NAND, NOR and XOR gates, used for gating digital signals.
2. TIL characteristics
3. Verification of the postulates of Boolean algebra and DeMorgan’s theorem using logic gates.
4. Half and full adders, half and full subtractors.
5. Digital comparator, parity generator and checker, and code converter
6. Characteristics and operations of RS, gated RS, D, T, and JK master slave flipflops
7. Multiplexer and demultiplexer using gates
8. Shift register, ring counter, and twisted ring counter.
9. Decade counter and variable modulo asynchronous counter
10. Astable multivibrator and schmitt trigger using gates, astable and monostable multivibrator and frequency divider using 555.

Reference Books
1. C Nagarath J., Electronics Analog & Digital, Prentice Hall India

Internal Continuous Assessment (Maximum Marks-50)
60% - Laboratory practical and record
30% - Test/s
10% - Regularity in the class

Semester End Examination (Maximum Marks-50)
70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record
CS09 501: Software Architecture and Project Management

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To impart the basic concepts of software architecture and design patterns.
- To develop an understanding about development of complex software systems in a methodical manner.

Module I (13 hours)

Module II (11 hours)
Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns, Literate Modeling, Archetype Pattern, Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype Pattern. Design Patterns, Creational Patterns, Patterns for Organization of Work, Access Control Patterns, Service Variation Patterns, Service Extension Patterns.

Module III (13 hours)
Object Management Patterns Adaptation Patterns, Communication Patterns, Architectural Patterns, Structural Patterns, Patterns for Distribution, Patterns for Interactive Systems Adaptable Systems, Frameworks and Patterns, Analysis Patterns Patterns for Concurrent and Networked Objects, Patterns for Resource Management, Pattern Languages, Patterns for Distributed Computing.

Module IV (15 hours)
Defining EAI, Data-Level EAI, Application Interface-Level EAI, Method-Level EAI, User Interface-Level EAI, The EAI Process - An Introduction to EAI and Middleware, Transactional Middleware and EAI, RPCs, Messaging, and EAI, Distributed Objects and EAI, Database-Oriented Middleware and EAI, Java Middleware and EAI, Implementing and Integrating Packaged Applications—The General Idea, XML and EAI, Message Brokers—The Preferred EAI Engine, Process Automation and EAI, Layering, Organizing Domain Logic, Mapping to Relational Databases, Web Presentation, Domain Logic Patterns, Data Source Architectural Patterns, Object-Relational Behavioral Patterns, Object-Relational Structural Patterns, Object-Relational Metadata Mapping Patterns, Web Presentation Patterns, Distribution Patterns, Offline Concurrency Patterns.

Reference Books
4. Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Design Patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley Professional; 1st edition.
**Internal Continuous Assessment** *(Maximum Marks-30)*

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

---

**University Examination Pattern**

**PART A:** *Short answer questions (one/two sentences)*  
5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** *Analytical/Problem solving questions*  
4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** *Descriptive/Analytical/Problem solving questions*  
4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Section A: Industrial Economics

Objectives

- To provide knowledge on fundamentals of economics, forms of business organisations, trade and taxation.

Module I (14 hours)

Module II (13 hours)

Text Books
1. K.K. Dewitt, J.D. Varma, Elementary Economic Theory, S. Chand Publishers

Reference Books
1. G. Narendrababu, Elements of Economic Analysis
2. K. P. M. Sundaran, Money, Banking, Trade & Finance

Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
University Examination Pattern

<table>
<thead>
<tr>
<th>PART A: Short answer questions (one/two sentences)</th>
<th>2 x 2 marks = 4 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART B: Analytical/Problem solving questions</th>
<th>2 x 5 marks = 10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART C: Descriptive/Analytical/Problem solving questions</th>
<th>2 x 10 marks = 20 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Section A (Engineering Economics) and Section B (Principles of Management) should be written in separate answer sheets.

Section B : Principles of Management

**Objectives**

- To provide knowledge on principles of management, decision making techniques, accounting principles and basic management streams.

Module III (13 hours)

Principles of Management – Evolution of management theory and functions of management
Organizational structure – Principles and types.
Decision making – Strategic, tactical and operational decisions, decision making under certainty, risk and uncertainty and multistage decisions and decision tree. Human resource management – Basic concepts of job analysis, job evaluation, merit rating, wages, incentives, recruitment, training and industrial relations.

Module IV (14 hours)

Financial management – Time value of money and comparison of alternative methods.
Costing – Elements and components of cost, allocation of overheads, preparation of cost sheet – break even analysis
Marketing management – Basic concepts of marketing environment, marketing mix, advertising and sales promotion.
Project management – Phases, organization, planning, estimating, planning using PERT & CPM.
### Reference Books


### Internal Continuous Assessment (Maximum Marks-30)

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

### University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
2 x 2 marks = 4 marks  
1 x 1 mark = 1 mark

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
2 x 5 marks = 10 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
2 x 10 marks = 20 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 35*

**Note:** Section A (Engineering Economics) and Section B (Principles of Management) should be written in separate answer sheets.
CS09 503: Signal Processing

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To impart the basic concepts of continuous and discrete signals and systems
- To develop understanding about frequency domain approaches used for analysis of continuous and discrete time signals and systems.

Module I (14 hours)

Module II (12 hours)

Module III (12 hours)

Module IV (14 hours)
Text Books
2. Proakis J.G. & Manolakis D.G., *Digital signal processing, principles, algorithms & applications* – Pearson Education

Reference Books
1. Bandyopadhyay M N, *Introduction to Signals and Systems and DSP*, PHI

Internal Continuous Assessment *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

Note: One of the assignments shall be simulation of continuous systems using any technical computing software

University Examination Pattern

**PART A: Short answer questions (one/two sentences) 5 x 2 marks=10 marks**
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B: Analytical/Problem solving questions 4 x 5 marks=20 marks**
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C: Descriptive/Analytical/Problem solving questions 4 x 10 marks=40 marks**
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
CS09 504: Operating Systems

Teaching scheme
4 hours lecture and 1 hour tutorial per week

Credits: 5

Objectives

- To impart the knowledge on the need and requirement of an interface between Man and Machine; to enable the learners to identify the difference between the system software and the application software and their design requirements.
- To teach the features of operating systems and the fundamental theory associated with process, memory and file management components of operating systems.

Module I (16 hours)
Review of operating system strategies - resources - processes - threads - objects, operating system organization - design factors - functions and implementation considerations - devices - characteristics - controllers - drivers – device management - approaches - buffering - device drivers - typical scenarios such as serial communications - storage devices etc.

Module II (14 hours)

Module III (17 hours)
Memory management - issues - memory allocation - dynamic relocation various management strategies - virtual memory - paging - issues and algorithms segmentation - typical implementations of paging & segmentation systems.

Module IV (18 hours)
File management - files - implementations - storage abstractions - memory mapped files - directories and their implementation - protection and security - policy and mechanism - authentication - authorization - case study of Unix kernel and Microsoft windows NT (concepts only).

Text Books

Reference Books
1. Silberschatz & Galvin, Operating System Concepts, Addison Wesley
**Internal Continuous Assessment (Maximum Marks-30)**

- 60% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- 10% - Regularity in the class

---

**University Examination Pattern**

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
CS09 505: Digital Data Communication

Objectives

- To introduce the concepts of communication of digital data by looking at the various aspects of generation, transmission and reception.
- To introduce the various protocols involved in communication of digital content.

Module I (13 hours)

Module II (13 hours)

Module III (13 hours)

Module IV (13 hours)

Text Books

Reference Books
2. Fred Halsall, Data Communication, Computer Networks and Open Systems, Pearson Education.
3. Harold Kolimbris, Digital Communication Systems, Pearson Education

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
<table>
<thead>
<tr>
<th>University Examination Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART A:</strong> Short answer questions (one/two sentences) 5 x 2 marks = 10 marks</td>
</tr>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
<tr>
<td><strong>PART B:</strong> Analytical/Problem solving questions 4 x 5 marks = 20 marks</td>
</tr>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
<tr>
<td><strong>PART C:</strong> Descriptive/Analytical/Problem solving questions 4 x 10 marks = 40 marks</td>
</tr>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
</tr>
</tbody>
</table>

*Maximum Total Marks: 70*
Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To teach the fundamentals on computational models and computability.
- To introduce the introductory concepts of languages and their classification.
- To familiarize the students on recognizers and automata.
- To impart knowledge on classifying algorithms into the various computability classes and proofs of some standard algorithms.

Module I (13 hours)
Introduction to formal proof - Inductive proofs - Concepts of automata theory - Deterministic finite automata - Non-deterministic finite Automata - equivalence of deterministic and non-deterministic finite automata - Nondeterministic Finite Automata with a transitions - Regular expressions - Finite automata and regular expressions - Algebraic laws for Regular expressions - Pumping lemma for regular languages - Closure properties of regular languages - Decision properties of regular languages - Equivalence and minimization of automata.

Module II (13 hours)
Context free Grammars - Derivations - sentential forms - The language of grammar - Parse trees - Ambiguity in grammar and languages - Inherently ambiguous languages - Pushdown automata - Formal definition - Graphical notation - The language of a PDA - Acceptance by PDA - Empty stack - Final state - PDAs to grammars - Deterministic PDAs and CFLs - Non deterministic PDAs - Chomsky Normal Form - Greibach Normal Form - Pumping lemma for CFLs - Closure properties of CFLs - Decision properties of CFLs.

Module III (14 hours)
Turing Machines - Notation - Instantaneous Description - Transition Diagram - The language of a Turing Machine - Halting of TMs - Programming techniques for Turing Machines - Extension to basic TMs - Nondeterministic TMs - Restricted TMs - Recursive and Recursively Enumerable Languages - Halting problem of TMs - Undecidable problem about TMs - Rice's Theorem - Post Correspondence problem - Undecidability of Post Correspondence Problem - Undecidable problems on Languages.

Module IV (12 hours)

Text Books

Reference Books
# Internal Continuous Assessment (Maximum Marks-30)

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

---

## University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
Teaching scheme
3 hours practical per week

Credits: 2

Objectives
- To impart the working experience on paradigms of programming.
- To focus on teaching the paradigms not the platforms. However, adequate knowledge about platform is a need for successful experimentation.

Lab. 1: (object-oriented programming in - Java /C++ ) - programming to bring out the concept of classes and objects- for example the abstract data type binary tree.

Lab 2: (object-oriented programming) - programming to demonstrate inheritance and class hierarchy - for example define a base class "shape" and derived classes for rectangle, square, ellipse, circle with proper class hierarchy.

Lab.3: (object oriented programming) programming to demonstrate polymorphism, virtual functions - for example define base class for vectors and use inheritance to define complex and real vector with standard operations.

Lab.4: (functional programming - in Lisp) - programming to demonstrate functional specification for a solution - for example implementation of quick sort.

Lab.5: (functional programming) - programming to demonstrate implementation of conventional data structures - for example implementation of binary search tree with insertion, deletion and search operations.

Lab.6: (functional programming) - programming to demonstrate the use of available data structures in functional programming languages - for example implementation of set with membership, union and intersection operations

Lab.7: (logic programming - in prolog) - programming to demonstrate ready implementation of propositional logic statements- for example to find the gcd of two given integers.

Lab.8: (logic programming) - programming to demonstrate language specific features - for example implementation of a logic program to check whether a given NFA accepts the given string.

Lab.9: (concurrent programming- in Java) - demonstration of concurrency support - for example programming to find the least common ancestor of two given nodes in a binary tree.

Lab.10: (concurrent programming- in Java) - demonstration of synchronized concurrency - for example programming for the readers and writers problem.

Reference Books
1. Sethi R., Programming Languages: Concepts and Constructs, Addison Wesley
3. Luger & Stubblefield, Artificial Intelligence, Addison Wesley

Internal Continuous Assessment (Maximum Marks-50)
60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class
CS09 508(P) Hardware Lab

Teaching scheme
3 hours practical per week

Credits: 2

Objectives
- To teach the relevance and characteristics of hardware and operating system components of a digital computer system through various laboratory experiments.
- To enable the students to develop the ability to interface devices to computer systems through various interfacing techniques.

Lab 1: Identification of components/cards and PC assembling from components

Lab 2: Assembly language program for implementing arithmetic operations.

Lab 3,4: Implementation of a file manager using DOS/BIOS interrupts.

Lab 5: TSR (Terminate and Stay Resident) Programming.

Lab 6: ADC interface.

Lab 7: Stepper Motor interface using DAC.

Lab 8,9: Parallel Interface: Printer and HEX keyboard.

Lab 10: Serial Interface: PC to PC serial interface using MODEM.

Reference Books

Internal Continuous Assessment (Maximum Marks-50)
60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class

Semester End Examination (Maximum Marks-50)
70% - Procedure, conducting experiment, results, tabulation, and inference
20% - Viva voce
10% - Fair record
CS09 601 : Embedded Systems

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

• To teach students about architecture, hardware and software elements, programming models and practices and tools for embedded system design and implementation.
• To focus on the hardware and real time operating systems used for the embedded systems design.

Pre-requisites: Knowledge of digital design, computer organization

Module I (14 hours)
Embedded systems: Overview, Design challenges-Optimising design metrics, Common design metrics-Processor technology-General purpose processors, Single purpose processors and Application specific processors.
IC technology: Full-custom/VLSI, Semi-custom ASIC, Compilation/Synthesis, libraries/IP, Test/Verification, Custom Single-purpose processors: Hardware-Combinational Logic, Transistors and logic gates, Basic combinational and Sequential logic design, Custom single purpose processor design and optimisation.
Application-specific instruction-set processors, Microcontrollers, Digital signal processors.
Standard single-purpose processors: Peripherals-some examples such as Timers, counters, Analog-digital converters, etc.

Module II (14 hours)
Memory: Write-ability and storage permanence. Common memory types, Composing memories, memory hierarchy and cache - Cache mapping techniques: replacement, write techniques, Cache impact on system performance, Advanced RAM, the basic DRAM, types of DRAMS, DRAM integration problem, Memory management unit (MMU)
Interfacing: Basic protocol concepts, Microprocessor interfacing: I/O addressing, interrupts, DMA, Arbitration methods, Multi-level bus architectures, Advanced communication principles, Parallel, Serial and Wireless communication, Error detection and correction, Bus standards and protocols.

Module III (13 hours)
State machine and concurrent process models: Models vs. languages, text vs. graphics, A basic state machine model: finite-state machines, FSM with datapath model FSMD, Hierarchical/Concurrent state machine model (HCFSM) and the State charts language, Program-state machine model (PSM),The role of an appropriate model and language
Concurrent process model: Concurrent processes, create, terminate suspend, resume and join, Interproccess Communication and synchronization methods and their implementation
Case studies : Windows CE, QNX

Module IV (11 hours)
Design technology: Automation-The parallel evolution of compilation and synthesis, Synthesis levels, Logic synthesis, Two-level and, Multi-level logic minimization, FSM synthesis, Technology mapping, Integration logic synthesis and physical design, Register-transfer synthesis, Behavioural synthesis, System synthesis and
hardware/software codesign, Intellectual property cores, New challenges posed by cores to processor providers and users.

**Text Books**


**Reference Books**


**Internal Continuous Assessment (Maximum Marks-30)**

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

**University Examination Pattern**

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks=10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks=20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks=40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
CS09 602: Compiler Design

**Teaching scheme**
4 hours lecture and 1 hour tutorial per week

**Credits:** 5

**Objectives**
- To introduce the various techniques involved in the translation of source programs into object programs by a compiler.
- To understand the inner working of a compiler using the various data structures used in the translation process.

**Module I (15 hours)**

**Module II (16 hours)**
Syntax analysis : role of the parser - context-free grammars - top-down parsing - bottom-up parsing - operator precedence parsing - LR parsers (SLR, canonical LR, LALR) - parser generators.

**Module III (16 hours)**
Syntax-directed translation - syntax-directed definitions - S-attributed definitions - L-attributed definitions - bottom-up and top-down translation - type checking - type systems - specification of a type checker - runtime environments - source language issues - storage organization - storage allocation strategies - access to non-local names - parameter passing - symbol tables.

**Module IV (18 hours)**
Intermediate code generation - intermediate languages - declarations - assignment statements - Boolean expressions - procedure calls - introduction to code optimization - sources of optimization - introduction to data-flow analysis - introduction to code generation - issues in the design of a code generator - the target machine - a simple code generator

**Text Books**

**Reference Books**
1. Aho A. V., Ullman J.D. *Principles of Compiler Design*, Narosa
3. Holub A.I., *Compiler Design in C*, Prentice Hall India
### Internal Continuous Assessment (Maximum Marks-30)

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

### University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.  
5 x 2 marks = 10 marks

**PART B:** Analytical/Problem solving questions  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.  
4 x 5 marks = 20 marks

**PART C:** Descriptive/Analytical/Problem solving questions  
Two questions from each module with choice to answer one question.  
4 x 10 marks = 40 marks

*Maximum Total Marks: 70*
CS09 603: Computer Networks

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To teach the mode of operation of different types of computer networks that are used to interconnect a distributed community of computers and various interfacing standards and protocols.

Module I (13 hours)

Module II (13 hours)
Internetworking - Networking devices - Bridges, Routers, Gateways, Routing- Network as a graph, distance vector (RIP), link state (OSPF), Metrics, Routing for mobile hosts, Global Internet - Subnetting, CIDR, BGP, Routing areas.

Module III (13 hours)
Internetworking - IPv4 and IPv6, Multicast addresses, Multicast routing, DVMRP, PIM, MSDP, Multiprotocol label switching- Destination based forwarding, Explicit routing, virtual private networks and tunnels.

Module IV (13 hours)

Text Books

1. L. Peterson & Bruce S. Davie, *Computer Networks- A systems approach*, 4/e Morgan Kaufmann publishers an imprint of Elsevier

Reference Books

4. Andrew S. Tanenbaum, *Computer Networks*, PHI.
<table>
<thead>
<tr>
<th><strong>Internal Continuous Assessment (Maximum Marks-30)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>60% - Tests (minimum 2)</td>
</tr>
<tr>
<td>30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.</td>
</tr>
<tr>
<td>10% - Regularity in the class</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>University Examination Pattern</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART A:</strong> Short answer questions (one/two sentences)</td>
</tr>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
</tbody>
</table>

| **PART B:** Analytical/Problem solving questions       | 4 x 5 marks = 20 marks |
| Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module. |

| **PART C:** Descriptive/Analytical/Problem solving questions | 4 x 10 marks = 40 marks |
| Two questions from each module with choice to answer one question. |

*Maximum Total Marks: 70*
CS09 604: Database Management Systems

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives
- To introduce the basic concepts of databases connected with software engineering techniques and background information useful for the management of data bases. The syllabus includes the file organization, database design and transaction processing techniques.

Module I (14 hours)
Introduction: characteristics of database approach - advantages of using DBMS - database concept and architecture - data models - schemes - instances - data independence - database languages and interfaces - database modeling using entity-relationship (ER) - entity sets attributes and keys - relationships - type role and structural constraints - weak entity types - enhanced entity-relationship (EER) and object modeling - subclass - super classes and inheritance - specialization and generalization - modeling of union types.

Module II (12 hours)
File organization and storage: secondary storage devices - RAID technology - operations in files - heap files and sorted files - hashing techniques - types of single level ordered index, multi-level indexes - B-trees and B+ trees - indexes on multiple keys - other types of indexes.

Module III (13 hours)
Database design: functional dependencies - normal forms - general definition of second and third normal forms - Boyce-Codd normal form - multi valued dependencies and fourth normal form - join dependencies and fifth normal form - inclusion dependencies - practical database design tuning - database design process relational model concepts - relational algebra operations - queries in SQL – insert, delete and update statements in SQL views in SQL.

Module IV (13 hours)
Transaction processing : desirable properties of transactions, schedules and recoverability - serializability of schedules - concurrency control - locking techniques - time stamp ordering multi version concurrency control - granularity of data items - database recovery techniques based on deferred up data and immediate updating - shadow pages - ARIES recovery algorithm - database security and authorization - security issue access control based on granting/revoking of privileges introduction to statistical database security.

Text Books

Reference Books
2. O'neil P. & O'neil E., Database Principles, Programming, and Performance, Harcourt Asia, Morgan Kaufman
5. Date C.J., An Introduction to Database Systems, Addison Wesley
### Internal Continuous Assessment

Maximum Marks-30

- 60% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- 10% - Regularity in the class

### University Examination Pattern

**PART A: Short answer questions (one/two sentences)**  
5 x 2 marks=10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B: Analytical/Problem solving questions**  
4 x 5 marks=20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C: Descriptive/Analytical/Problem solving questions**  
4 x 10 marks=40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
CS09 605: Computer Graphics

Teaching scheme
2 hours lecture and 1 hour tutorial per week

Credits: 3

Objectives

- To teach the fundamentals of computer graphics including algorithms for drawing 2D and 3D primitives, object transformations and the like.

Module I (10 hours)

Module II (8 hours)
Graphic Operations - Windowport and viewport - Elimination of totally visible and totally invisible lines with respect to a rectangular window using line and point codes - Explicit line clipping algorithm - Sutherland Cohen Algorithm - Mid-point subdivision algorithm - Filling - Stack based and queue based seed fill algorithms - Scan line seed fill algorithm - Generation of Bar Charts - Pie Charts - Character Generation

Module III (9 hours)

Module IV (12 hours)
3D Graphics - Transformations - Right handed coordinate system - transformation matrices for translation - Scaling and Rotation around axes - parallel projection - Multiviews - front, top and side views - Oblique view - Projection on xy plane with Rays along a given direction - Perspective projection - Transformation matrix to yield one vanishing point - Perspective view with viewpoint lying on z-axis - effect of Translating the object - Computing the vanishing point - Numerical Examples - Hidden surface removal - Back Face removal - Depth Buffer Method

Text Books

Reference Books
## Internal Continuous Assessment (Maximum Marks-30)

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

## University Examination Pattern

<table>
<thead>
<tr>
<th>PART A: Short answer questions (one/two sentences)</th>
<th>5 x 2 marks = 10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART B: Analytical/Problem solving questions</th>
<th>4 x 5 marks = 20 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART C: Descriptive/Analytical/Problem solving questions</th>
<th>4 x 10 marks = 40 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
<td></td>
</tr>
</tbody>
</table>

*Maximum Total Marks: 70*
Objectives

- To make the learners understand the operating system structures and the implementation aspects of various OS functions and schedulers.
- To teach database technology and familiarize them with issues related to database design through hands on practice.

Operating systems

1. Implementation of dining philosophers problem by multiprogramming using threads, semaphores and shared memory
2. Implementation of ls/dir command of Unix/Dos to display contents of a given floppy disk.
3. Program to generate disk usage status report for a given Unix/Dos formatted floppy disk giving details like free space availability etc.
4. Implementation of banker's algorithm
5. Inter-process communication using mailboxes and pipes
6. Program to find the least common ancestor of two given nodes in a binary tree (Concurrent Programming)
7. Program for the readers and writers problem (Concurrent Programming)

Database management systems

1. Conversion of a given relational scheme to 3NF and BCNF
2. Implementation of B tree and B+ tree
3. Implementation of a database stored in an RDBMS accessible through a web browser.
4. Program to convert SQL subset into relational algebra (tools like YACC may be used.)
5. Implementation of optimistic concurrency control algorithm

Reference Books


Internal Continuous Assessment *(Maximum Marks-50)*

- 60% - Laboratory practical and record
- 30% - Test/s
- 10% - Regularity in the class

Semester End Examination *(Maximum Marks-50)*

- 70% - Procedure, conducting experiment, results, tabulation, and inference
- 20% - Viva voce
10% - Fair record
Objectives

- To estimate the ability of the student in transforming the theoretical knowledge studied so far into a working model of a computer / information system.
- For enabling the students to gain experience in organisation and implementation of a small project and thus acquire the necessary confidence to carry out main project in the final year.

In this practical course, each group consisting of three/four members is expected to design and develop a moderately complex computer / information system with practical applications; this should be a working model. The basic concepts of product design may be taken into consideration while designing the project. A committee consisting of minimum three faculty members specialised in computer science and engineering will perform assessment of the mini project. Students have to submit a report on the mini project and demonstrate the mini project before the evaluation committee.

The division of the total marks is into two namely, 60% of the total marks to be awarded by the guide / Co-ordinator and the remaining 40% by the evaluation committee.

<table>
<thead>
<tr>
<th>Internal Continuous Assessment (50 marks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% - Design and development</td>
</tr>
<tr>
<td>30% - Final result and Demonstration</td>
</tr>
<tr>
<td>20% - Report</td>
</tr>
<tr>
<td>10% - Regularity in the class</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Semester End Examination (Maximum Marks-50)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% - Demonstration of mini project</td>
</tr>
<tr>
<td>50% - Practical test connected with mini project</td>
</tr>
<tr>
<td>20% - Viva voce</td>
</tr>
<tr>
<td>10% - Fair record</td>
</tr>
</tbody>
</table>
**Objectives**

- This introductory course is intended to introduce the basics of wireless and mobile networks in the context of the recent trends in this area and their proliferation in day to day life. Local Area Network (LAN), Wide area Network (WAN) and Inter networking are dealt with.

**Pre-requisites:** Knowledge of Data communication, Computer networks, and Operating systems

**Module I (12 hours)**
Introduction: PCS Architecture, Cellular Telephony - popular cellular telephony networks, Cordless telephony, Third generation Wireless systems
Mobility Management: Handoff, Roaming Management, Handoff Management - Detection and Assignment, Radio Link Transfer, Types of Handoff

**Module II (12 hours)**

**Module III (8 hours)**
GSM Overview, GSM Network signaling, GSM Mobility Management, GSM Short Message Service, Mobile Number portability

**Module IV (7 hours)**
General Packet Radio Service: Functional Groups, Architecture, GPRS Network nodes and Interfaces, Introductory ideas about WAP

**Text Books**


**Reference Books**

2. Schiller J., *Mobile Communications*, Addison Wesley
**Internal Continuous Assessment** *(Maximum Marks-30)*

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>Tests (minimum 2)</td>
</tr>
<tr>
<td>30%</td>
<td>Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.</td>
</tr>
<tr>
<td>10%</td>
<td>Regularity in the class</td>
</tr>
</tbody>
</table>

**University Examination Pattern**

**PART A:** Short answer questions *(one/two sentences)*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Teaching scheme
4 hours lecture and 1 hour tutorial per week

Credits: 5

Objectives

- To provide a sound basis of algorithm design and analysis techniques.
- To introduce the various computing models and their capabilities with respect to computing.

Module I (16 hours)

Module II (16 hours)

Module III (15 hours)
Complexity: Complexity classes - P, NP, Co-NP, NP Hard and NP Complete problems - Cook’s theorem(Proof not expected) - NP- Completeness reductions for clique - Vertex Cover - Subset Sum - Hamiltonian Cycle - TSP - integer programming - approximation algorithms - Vertex Cover - TSP-Set covering and subset sum - Bin packing - Graph coloring.

Module IV (18 hours)

Text Books

Reference Books
1. Basse S., Computer Algorithms: Introduction to Design And Analysis, Addison Wesley
Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: Short answer questions (one/two sentences) 5 x 2 marks=10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: Analytical/Problem solving questions 4 x 5 marks=20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: Descriptive/Analytical/Problem solving questions 4 x 10 marks=40 marks
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
CS09 703 : Internet Technology

Teaching scheme
2 hours lecture and 1 hour tutorial per week

Credits: 3

Objectives

• To introduce the algorithms and protocols implemented to have human interaction with internet with an emphasis on application layer and multimedia networking.
• To introduces the techniques and methods of E-Commerce.

Module I (10 hours)

Module II (10 hours)

Module III (9 hours)

Module IV (10 hours)

Text Books

Reference Books
2. Douglas E. Comer, Computer Networks and Internets with Internet Applications, Pearson Education
### Internal Continuous Assessment *(Maximum Marks-30)*

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>Tests (minimum 2)</td>
</tr>
<tr>
<td>30%</td>
<td>Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.</td>
</tr>
<tr>
<td>10%</td>
<td>Regularity in the class</td>
</tr>
</tbody>
</table>

### University Examination Pattern

**PART A:** Short answer questions *(one/two sentences)*

5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions

4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions

4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
CS09 704 : Cryptography and Network Security

Objectives

- To introduce the principles and practices of cryptography and network security
- To discuss algorithms and schemes to handle the security issues
- To introduce web security

Module I (14 hours)

Module II (13 hours)

Module III (13 hours)

Module IV (12 hours)

Text Books


Reference Books

2. Wenbo Mao, Modern Cryptography - Theory and Practice, Pearson Education Asia
3. Niven & Zuckerman H.S., An Introduction to The Theory of Numbers, John Wiley
**Internal Continuous Assessment** *(Maximum Marks-30)*

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

---

**University Examination Pattern**

**PART A:** *Short answer questions (one/two sentences)*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

5 x 2 marks = 10 marks

**PART B:** *Analytical/Problem solving questions*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

4 x 5 marks = 20 marks

**PART C:** *Descriptive/Analytical/Problem solving questions*

Two questions from each module with choice to answer one question.

4 x 10 marks = 40 marks

*Maximum Total Marks: 70*
Objectives

- To familiarize the design of all phases of compilers up to a stage of intermediate code generation.
- To enable the students to design and implement modern compilers for any environment.

Lab 1,2 : Generation of lexical analyzer using tools such as LEX.
Lab 3,4 : Generation of parser using tools such as YACC.
Lab 5,6 : Creation of Symbol tables.
Lab 7,8 : Creation of type checker.
Lab 9,10 : Generation of intermediate code.

Reference Books

Internal Continuous Assessment (Maximum Marks-50)
- 60%-Laboratory practical and record
- 30%- Test/s
- 10%- Regularity in the class

Semester End Examination (Maximum Marks-50)
- 70% - Procedure, conducting experiment, results, tabulation, and inference
- 20% - Viva voce
- 10% - Fair record
CS09 708 (P) : Network Programming Lab

Teaching scheme
3 hours practical per week

Credits: 2

Objectives

- To teach the working of various networking protocols

Lab 1: Implementation of PC to PC file transfer using serial port and MODEM.

Lab 2,3: Software Simulation of IEEE 802.3, 802.4 and 802.5 protocols.

Lab 4,5: Software Simulation of Medium Access Control protocols –
   1) GoBackN,
   2) Selective Repeat and
   3) Sliding Window.

Lab 6: Implementation of a subset of Simple Mail Transfer Protocol using UDP.

Lab 7,8: Implementation of a subset of File Transfer Protocol using TCP/IP

Lab 9: Implementation of "finger" utility using Remote Procedure Call (RPC)

Lab 10: Generation and processing of HTML forms using CGI.

Reference Books
1. S Richard S.W., Unix Network Programming, Prentice Hall India
2. Comer D.E., Internetworking with TCP/IP, Vol. 1, 2 & 3, Prentice Hall India
3. Campione et. al M., The Java Tutorial Continued, Addison Wesley

Internal Continuous Assessment (Maximum Marks-50)
60%-Laboratory practical and record
30%- Test/s
10%- Regularity in the class
Objectives

- To judge the capacity of the students in converting the theoretical knowledge into practical systems/investigative analysis.

Project work is for duration of two semesters and is expected to be completed in the eighth semester. Each student group consisting of not more than five members is expected to design and develop a complete system or make an investigative analysis of a technical problem in the relevant area. The project may be implemented using software, hardware, or a combination of both. The project work may be undertaken in computer science engineering or allied areas like -

OS platforms: Relevant to the current state of the art with support for networked environment, distributed computing and development of multi-platform applications, Internet technologies: Architectural concepts, XML, Scripting languages, Middleware (Component) technologies, Front end / GUI: Code development or development based on tools, RDBMS/Back End: Relevant to current state with database connectivity to different platforms, Languages: Qt, Glade or any similar 4GLs, Scripting languages and C & C-Linux (under GNU gcc) etc, Universal network applications development platforms such as JAVA, OS internals: Device drivers, RPC, Threads, Socket programming etc., Networking: Mechanisms, protocols, security etc., Embedded systems: RTOS, Embedded hardware with software for an application, Code optimization, security etc.

Project evaluation committee consisting of the guide and three/four faculty members specialised in biomedical/electronics/ computer science/instrumentation engg. (Please write areas of specialisations relevant to the concerned branch concerned) will perform the screening and evaluation of the projects.

Each project group should submit project synopsis within three weeks from start of seventh semester. Project evaluation committee shall study the feasibility of each project work before giving consent. Literature survey is to be completed in the seventh semester.

Students should execute the project work using the facilities of the institute. However, external projects can be taken up in reputed industries, if that work solves a technical problem of the external firm. Prior sanction should be obtained from the head of department before taking up external project work and there must be an internal guide for such projects.

Each student has to submit an interim report of the project at the end of the 7th semester. Members of the group will present the project details and progress of the project before the committee at the end of the 7th semester.

50% of the marks is to be awarded by the guide and 50% by the evaluation committee.

<table>
<thead>
<tr>
<th>Internal Continuous Assessment</th>
<th>:</th>
</tr>
</thead>
<tbody>
<tr>
<td>20% - Technical relevance of the project</td>
<td></td>
</tr>
<tr>
<td>40% - Literature survey and data collection</td>
<td></td>
</tr>
<tr>
<td>20% - Progress of the project and presentation</td>
<td></td>
</tr>
<tr>
<td>10% - Report</td>
<td></td>
</tr>
<tr>
<td>10% - Regularity in the class</td>
<td></td>
</tr>
</tbody>
</table>
Objectives

- To teach ideas on parallel computing based computer architectures with a quantitative approach.
- To impart concepts in new design paradigms to achieve parallelism, memory hierarchy design and inter-connection networks.

Module I (16 hours)
Fundamentals - task of a computer designer - trends in technology usage and cost - performance measurement - quantitative principles of computer design - instruction set architectures - classification - addressing and operations - encoding an instruction set - role of compilers - case study - the DLX architecture - pipelining - pipeline for DLX - pipeline hazards - data and control hazards - implementation difficulties - pipelining with multicycle operations.

Module II (15 hours)
Instruction level parallelism - concepts and challenges - dynamic scheduling - dynamic hardware prediction - multiple issue of instructions - compiler and hardware support for ILP - vector processing - vector architecture - vector length and stride - compiler vectorization - enhancing vector performance

Module III (17 hours)

Module IV (17 hours)
Interconnection networks - simple networks - connecting more than two computers - practical issues - multiprocessors - introduction - application domains - centralised-shared memory and distributed-shared memory architectures - synchronisation - models of memory consistency

Text Books

Reference Books
1. C. Pattersen D.A. & Hennesy J.L., Computer Organisation and Design: The Hardware/Software Interface, Harcourt Asia Pvt. Ltd. (Morgan Kaufman)
## Internal Continuous Assessment *(Maximum Marks-30)*

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

## University Examination Pattern

### PART A: Short answer questions *(one/two sentences)*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

### PART B: Analytical/Problem solving questions

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

### PART C: Descriptive/Analytical/Problem solving questions

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objectives

- To give only a broad, yet in-depth overview of the field of data mining and warehousing, a multidisciplinary field of study.

Module I (10 hours)
Introduction: what is Data Mining, which data, what kinds of patterns can be mined-Data Warehouse and OLAP technology for Data Mining, Data Warehouse Architecture.
Data preprocessing: data cleaning, data integration and transformation, data reduction, discretization and concept - hierarchy generation.

Module II (10 hours)
Data Mining Primitives, Languages and System Architectures. - Concept Descriptions: Characteristic and Discriminant rules.
Data Generalization. - Mining Association Rules in Large Databases - Transactional databases.

Module III (10 hours)
Concept Descriptions: Characteristic and Discriminant rules, Data Generalization, Example of decision tables and Rough Sets.
Classification and prediction, Decision Tree Induction (ID3, C4.5), Bayesian Classification.
Cluster Analysis. A Categorization of major Clustering methods

Module IV (9 hours)
Introduction to Data warehousing: Need for warehousing, Data warehouse Architecture and design, Hardware and operational design, Tuning and testing.
Trends, Developments and Applications.

Teaching scheme
2 hours lecture and 1 hour tutorial per week

Credits: 3

Text Books

Reference Books
### Internal Continuous Assessment *(Maximum Marks-30)*

- **60% -** Tests (minimum 2)
- **30% -** Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10% -** Regularity in the class

**Note:** One of the assignments shall be simulation of continuous systems using any technical computing software

### University Examination Pattern

**PART A:** Short answer questions *(one/two sentences)*  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
Teaching scheme
3 hours practical per week

Credits: 2

Objectives

This project work is the continuation of the project initiated in seventh semester. The performance of
the students in the project work shall be assessed on a continuous basis by the project evaluation committee
through progress seminars and demonstrations conducted during the semester. Each project group should
maintain a log book of activities of the project. It should have entries related to the work done, problems
faced, solution evolved etc.

There shall be at least an Interim Evaluation and a final evaluation of the project in the 8th semester.
Each project group has to submit an interim report in the prescribed format for the interim evaluation.

Each project group should complete the project work in the 8th semester. Each student is expected to
prepare a report in the prescribed format, based on the project work. Members of the group will present the
relevance, design, implementation, and results of the project before the project evaluation committee
comprising of the guide, and three/four faculty members specialised in computer science and engineering.

50% of the marks is to be awarded by the guide and 50% by the evaluation committee.

Internal Continuous Assessment

40% - Design and development/Simulation and analysis
30% - Presentation & demonstration of results
20% - Report
10% - Regularity in the class
Teaching scheme
3 hours practical per week

Objectives

- To assess the ability of the student to study and present a seminar on a topic of current relevance in computer science engineering or allied areas

It enables the students to gain knowledge in any of the technically relevant current topics and acquire the confidence in presenting the topic. The student will undertake a detailed study on the chosen topic under the supervision of a faculty member, by referring papers published in reputed journals and conferences. Each student has to submit a seminar report, based on these papers; the report must not be reproduction of any original paper. A committee consisting of three/four faculty members will evaluate the seminar.

<table>
<thead>
<tr>
<th>Internal Continuous Assessment</th>
<th>Weightage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relevance of the topic and literature survey</td>
<td>20%</td>
</tr>
<tr>
<td>Presentation and discussion</td>
<td>50%</td>
</tr>
<tr>
<td>Report</td>
<td>20%</td>
</tr>
<tr>
<td>Regularity in the class and Participation in the seminar</td>
<td>10%</td>
</tr>
</tbody>
</table>
Objectives

- To examine the knowledge acquired by the student during the B.Tech. course, through an oral examination

The students shall prepare for the oral examination based on the theory and laboratory subjects studied in the B.Tech. Course, mini project, seminar, and project. There is only university examination for viva-voce. University will appoint two external examiners and an internal examiner for viva-voce. These examiners shall be senior faculty members having minimum five years teaching experience at engineering degree level. For final viva-voce, candidates should produce certified reports of mini project, seminar, and project (two interim reports and main report). If he/she has undergone industrial training/industrial visit/educational tour or presented a paper in any conference, the certified report/technical paper shall also be brought for the viva-voce.

Allotment of marks for viva-voce shall be as given below.

<table>
<thead>
<tr>
<th>Assessment in Viva-voce</th>
</tr>
</thead>
<tbody>
<tr>
<td>40% - Subjects</td>
</tr>
<tr>
<td>30% - Project and Mini Project</td>
</tr>
<tr>
<td>20% - Seminar</td>
</tr>
<tr>
<td>10% - Industrial training/industrial visit/educational tour</td>
</tr>
<tr>
<td>or Paper presented at National-level</td>
</tr>
</tbody>
</table>
CS09 L01 : Information Security

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To teach the fundamentals of information security which deals with protecting information and information systems from unauthorized access, use, disclosure, disruption, modification or destruction.
- To teach the various threats to storage of secure information.

Module I (15 hours)

Module II (12 hours)

Module III (11 hours)

Module IV (14 hours)

Text Books

Reference Books
Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: Analytical/Problem solving questions  
4 x 5 marks = 20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
Objectives

- To teach how to create cognitive systems that could compete with humans in large number of
  areas.
- To teach fundamental heuristic algorithms such as those found in fuzzy
  systems, neural networks and evolutionary computation

Module I (13 hours)
Recursion and Mathematical Induction - Verification and Limitations - Verification of Logic Programs -
Limitations - Applications in Natural Language Processing - Using Definite Clauses for Context-Free
Grammars - Augmenting the Grammar - Building Structures for Nonterminals - Canned Text Output -
Enforcing Constraints - Building a Natural Language Interface to a Database

Module II (14 hours)

Module III (12 hours)

Module IV (13 hours)

Text Books

Reference Books
   2005.
## Internal Continuous Assessment (Maximum Marks-30)

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

## University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
CS09 L03: Queuing Theory

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

• To teach the fundamental queueing models and the various parameters involved with performance of the individual disciplines.

Module I (14 hours)
Description of the Queueing problem - Characteristics of Queueing processes - Notation - Measuring System Performance - Some General Results - Simple Bookkeeping for Queues - Poisson process and the Exponential Distribution - Markovian property of the Exponential Distribution - Stochastic Processes and Markov Chains - Steady-state Birth-Death Processes - Simple Markovian Birth-Death Queueing Models -

Module II (15 hours)
Steady-state solution for the M/M/1 Model - Methods of Solving Steady-state Difference Equations - Queues with parallel channels (M/M/c) - Queues with Parallel Channels and Truncation (M/M/c/K) - Erlang's Formula (M/M/c/c) - Queues with Unlimited Service - Queues with Impatience - Transient Behaviour - Busy-Period analyses for M/M/1 and M/M/c - Bulk input (M[x]/M/1) - Bulk Service (M/M[Y]/1) - Erlang's Models (M/Ek/1, Ek/M/1, Ej/Ek/1) - Priority Queue disciplines

Module III (12 hours)
Series Queues - Open Jackson Networks - Closed Jackson Networks - Cyclic Queues - Extensions of Jackson Networks - Non-Jackson Networks - Single-server Queues with Poisson Input and General Service (M/G/1) - Multi server Queues with Poisson input and General Service - General Input and Exponential service

Module IV (13 hours)
G/Ek/1, G(k)/M/1 and G/PHk/1 - General Input, General Service (G/G/1) - Multichannel Queues with Poisson input and Constant Service (M/D/c) - Semi-Markov and Markov Renewal Processes in Queueing - Other Queueing Disciplines - Design and Control of Queues - Statistical Inference in Queueing - Bounds, Approximations, Numerical Techniques and Simulation. - Bounds and Inequalitites - Approximations - Numerical Techniques - Discrete-Event Stochastic Simulation Problems.

Text Books

Reference Books
Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: Short answer questions (one/two sentences) 5 x 2 marks=10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: Analytical/Problem solving questions 4 x 5 marks=20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: Descriptive/Analytical/Problem solving questions 4 x 10 marks=40 marks
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
CS09 L04 : Object Oriented Modelling and Design

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To impart ideas on building systems through the object oriented modelling approach using the Unified Modelling Language.

Module I (14 hours)
Introduction to UML and Unified Process - Use case modeling: Actors and Use cases, Use case specification, Actor generalization, Use case generalization - Objects and classes, Relationships, Inheritance and Polymorphism, Packages.

Module II (14 hours)

Module III (13 hours)
Design: Design workflow, well-formed design classes, Refining analysis relationships. Interfaces and components - State machine diagrams, Composite states, submachine states

Module IV (13 hours)
Implementation workflow, Deployment, Introduction to OCL: Why OCL? OCL expression syntax, Types of OCL expressions. Introduction to Software Architecture, Architecture description language (ADL)

Text Books

Reference Books
4. James Rambaugh et. al., *Object Oriented Modelling and Design*, Prentice Hall India

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
### University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objective

• To introduce the methods and the influence of the information systems in management milieu
• To enable the students to use MIS as an effective tool in management and decision making

Module I (14 hours)
Information Systems-functions of management-levels of management-framework for information systems-systems approach-systems concepts-systems and their environment-effects of systems approach in information systems design-using systems approach in problem solving - strategic uses of information technology.

Module II (14 hours)
Computer Fundamentals, Telecommunication and Networks - Communication, Media, Modems & Channels - LAN, MAN & WAN - Network Topologies, Internet, Intranet and Extranet. Wireless technologies like Wi-Fi, Bluetooth and Wi-Max.

Module III (10 hours)
Kinds of Information Systems - Transaction Processing System (TPS) - Office Automation System (OAS) - Management Information System (MIS) - Decision Support System (DSS) and Group Decision Support System (GDSS) - Expert System (ES) - Executive Support System (EIS or ESS).

Module IV (14 hours)
Information systems planning - critical success factor - business system planning - ends/means analysis - organizing the information systems plan - system analysis and design - alternative application development approaches - organization of data processing - security and ethical issues of information systems.

Reference Books

### Internal Continuous Assessment *(Maximum Marks-30)*

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>Tests (minimum 2)</td>
</tr>
<tr>
<td>30%</td>
<td>Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.</td>
</tr>
<tr>
<td>10%</td>
<td>Regularity in the class</td>
</tr>
</tbody>
</table>

### University Examination Pattern

**PART A:** Short answer questions *(one/two sentences)*  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

• To teach the fundamental building blocks of Neural networks and to promote their widespread use in the current day scientific research environment.

Module I (14 hours)

Module II (14 hours)

Module III (13 hours)

Module IV (13 hours)

Text Books


Reference Books

2. Simon Haykin, Artificial Neural Network, Pearson Education.
4. B. Yenganarayana, Artificial Neural Networks, Prentice Hall India.

Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objectives

- To impart basic knowledge of the issues concerning distributed systems, from both software and hardware viewpoints.

Module I (10 hours)
Operating system fundamentals - distributed system concepts and architectures - major design issues - distributed computing environments (DCE).

Module II (13 hours)
Concurrent processes and programming - threads and processes - client server model - time services language mechanisms for synchronization - concurrent programming languages.

Module III (13 hours)
Inter-process communication and coordination - message passing communication - request/reply communication - transaction communication - name and directory services - distributed mutual exclusion - leader election.

Module IV (13 hours)
Distributed process scheduling - static process scheduling, dynamic load sharing and balancing - distributed process implementation - real-time scheduling - concepts of distributed file systems - distributed shared memory - distributed computer security.

Text Books

Reference Books

Internal Continuous Assessment (Maximum Marks-30)
- 60% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- 10% - Regularity in the class
## University Examination Pattern

**PART A:**  *Short answer questions (one/two sentences)*  
5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:**  *Analytical/Problem solving questions*  
4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:**  *Descriptive/Analytical/Problem solving questions*  
4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To impart the basic concepts of fuzzy set theory.
- To understand the applications of fuzzy logic in various fields.

Module I (14 hours)

Module II (14 hours)

Module III (13 hours)
Fuzzy measures – general discussion – belief and plausibility measures – probability measures – possibility and necessity measures – relationships among classes of fuzzy measures.

Module IV (13 hours)

Text Books

Reference Books

Internal Continuous Assessment *(Maximum Marks-30)*
60% - Tests (minimum 2) 
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc. 
10% - Regularity in the class
### University Examination Pattern

<table>
<thead>
<tr>
<th>PART A: Short answer questions (one/two sentences)</th>
<th>5 x 2 marks = 10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART B: Analytical/Problem solving questions</th>
<th>4 x 5 marks = 20 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART C: Descriptive/Analytical/Problem solving questions</th>
<th>4 x 10 marks = 40 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
<td></td>
</tr>
</tbody>
</table>

*Maximum Total Marks: 70*
Teaching scheme

3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To teach the fundamental concepts in speech processing and natural language processing through which human-computer dialog systems may be developed.

Module I (13 hours)

Module II (13 hours)
Speech: Phonetics, Speech Synthesis, Automatic Speech, Recognition, Speech Recognition : Advanced Topics, Computational Phonology

Module III (13 hours)

Module IV (13 hours)
Semantics and Pragmatics: The Representation of Meaning, Computational Semantics, Lexical Semantics, Computational Lexical Semantics, Computational Discourse Applications : Information Extraction, Question Answering and Summarization, Dialog and Conversational Agents, Machine Translation

Text Books


Reference Books


Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
### University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To teach advanced concepts related to operating systems including various categories and the complex algorithms in their management functions.

Module I (14 hours)

Module II (14 hours)

Module III (13 hours)

Module IV (13 hours)

Text Books

Reference Books

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objectives

- To impart knowledge on the advancements in database management systems. This covers ideas on the latest methodologies such as object oriented, distributed and deductive database systems along with comparisons and some case studies.
- To enable the student to analyze, design and implement modern database systems, especially for a distributed environment.

Module I (11 hours)
Overview of relational database concept - object oriented database - overview of object oriented concepts - object definition language - object query languages - object database conceptional design – Object relational and extended relational systems.

Module II (13 hours)
Distributed database concepts - data fragmentation replication and allocation - types of distributed database system - query process - concurrency control for distributed database - overview of client - server architecture and its relationship to distributed database

Module III (13 hours)

Module IV (15 hours)
Oracle and microsoft access - basic structure of the oracle system - database structures and its manipulation in oracle - storage organization programming oracle applications - oracle tools - an overview of Microsoft access features and functionality of access - distributed databases in oracle

Text Books

Reference Books
2. O'neil P. & O'neil E., Database Principles, Programming, And Performance, Harcourt Asia (Morgan Kaufman)
4. Theory T.J., Database Modelling And Design, Harcourt Asia (Morgan Kaufman)

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
# University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
*5 x 2 marks = 10 marks*

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
*4 x 5 marks = 20 marks*

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
*4 x 10 marks = 40 marks*

Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
# CS09 L12: Digital Image Processing

## Objectives
- To impart the introductory concepts of image processing
- To understand all the elements of image processing beginning from formation and digitization to enhancement, restoration, edge detection, segmentation, and compression.

### Module I (15 hours)

### Module II (12 hours)

### Module III (12 hours)
Image restoration - model of Image degradation/restoration process - noise models - inverse filtering - least mean square filtering - constrained least mean square filtering. Edge detection - thresholding - region based segmentation - Boundary representation

### Module IV (13 hours)

## Text Books

<table>
<thead>
<tr>
<th>Text Books</th>
</tr>
</thead>
</table>

## Reference Books

<table>
<thead>
<tr>
<th>Reference Books</th>
</tr>
</thead>
</table>

## Internal Continuous Assessment (Maximum Marks-30)

<table>
<thead>
<tr>
<th>60% - Tests (minimum 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.</td>
</tr>
<tr>
<td>10% - Regularity in the class</td>
</tr>
<tr>
<td>University Examination Pattern</td>
</tr>
<tr>
<td>-------------------------------</td>
</tr>
<tr>
<td><strong>PART A:</strong> Short answer questions (one/two sentences) 5 x 2 marks 10 marks</td>
</tr>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
<tr>
<td><strong>PART B:</strong> Analytical/Problem solving questions 4 x 5 marks 20 marks</td>
</tr>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
<tr>
<td><strong>PART C:</strong> Descriptive/Analytical/Problem solving questions 4 x 10 marks 40 marks</td>
</tr>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
</tr>
<tr>
<td><strong>Maximum Total Marks:</strong> 70</td>
</tr>
</tbody>
</table>
CS09 L13 : VLSI Design

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

• To impart the required skills to the students in design of VLSI components.

Module I (14 hours)
Introduction to MOS technology - IC technology - MOS and VLSI - NMOS and "CMOS fabrication - thermal aspects - MOS circuits tub ties and latch up - wire parasitic - design rules and layouts - multilayer CMOS process - layout diagrams - stick diagrams - hierarchical stick diagrams - layout design analysis tools.

Module II (14 hours)

Module III (12 hours)
Sequential machines - latches and flip flops - sequential system design -subsystem design - pipelining - data paths - adders - ALU - ROM - RAM -FPGA - PLA – multipliers.

Module IV (12 hours)
Floor planning - methods - floor plan of a 4 bit processor - off chip connections –architecture design - register transfer design - architecture for low power - architecture testing - cad systems and algorithms - simulation - layout synthesis.

Text Books

Reference Books
1. C. Puck Nell D. A. & Eshraghian K., Basic VLSI Design - Systems and Circuits
2. Mead C, Conway L., Introduction to VLSI System, Addison Wesley

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
### University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
CS09 L14 : Information Theory and Coding

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To teach the fundamentals of information quality, error control in communication process and various systems of coding information for reliable communications.

Module I (14 hours)

Module II (14 hours)
Coding - linear block codes - generator matrices - parity check matrices - encoder-syndrome and error detection - minimum distance - error correction and error detection capabilities - cyclic codes - coding and decoding.

Module III (13 hours)
Introduction to algebra - groups - fields - binary field arithmetic - construction of galois field - basic properties - computations - vector spaces - matrices - BCH codes - description - decoding - reed 55eneral codes

Module IV (13 hours)
Coding - convolutional codes - encoder - generator matrix - transform domain representation - state diagram - distance properties - maximum likelihood decoding - Viterbi decoding - sequential decoding - interleaved convolutional codes.

Text Books
1. Simon Haykin, Communication Systems, John Wiley

Reference Books
2. Sam Shanmugham, Digital and Analog Communications, John Wiley
3. Simon Haykin, Digital Communications, John Wiley
### Internal Continuous Assessment (Maximum Marks-30)

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

### University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Teaching scheme: 3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To impart the fundamental concepts of multimedia.

Module I (13 hours)
Multimedia system organization and architecture - QOS architecture - multimedia distributed processing models - multimedia conferencing model - storage organization.

Module II (13 hours)
Psychoacoustics - digital audio and computer - digital representation of sound - audio signal processing (editing and sampling) - audio production - digital music - musical instrument synthesizer - MIDI protocol

Module III (13 hours)
Raster scanning principle - color fundamental - color video performance measurement - analog audio - stereo effect - MPEG and DVI technology - multimedia applications - toolkit and hyper application.

Module IV (13 hours)
Multimedia information system - operating system support middleware system service architecture - presentation services - user interface - file system and information and information model - presentation and anchoring file - Multimedia standards - role of standards - standardization issues - distributed multimedia systems.

Text Books


Reference Books


Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
## University Examination Pattern

<table>
<thead>
<tr>
<th>PART A: Short answer questions (one/two sentences)</th>
<th>5 x 2 marks = 10 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART B: Analytical/Problem solving questions</th>
<th>4 x 5 marks = 20 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PART C: Descriptive/Analytical/Problem solving questions</th>
<th>4 x 10 marks = 40 marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two questions from each module with choice to answer one question.</td>
<td></td>
</tr>
</tbody>
</table>

Maximum Total Marks: 70
CS09 L16 : Web Programming

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To teach the various technologies available for programming the web applications.

Module I (14 hours)

Module II (14 hours)
CGI/Perl: Creating link to a CGI Script – Using a link to send data to a CGI Script – parsing data sent to a Perl CGI script – Using CGI script to process form data – Using scalar variables in Perl – Using variables in Perl – Using arithmetic operators in Perl – Associating a form with a script.

Module III (13 hours)

Module IV (13 hours)

Text Books

Reference Books
7. Barry Burd, JSP, IDG Books India.
9. Floyd Marinescu, EJB Design Patterns,
Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: Short answer questions (one/two sentences)  
5 x 2 marks=10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: Analytical/Problem solving questions  
4 x 5 marks=20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: Descriptive/Analytical/Problem solving questions  
4 x 10 marks=40 marks
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
CS09 L17 : Graph Theory and Combinatorics

**Objectives**

- To introduce the basics of graph theory as a modelling and analysis tool in computer science and engineering.
- To introduce the structures such as graphs and trees and several combinatorial techniques which are needed in number theory based computing and network security studies in Computer Science.

**Module I (13 hours)**
Introduction to graphs - definitions - subgraphs - paths and cycles - matrix representation of graphs - Euler tours - Chinese postman problem - planar graphs - Euler's formula - platonic bodies - applications of Kuratowski's theorem - Hamiltonian graphs - graph colouring and chromatic polynomials - map colouring.

**Module II (14 hours)**
Trees - definitions and properties - rooted trees - trees and sorting - weighted trees and prefix codes - biconnected components and articulation points - the max-flow min-cut theorem - maximum bipartite matching - Matchings -matchings and augmenting paths - the personal assignment problem – Networks - flows and cuts - ford and Fulkerson algorithm - separating sets.

**Module III (11 hours)**
Fundamental principles of counting - permutations and combinations - binomial theorem - combinations with repetition - combinatorial numbers - principle of inclusion and exclusion - derangements - arrangements with forbidden positions.

**Module IV (14 hours)**
Generating functions - partitions of integers - the exponential generating function - the summation operator - recurrence relations - first order and second order - non-homogeneous recurrence relations - method of generating functions.

**Text Books**

**Reference Books**
## Internal Continuous Assessment (Maximum Marks-30)

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>60%</td>
<td>Tests (minimum 2)</td>
</tr>
<tr>
<td>30%</td>
<td>Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.</td>
</tr>
<tr>
<td>10%</td>
<td>Regularity in the class</td>
</tr>
</tbody>
</table>

## University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks=10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks=20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks=40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objectives

- To teach the fundamental concepts of Machine Learning,
- To equip the learners with techniques and methods using which machines mimic the human learning process.

Module I (10 hours)
Preliminaries - Introduction - Learning Input-Output Functions - Learning and Bias - Sample applications - Boolean Functions - Representation - Classes of Boolean Functions - Introduction to Neural Networks

Module II (14 hours)

Module III (14 hours)

Module IV (14 hours)

Text Books

Reference Books
**Internal Continuous Assessment (Maximum Marks-30)**

- 60% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- 10% - Regularity in the class

---

**University Examination Pattern**

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Objectives

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience.
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems.
- To provide the mathematical background for carrying out the optimization associated with neural network learning.
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations.
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing.

Module I (14 hours)

Module II (14 hours)
Neural Model and Network Architectures, Perceptron Learning, Supervised Hebbian Learning, Backpropagation, Associative Learning, Competitive Networks, Hopfield Network, Computing with Neural Nets and applications of Neural Network.

Module III (13 hours)
Introduction to Fuzzy Sets, Operations on Fuzzy sets, Fuzzy Relations, Fuzzy Measures, Applications of Fuzzy Set Theory to different branches of Science and Engineering.

Module IV (13 hours)
Advanced Topics: Support Vector Machines, Evolutionary computation (EC)- Evolutionary algorithms, Harmony search, Swarm intelligence

Text Books

Reference Books
**Internal Continuous Assessment (Maximum Marks-30)**

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

---

**University Examination Pattern**

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Teaching scheme
3 hours lecture and 1 hour tutorial per week

Objectives
- To familiarize the students with tools and techniques for deriving the right information at the right time, in the current scenario of information explosion
- To present the techniques for storage of many forms of information, such as text, image, audio and video formats, and to present several issues related to different IR tasks.

Module I (10 hours)

Module II (12 hours)
Retrieval evaluation: Performance evaluation of IR: Recall and Precision, other measures, Reference Collections, such as TREC, CACM, and ISI data sets. Query Languages: Keyword based queries, single word queries, context queries, Boolean Queries, Query protocols, query operations.

Module III (12 hours)
Text and Multimedia Languages and properties, Metadata, Text formats, Markup languages, Multimedia data formats, Text Operations. Indexing and searching: Inverted files, Suffix trees, Suffix arrays, signature files, sequential searching, Pattern matching.

Module IV (16 hours)
Multimedia IR: Spatial access methods, Generic multimedia Indexing approach, Distance functions, feature extraction, Image features and distance functions. Searching the Web: Characterizing and measuring the Web. Search Engines: Centralized and Distributed architectures, user Interfaces, Ranking, Crawling the Web, Web directories, Dynamic search and Software Agents.

Text Book

Reference Books

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
University Examination Pattern

**PART A:** Short answer questions (one/two sentences) \(5 \times 2 \text{ marks}=10 \text{ marks}\)
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions \(4 \times 5 \text{ marks}=20 \text{ marks}\)
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions \(4 \times 10 \text{ marks}=40 \text{ marks}\)
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
CS09 L21: Digital Design using VHDL

**Objectives**

- To teach the various aspects in the design of digital circuits using VHDL, including the language elements.

**Module I (13 hours)**

VHDL Design methodology - Requirements analysis and specification - VHDL Design Description - Verification using simulation – Test benches – Functional (Behavioral) Simulation - Logic synthesis for the Target - Place-and-Route and Timing simulation - VHDL Design Methodology advantages - VHDL for synthesis versus VHDL for simulation - Design Units, Library units and Design entities - Entity declaration - VHDL Syntax definitions - Architecture body - Coding styles - Object classes and object types - Signal objects - Scalar types - Type Std_logic - Scalar literals and Scalar constants - Composite types - Arrays - Types unsigned and signed - Composite literals and Composite constants - Integer types - Port Types for Synthesis - Operators and expressions

**Module II (13 hours)**

Logical operators - Signal assignments in dataflow style architectures - Selected signal assignment - Type Boolean and the Relational operators - Conditional signal assignment - priority encoders - Don't care inputs and outputs - Decoders - Table lookup - Three state buffers - Avoiding conditional loops - Behavioral style architecture - process statement - Sequential statements - Case statement - If statement - Loop statement – Variables - Simulator Approaches - Elaboration - Signal Drivers - Simulator Kernel Process - Simulation Initialization - Simulation Cycles - Signals Versus Variables - Delta Delays - Delta Delays and combinational feedback - Multiple Drivers - Signal Attributes - Design Verification - Single process testbench - Wait statements - Assertion and Report statements - Records and Table lookup test benches - Predefined shift operators - Stimulus order based on UUT functionality

**Module III (13 hours)**

Latches and Flipflops - D Latch - Detecting clock edges - D Flip-flops - Enabled (Gated) Flip-flop - Other Flip-flop types - PLD Primitive memory elements - Timing requirements and Synchronous input data - Multitbit latches and registers - shift registers - Shift register counters - Counters - Detecting non-clock signal edges – Memories - Finite state machines - FSM state diagrams - Three process FSM VHDL template - State diagram development - State encoding and state assignment - supposed state FSMs - Counters as Moore FSMs - Algorithmic State Machine charts ASM charts to VHDL - System architecture - Successive approximation register design example - Sequential Multiplier Design - Subprograms - Functions - Procedures - Array attributes and unconstrained arrays – Overloading Subprograms and operators – Type conversions

**Module IV (13 hours)**

Packages and package bodies - Standard and De factor standard packages - Packages for VHDL text output- Simple sequential test benches - Systems clock - System reset - Synchronizing stimulus generation and monitoring – Test bench for successive approximation register - Output verification in stimulus procedures - Bus functional models – Response monitors - Modular design, partitioning and hierarchy - Design units and library units - Design libraries - Direct design entity instantiation - Configuration declarations - Component connections - Parameterized design entities - Library of parameterized modules (LPM) - Generate statement

**Text Books**


**Reference Books**

Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

PART A: Short answer questions (one/two sentences) 5 x 2 marks = 10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: Analytical/Problem solving questions 4 x 5 marks = 20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: Descriptive/Analytical/Problem solving questions 4 x 10 marks = 40 marks
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
CS09 L22 : Computational Geometry

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives
- To teach the algorithms concerned with geometric shapes and figures, particularly related to space manipulation.

Module I (13 hours)
Introduction - An example : convex hull - degeneracies and robustness - application domains - line segment intersection - the doubly-connected edge list - computing the overlay of two subdivisions - boolean operations - guarding and polygon triangulations - partitioning a polygon into monotone pieces - triangulating a monotone polygon - Linear programming - the geometry of casting - half-plane intersection - incremental linear programming - randomized linear programming - unbounded linear programs - linear programming in higher dimensions - smallest enclosing discs

Module II (13 hours)
orthogonal range searching - 1-dimensional range searching - Kd-Trees - range trees - higher dimensional range trees - general sets of points - fractional cascading - point location and trapezoidal maps - a randomized incremental algorithm - dealing with degenerate cases - a tail estimate - voronoi diagrams - computing the voronoi diagram - voronoi diagrams of line segments - farthest-point voronoi diagrams arrangements and duality - computing the discrepancy - duality - arrangements of lines - levels and discrepancy

Module III (13 hours)
Delaunay triangulations - triangulations of planar point sets - computing the delaunay triangulation - the analysis - a framework of randomized algorithms - geometric data structures - interval trees - priority search trees - segment trees - convex hulls - complexity in 3-space - computing convex hulls in 3-space - analysis - convex hulls and half-space intersection - binary space partitions - determination of BSP trees - BSP trees and the painter's algorithm - construction of BSP tree - the size of BSP tree in 3-space - BSP trees for low-density scenes

Module IV (13 hours)
robot motion planning - work space and configuration space - a point robot - minkowski sums - translational motion planning - motion planning with rotations - quadtrees (non-uniform mesh generation) - uniform and non-uniform meshes - quadtrees for point sets - from quadtrees to meshes - visibility graphs - shortest paths for a point robot - computing the visibility graph - shortest paths for a translating polygonal robot - simplex range searching - partition trees - multi-level partition trees - cutting trees

Text Books

Reference Books
Internal Continuous Assessment *(Maximum Marks-30)*

- 60% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- 10% - Regularity in the class

University Examination Pattern

**PART A:** Short answer questions *(one/two sentences)*  
5 x 2 marks=10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks=20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks=40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
**CS09 L23 : Simulation and Modelling**

**Teaching scheme**
3 hours lecture and 1 hour tutorial per week

**Credits:** 4

**Objectives**

- To teach the students how to reproduce real-world events or process under controlled laboratory conditions, using mainly mathematical models.

**Module I (10 hours)**
Introduction - systems and models - computer simulation and its applications - continuous system simulation - modeling continuous systems - simulation of continuous systems - discrete system simulation - methodology – event scheduling and process interaction approaches - random number generation - testing of randomness - generation of stochastic variates - random samples from continuous distributions - uniform distribution - exponential distribution - Erlang distribution - gamma distribution - normal distribution - beta distribution - random samples from discrete distributions - Bernoulli - discrete uniform - binomial - geometric and poisson

**Module II (12 hours)**
Evaluation of simulation experiments - verification and validation of simulation experiments - statistical reliability in evaluating simulation experiments - confidence intervals for terminating simulation runs - simulation languages - programming considerations - general features of GPSS - SIM SCRIPT and SIMULA.

**Module III (15 hours)**

**Module IV (15 hours)**

**Reference Books**
### Internal Continuous Assessment (Maximum Marks-30)

- **60% -** Tests (minimum 2)
- **30% -** Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10% -** Regularity in the class

**Note:** One of the assignments shall be computer based simulation of continuous systems using any technical computing software. One of the tests must be computer based (practical).

### University Examination Pattern

- **PART A:** Short answer questions (one/two sentences)  
  5 x 2 marks = 10 marks  
  All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

- **PART B:** Analytical/Problem solving questions  
  4 x 5 marks = 20 marks  
  Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

- **PART C:** Descriptive/Analytical/Problem solving questions  
  4 x 10 marks = 40 marks  
  Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

- To impart the basic concepts of mathematical modelling of problems in science and engineering and to know procedures for solving different kinds of problems.
- To understand the various numerical techniques which provide solutions to non-linear equations, partial differential equations etc that describe the mathematical models of problems.

Module I (13 hours)

Module II (13 hours)

Module III (13 hours)

Module IV (13 hours)
Statistical Computations - frequency Chart - method of least square curve fitting procedures - fitting a straight line - curve fitting by sum of exponential - data fitting with cubic splines - approximation of functions. Regression Analysis - linear and nonlinear regression - multiple regression - statistical quality control methods.

Text Books

Reference Books

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
<table>
<thead>
<tr>
<th>Part</th>
<th>Question Type</th>
<th>Marks</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Short answer questions (one/two sentences)</td>
<td>5 x 2 marks = 10 marks</td>
<td>All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
<tr>
<td>B</td>
<td>Analytical/Problem solving questions</td>
<td>4 x 5 marks = 20 marks</td>
<td>Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.</td>
</tr>
<tr>
<td>C</td>
<td>Descriptive/Analytical/Problem solving questions</td>
<td>4 x 10 marks = 40 marks</td>
<td>Two questions from each module with choice to answer one question.</td>
</tr>
</tbody>
</table>

Maximum Total Marks: 70
CS09 L25 : Pattern Recognition

Objectives

- To impart a basic knowledge on pattern recognition and to give a sound idea on the topics of parameter estimation and supervised learning, linear discriminant functions and syntactic approach to PR.
- To provide a strong foundation to students to understand and design pattern recognition systems.

Module I (12 hours)
Introduction - introduction to statistical - syntactic and descriptive approaches - features and feature extraction - learning - Bayes Decision theory - introduction - continuous case - 2-category classification - minimum error rate classification - classifiers - discriminant functions - and decision surfaces - error probabilities and integrals - normal density - discriminant functions for normal density

Module II (12 hours)
Parameter estimation and supervised learning - maximum likelihood estimation - the Bayes classifier - learning the mean of a normal density - general Bayesian learning - nonparametric technic - density estimation - parzen windows - k-nearest neighbour estimation - estimation of posterior probabilities - nearest-neighbour rule - k-nearest neighbour rule

Module III (12 hours)
Linear discriminant functions - linear discriminant functions and decision surfaces - generalised linear discriminant functions - 2-category linearly separable case - non-separable behaviour - linear programming procedures - clustering - data description and clustering - similarity measures - criterion functions for clustering

Module IV (16 hours)
Syntactic approach to PR - introduction to pattern grammars and languages - higher dimensional grammars - tree, graph, web, plex, and shape grammars - stochastic grammars - attribute grammars - parsing techniques - grammatical inference

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Text Books
1. Duda & Hart P.E, Pattern Classification And Scene Analysis, John Wiley

Reference Books
1. Fu K.S., Syntactic Pattern Recognition And Applications, Prentice Hall, Eaglewood cliffs
### Internal Continuous Assessment (Maximum Marks-30)

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

### University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
EE09 L23 PROCESS CONTROL AND INSTRUMENTATION

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives
- To create an awareness of the different transducers used in industry and signal conditioning
- To familiarize the process control elements and their control characteristics

Module I (8 hours)
Signal Conditioning – Analog – Digital - Signal conversions - Process Control Principles - Identification of elements, block diagram, the loop, control system evaluation stability, regulation, evaluation criteria, and cyclic response.

Module II (10 hours)

Module III (12hours)

Module IV (14hours)
Control Loop Characteristics: Control system configurations, cascade control, multivariable control, feed forward control, Split range control, inferential control, Adaptive control, control system quality – loop disturbance, optimum control, measure of quality, Stability, process loop tuning

Text Books

Reference Books
1. Curtis D. Johnson, Microprocessors in Process Control, PHI
2. George Stephanopoulis, Chemical Process Control
3. Caughner, Process Analysis and Control
4. Deshpande and Ash, Elements of computer process control of Industrial processes, ISA
7. Dale E. Seborg, Thomas F. Edgar, Duncan A. Mekkichamp, Process Dynamics and Control, Wiley India
### Internal Continuous Assessment *(Maximum Marks-30)*

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

### University Examination Pattern

**PART A: Short answer questions (one/two sentences) 5 x 2 marks=10 marks**

- All questions are compulsory. There should be at least one question from each Module and not more than two questions from any Module.

**PART B: Analytical/Problem solving questions 4 x 5 marks=20 marks**

- Candidates have to answer four questions out of six.
- There should be at least one question from each Module and not more than two questions from any Module.

**PART C: Descriptive/Analytical/Problem solving questions 4 x 10 marks=40 marks**

- Two questions from each Module with choice to answer one question.

*Maximum Total Marks: 70*
Module I (14 Hours)

Module II (13 Hours)

Module III (14 Hours)

Module IV (13 Hours)
Introduction to robot intelligence and task planning- state space search-problem reduction-use of predicate logic-means -end analysis-problem-solving -robot learning-robot task planning-expert systems and knowledge learning.

Text Books

Internal Continuous Assessment *(Maximum Marks-30)*
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class
University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks

All questions are compulsory. There should be at least one question from each Module and not more than two questions from any Module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks

Candidates have to answer four questions out of six. There should be at least one question from each Module and not more than two questions from any Module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks

Two questions from each Module with choice to answer one question.

Maximum Total Marks: 70
ME09 L24: Marketing Management

Objectives

- To impart knowledge on fundamentals of marketing, marketing environment market oriented strategic planning, marketing research and marketing communications.

Pre-requisites: Basic knowledge of principles of management

Module I (13 hours)
Introduction to marketing: Defining marketing for the twenty first century, marketing – scope, tasks, concept of market and marketing, company orientations towards the market place – production, product, selling, marketing, customer and societal marketing concepts. Marketing environment: Controllable factors, identifying and responding to the major macro environment – uncontrollable factors – demographic, economic, natural technological, political-legal and social – cultural environment.

Module II (13 hours)

Module III (13 hours)

Module IV (15 hours)
Marketing communications – process – developing effective communications – Identification of the target audience, determination of communication objectives, Designing the message, select the communication channels, establishing the total marketing communications budget – Deciding on the marketing communications mix – promotional tools an over view – advertising, sales promotion, public relations and publicity, sales force and direct marketing- developing and managing an advertising program – setting objectives, deciding budget, choosing message – an overview on measuring effectiveness of a media – sales promotion – purpose, major decisions.

Text Books

Reference Books
**Internal Continuous Assessment (Maximum Marks-30)**

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, Literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

**University Examination Pattern**

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
Teaching scheme
3 hours lecture and 1 hour tutorial per week credits 4

Objectives:

- To give an exposure to the major aspects of project viz. Project Planning, Analysis, Selection, Implementation and review.

Module I (13 hours)
Planning -Capital Expenditures -Phases of Capital Budgeting -Levels of decision Making -Facets of Project analysis -Feasibility Study -Objectives of Capital Budgeting -Resource Allocation framework Key Criteria -Elementary Investment strategies -Portfolio planning tools -Generation of project Ideas Monitoring the environment -Corporate appraisal -Scouting for project ideas -Preliminary Screening Project rating index -Sources of Positive net present value

Module II (14hours)

Module III (13hours)
Project Cash flows -Basic I single amount -Future value of an annuity -Present value of a single amount -Present Value of an annuity-Cost of capital -Cost of debt capital -cost of preference capital -Rate of return -Cost of external equity and retained earnings -Determination of weights -Appraisal criterion -Net present value Cost benefit ratio-Internal rate of return-Urgency -payback period

Module IV (14hours)
Implementation-Forms of Project organization -Project planning -Project control -Human Aspects of Project management -Network Techniques -Development of Network -Time estimation -Critical path determination -Scheduling under limited resources -PERT Model-CPM Model -Network Cost System -Project review-Initial; review -Performance evaluation-Abandonment analysis
**Text Book:**

**Reference books**

---

**Internal Continuous Assessment** *(Maximum Marks-30)*

60% - Tests (minimum 2)

30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.

10% - Regularity in the class

---

**University Examination Pattern**

**PART A:** *Short answer questions (one/two sentences)*

5 x 2 marks=10 marks

All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** *Analytical/Problem solving questions*

4 x 5 marks=20 marks

Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** *Descriptive/Analytical/Problem solving questions*

4 x 10 marks=40 marks

Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
**Objectives**

- To impart knowledge about the principle and working of different types of bio-medical electronic equipments/devices

**Module I (14 hours)**

- Electrical activity of excitable cells-SD curve-functional organization of the peripheral nervous system-electrocardiogram (in detail with all lead systems)-electroencephalogram-electromyogram – electroneurogram- electrode –electrolyte interface-polarisation-polarisable and non polarisable electrodes- surface electrodes –needle electrodes-micro electrodes- practical hints for using electrodes-’skin- electrodes’ equivalent circuit-characteristics of ‘bio-amplifiers’

**Module II (14 hours)**


**Module III (13 hours)**


**Module IV (13 hours)**

- Physiological effects of electricity-important susceptibility parameters-macro shock hazards-micro shock hazards-protection against shock-electrical isolation- electrical safety analyzers-measurements of pH,pC2, and PO2

---

**Text Books**

1. Webster J,’ Medical Instrumentation-Application and Design’, John Wiley
2. Handbook of Biomedical Instrumentation, Tata-Migraw Hill, New Delhi

**Reference Books**

2. Encyclopedia of Medical Devices and Instumentation Wiley
**Internal Continuous Assessment (Maximum Marks-30)**

- **60%** - Tests (minimum 2)
- **30%** - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- **10%** - Regularity in the class

---

**University Examination Pattern**

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks  
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks  
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks  
Two questions from each module with choice to answer one question.

Maximum Total Marks: 70
IC09 L23 Bioinformatics

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives:

- To get the students acquainted with the interdisciplinary field of bioinformatics
- To expose the students to the biological database resources and tools
- To provide an introduction to the important problems and algorithms in bioinformatics.

Prerequisites

Familiarity with internet resources and an aptitude for learning algorithms along with high school level knowledge in biology.

Module I (14hours)
The biological backdrop:

Cells-Prokaryotes and Eukaryotes-DNA double helix- central dogma – DNA, RNA, aminoacids, Proteins-string representations- different levels of protein structures-DNA cloning- RFLP-SNP-Polymerase chain reaction (PCR)-gel electrophoresis-hybridization-A brief introduction to different mappings techniques of genomes- genome sequencing methods-DNA micro arrays –Human Genome Project-A glossary of biological terms.

Module II (14hours)
Bioinformatics-the big picture and the biological database resources:

Scope of bioinformatics-Genomics and Proteomics- A very brief introduction to major problems in bioinformatics like sequence alignment, phylogeny, gene finding, microarray analysis, secondary structure prediction, protein structure prediction, comparative genomics and drug design.

An introduction to the major re sources at NCBI, EBI and ExPASy- Nucleic acid sequence databases: GenBank, EMBL, DDBJ -Protein sequence databases: SWISS-PROT, TrEMBL, PIR_PSD - Genome Databases at NCBI, EBI, TIGR, SANGER – How to access these databases and to make use of the tools available. Various file formats for bio-molecular sequences like genbank and fasta.

The concept of profiles- The derived databases- Prosite, Pfam, PRINTS, CATH, SCOP

Module III (13 hours)
Sequence alignment algorithms and Tools:

Basic concepts of sequence similarity, identity and homology, definitions of homologues, orthologues, paralogues.

Scoring matrices: basic concept of a scoring matrix, PAM and BLOSUM matrices, differences between distance & similarity matrix.

Pairwise sequence alignments: basic concepts of sequence alignment, Needleman & Wuncsh, Smith & Waterman algorithms for pairwise alignments. BLAST and FASTA and their versions.

Multiple sequence alignments (MSA): the need for MSA, basic concepts of various approaches for MSA (e.g. progressive, hierarchical etc.). Algorithm of CLUSTALW.

Module IV (13 hours)
Phylogeny, gene finding and molecular visualization:

Phylogeny: Basic concepts of phylogeny; molecular evolution; Definition and description of phylogenetic trees. Phylogenetic analysis algorithms - Maximum Parsimony, UPGMA and Neighbour-Joining.

Gene Finding: The six reading frames-Computational gene finding in prokaryotes and eukaryotes Basic signals –start and stop codons, promoters etc- important coding measures- Regular expressions- Introduction to Hidden Markov models- Introduction to genomic signal processing.

Molecular visualization: Visualization of protein structures using Rasmol or Rastop.
Text Books
1. Dan E. Krane and Michael L. Raymer, *Fundamental concepts of Bioinformatics*, Pearson Education

References
2. Resources at web sites of NCRI, EBI, SANGER, PDB etc.

Internal Continuous Assessment (Maximum Marks-30)
60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class

University Examination Pattern

**PART A:** Short answer questions (one/two sentences)  
5 x 2 marks = 10 marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** Analytical/Problem solving questions  
4 x 5 marks = 20 marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** Descriptive/Analytical/Problem solving questions  
4 x 10 marks = 40 marks
Two questions from each module with choice to answer one question.

*Maximum Total Marks: 70*
PE09 L23: Total Quality Management

Objectives
- To impart knowledge on the concept of quality tools for analysing quality statistical tools in quality acceptance sampling and life tests.

Module I (14 hours)
Definition of quality—internal and external customers—vision statement—mission statements—objectives—goals—targets—evolution of TQM—Defining TQM—stages in TQM implementation—TQM models.

Module II (14 hours)
SWOT analysis—strategic planning—customer focus—quality function deployment—customer satisfaction measurement—seven new management tools—Deming wheel—zero defect concept—benchmarking—six sigma concepts—failure mode and effect analysis—pok yoke.

Module III (13 hours)
Five S for quality assurance—quality circle philosophy—failure rate analysis—mean failure rate—mean time to failure (MTTF)—mean time between failure (MTBF)—hazard models—system reliability—availability—maintenance.

Module IV (13 hours)

Text Books

Reference Books

Internal Continuous Assessment *(Maximum Marks-30)*
- 60% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- 10% - Regularity in the class
| **University Examination Pattern** |
|-------------------------------|-----------------|
| **PART A:** Short answer questions (one/two sentences) | 5 x 2 marks=10 marks |
| All questions are compulsory. There should be at least one question from each module and not more than two questions from any module. |
| **PART B:** Analytical/Problem solving questions | 4 x 5 marks=20 marks |
| Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module. |
| **PART C:** Descriptive/Analytical/Problem solving questions | 4 x 10 marks=40 marks |
| Two questions from each module with choice to answer one question. |

*Maximum Total Marks: 70*
CE09 L24: REMOTE SENSING AND GIS

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives

• To make the students aware of the technological developments in the geographical database management and its advantages

Module I (14 Hours)


Module II (14 Hours)
Opticaa and Microwave Remote sensing:

Module III (13 Hours)

Module IV (13 Hours)

Text books:
1. Anji Reddy, Remote sensing and Geographical systems, BS Publications
2. M G Srinivas (Edited by), remote sensing applications, Nerusa publishing house
3. Lillesand T M and Kuefer R W., Remote sensing and image interpretation, John Wiley and sons

References:
CE09 L25 FINITE ELEMENT METHODS

Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objective:
- To make the background, basic concepts and basic formulation of finite element method clear to the students

Module I (14 hours)


Module II (13 hours)
Continuous systems: Practical Examples – mathematical models- differential formulation – limitations – Variational formulation – Total potential energy - principle of stationary potential energy - problems having many d.o.f - potential energy of an elastic body - the Rayleigh-Ritz method - piecewise polynomial field - finite element form of Rayleigh-Ritz method - finite element formulations derived from a functional - interpolation - shape functions for $C^0$ and $C^1$ elements - Lagrangian interpolation functions for two and three dimensional elements

Module III (13 hours)
Displacement based elements for structural mechanics: formulas for element stiffness matrix and load vector - overview of element stiffness matrices - consistent element nodal vector - equilibrium and compatibility in the solution - convergence requirements - patch test - stress calculation - other formulation methods

Straight sided triangles and tetrahedral: natural coordinates for lines - triangles and tetrahedral - interpolation fields for plane triangles - linear and quadratic triangle - quadratic tetrahedron

Module IV (14 hours)

Coordinate transformation: transformation of vectors - transformation of stress, strain and material properties - transformation of stiffness matrices - transformation of flexibility to stiffness - inclined support - joining dissimilar elements to one another- rigid links - rigid elements

Text books:
1. Bathe K.J., Finite Element Procedures in Engineering Analysis, Prentice Hall of India
2. Cook R.D., Malkus D.S. & Plesha M.F., Concepts & Applications of Finite Element Analysis, John Wiley
### Reference books:
1. Desai C.S., Elementary Finite Element Method, Prentice Hall of India

### Internal Continuous Assessment *(Maximum Marks-30)*
- 60% - Tests (minimum 2)
- 30% - Assignments (minimum 2) such as homework, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
- 10% - Regularity in the class

### University Examination pattern
**PART A:** *Short answer questions 5×2 marks=10 Marks*
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

**PART B:** *Analytical / Problem solving questions 4×5 marks=20 Marks*
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

**PART C:** *Problem solving questions. 4×10 marks= 40 Marks*
Two questions from each module with choice to answer one question.

*Maximum Total marks: 70*
Teaching scheme
3 hours lecture and 1 hour tutorial per week

Credits: 4

Objectives:
- To impart knowledge on bioethics and intellectual property rights
- To study the various ethical issues in biotechnology

Module I

Module II
Intellectual Property Rights – Development and need for IPR in knowledge based industries. Various types of intellectual Property Rights with examples (Trademarks, copyrights, Industrial Designs, Patents, Geographical Indicators etc) – Objectives of the patent system – Basic Principles and General Requirements of Patents (Novelty, Utility Non obviousness. Etc) and tenets of patent law – Product and process Patents

Module III


Module IV

Text Books
University Examination pattern

PART A: Short answer questions $5 \times 2$ marks = 10 Marks
All questions are compulsory. There should be at least one question from each module and not more than two questions from any module.

PART B: Analytical / Problem solving questions $4 \times 5$ marks = 20 Marks
Candidates have to answer four questions out of six. There should be at least one question from each module and not more than two questions from any module.

PART C: Problem solving questions $4 \times 10$ marks = 40 Marks
Two questions from each module with choice to answer one question.

Maximum Total marks: 70

Internal Continuous Assessment (Maximum Marks-30)

60% - Tests (minimum 2)
30% - Assignments (minimum 2) such as home work, problem solving, group discussions, quiz, literature survey, seminar, term-project, software exercises, etc.
10% - Regularity in the class