M.Sc COMPUTER SCIENCE

Course Structure and Syllabus

(For the candidates admitted from the academic year 2020-2021 onwards)

CHOICE BASED CREDIT SYSTEM

(CBCS)

THANHTHAI HANS ROEVER COLLEGE (AUTONOMOUS)

(Nationally Re-Accredited by NAAC with B++)

(Affiliated to Bharathidasan University, Tiruchirappalli)

ELAMBALUR, PERAMBALUR – 621 220
VISION:

- To be a Centre of excellence in education and research in the frontier areas of Computer Science

MISSION:

- To facilitate quality transformative education in Computer Science
- To promote quality research and innovation in technology for meeting global challenges

To transform students to competent professionals to cater to the needs of the society
Programme Outcomes (POs)

Upon completion of the programme, the postgraduate will be able to

1. Gain advanced knowledge resulting in entrepreneurship; innovation and newer opportunities for being employable in public and private sectors, research and development organizations
2. Apply enhanced new techniques and adopt new technologies needed in the respective disciplines
3. Appreciate the diversity of behaviour in professional practice and act in accordance with the core values of chosen profession
4. Demonstrate the knowledge, values and skills to be critical consumer of research practice and possess investigative skills to evaluate the practice
5. Engage in lifelong learning process, have the ability to communicate the findings of Physical Sciences with the current knowledge

Programme Specific Outcomes (PSOs)

Upon completion of the programme, the postgraduate will be able to

1. Basic fundamental knowledge in Mathematical problem solving and to identify, analyze, design, optimize and implement system solutions using appropriate algorithms of varying complexity.
2. Ability to demonstrate understanding of the working principles of the hardware and software aspects and development methodologies of the software systems
3. Communicate computer science concepts, designs, and solutions effectively and professionally
4. Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing problems
5. Basic knowledge for solving real-life and R&D problems with an orientation to lifelong learning
<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Title of the Course</th>
<th>Ins. Hours/ Weeks</th>
<th>Credit</th>
<th>Exam Hours</th>
<th>CIA (Max)</th>
<th>ESE (Max)</th>
<th>Total (Max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>20PCS1CC1</td>
<td>Design &amp; Analysis of Algorithms</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>20PCS1CC2</td>
<td>Advanced Web Technologies</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>20PCS1CC3</td>
<td>Advanced Database Management System</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>20PCS1CC4</td>
<td>Compiler Design</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>20PCS1CP1</td>
<td>Advanced Web Technologies Lab</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td></td>
<td><strong>20</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>500</strong></td>
</tr>
<tr>
<td>2</td>
<td>20PCS2CC5</td>
<td>Distributed Operating System</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20PCS2CC6</td>
<td>Advanced Java Programming</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20PCS2EC1:1</td>
<td>Advanced Computer Network</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20PCS2EC1:2</td>
<td>Cloud Computing</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20PCS2EC1:3</td>
<td>Web Services</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20PCS2EC2:1</td>
<td>Object Oriented System Development</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20PCS2EC2:2</td>
<td>Mobile Computing</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20PCS2EC2:3</td>
<td>Wireless Networks</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>20PCS2CP2</td>
<td>Advanced Java Lab</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td></td>
<td><strong>24</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>500</strong></td>
</tr>
<tr>
<td>3</td>
<td>20PCS3CC7</td>
<td>Cryptography and Network Security</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>20PCS3CC8</td>
<td>Digital Image Processing</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>20PCS3EC3:1</td>
<td>Theory of computation</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>20PCS3EC3:2</td>
<td>Optimization Techniques</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>20PCS3EC3:3</td>
<td>Embedded Systems</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>20PCS3EC4:1</td>
<td>WAP &amp; XML</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>20PCS3EC4:2</td>
<td>Statistical Computing</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>20PCS3EC4:3</td>
<td>Software Project Management</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>3</td>
<td>20PCS3CP3</td>
<td>Image processing Lab</td>
<td>6</td>
<td>4</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td></td>
<td><strong>24</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>-</strong></td>
<td><strong>500</strong></td>
</tr>
<tr>
<td>4</td>
<td>20PCS4CC9</td>
<td>Internet of Things</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>4</td>
<td>20PCS4CC10</td>
<td>Machine Learning</td>
<td>6</td>
<td>5</td>
<td>3</td>
<td>25</td>
<td>75</td>
<td>100</td>
</tr>
<tr>
<td>Elective</td>
<td>Course Code</td>
<td>Title of the Course</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>---------------</td>
<td>---------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective -1</td>
<td>20PCS2EC1:1</td>
<td>1. Advanced Computer Network</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS2EC1:2</td>
<td>2. Cloud Computing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS2EC1:3</td>
<td>3. Web Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective -2</td>
<td>20PCS2EC2:1</td>
<td>1. Object Oriented System Development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS2EC2:2</td>
<td>2. Mobile Computing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS2EC2:3</td>
<td>3. Wireless Networks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective - 3</td>
<td>20PCS3EC3:1</td>
<td>1. Theory of computation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS3EC3:2</td>
<td>2. Optimization Techniques</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS3EC3:3</td>
<td>3. Embedded Systems</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective - 4</td>
<td>20PCS32EC4:1</td>
<td>1. WAP &amp; XML</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS3EC4:2</td>
<td>2. Statistical Computing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS3EC4:3</td>
<td>3. Software Project Management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elective –5</td>
<td>20PCS4EC5:1</td>
<td>1. Data Mining</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS4EC5:2</td>
<td>2. Soft Computing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>20PCS4EC5:3</td>
<td>3. Data Science and Big Data Analytics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Note:

<table>
<thead>
<tr>
<th>Component</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project</td>
<td>100</td>
</tr>
<tr>
<td>Dissertation</td>
<td>80</td>
</tr>
<tr>
<td>Viva Voce</td>
<td>20</td>
</tr>
</tbody>
</table>

Core Papers - 10
Core Practical - 4
Elective Papers - 5
Project - 1

1. Theory Internal 25 marks External 75 marks
2. Practical ” 40 marks ” 60 marks

3. Separate passing minimum is prescribed for Internal and External
   a) The passing minimum for CIA shall be 40% out of 25 marks (i.e. 10 marks)
   b) The passing minimum for University Examinations shall be 40% out of 75 marks (i.e. 30 marks)
   c) The passing minimum not less than 50% in the aggregate.
SEMESTER – I

Course Code: 20PCS1CC1
Instruction Hours: 6
Credits: 4
Exam Hours: 3
Internal Marks: 25
External Marks: 75

CORE COURSE 1 – DESIGN AND ANALYSIS OF ALGORITHMS

Course Outcomes:

On successful completion of the course, students will able to

CO1: It gives stepwise procedure to solve problems
CO2: The problems can be broken down into small pieces for program development.
CO3: Efficient approach of solving problems by a model of computations
CO4: It gives the knowledge of programming skill
CO5: Impact the knowledge of to design and find solution for real time Problems in lifelong learning

Unit - I

Unit-II

Unit - III

Unit - IV

Unit - V
Backtracking: The General Method – The 8-Queens Problem – Sum of Subsets – Graph Coloring – Hamiltonian Cycles – Knapsack Problem Branch and Bound: Least Cost searched - 0/1 Knapsack Problem.
Text Book(s):


Reference Book(s):

1. Data Structures Using C - Langsam, Augenstien, Tenenbaum, PHI
2. Data structures and Algorithms, V.Aho, Hopcropft, Ullman, LPE
3. Introduction to design and Analysis of Algorithms - S.E. Goodman, ST. Hedetniem- TMH.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20PC1CC1</td>
<td>Design and Analysis of Algorithms</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High

<table>
<thead>
<tr>
<th>Mapping</th>
<th>1-29%</th>
<th>30-59%</th>
<th>60-69%</th>
<th>70-89%</th>
<th>90-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matches</td>
<td>1-14</td>
<td>15-29</td>
<td>30-34</td>
<td>35-44</td>
<td>45-50</td>
</tr>
<tr>
<td>Relationship</td>
<td>Very Poor</td>
<td>Poor</td>
<td>Moderate</td>
<td>High</td>
<td>Very High</td>
</tr>
</tbody>
</table>
SEMESTER – I

Course Code: 20PCS1CC2
Instruction Hours: 6
Credits: 4
Exam Hours: 3
Internal Marks: 25
External Marks: 75

CORE COURSE 2 - ADVANCED WEB TECHNOLOGIES

Course Outcomes:

On successful completion of the course, students will able to

CO1: Design a web page with Web form fundamentals and web control classes
CO2: Recognize the importance of various web development tools and methods of web services
CO3: Efficient approach of solving problems by web development controls
CO4: Provides the knowledge of programming skill and enables the skills of entrepreneurship development
CO5: Impact the knowledge of to design web sites for real time requirements in lifelong learning

Unit - I
OVERVIEW OF ASP.NET - The .NET framework – Learning the .NET languages Data types – Declaring variables- Scope and Accessibility- Variable operations- Object Based manipulation- Conditional Structures- Loop Structures- Functions and Subroutines. Types, Objects and Namespaces : The Basics about Classes- Value types and Reference types- Advanced class programming- Understanding name spaces and assemblies. Setting up ASP.NET and IIS

Unit – II

Unit – III
Unit - IV

**Web Services** - Web services Architecture: Internet programming then and now- WSDL–SOAP- Communicating with a web service-Web service discovery and UDDI. Creating Web services: Web service basics- The Stock Quote web service – Documenting the web service- Testing the web service- Web service Data types- ASP.NET intrinsic objects. Using web services: Consuming a web service- Using the proxy class- An example with Terra Service.

Unit – V


**Text Book(s):**

1. Mathew Mac Donald, “ASP.NET Complete Reference”, TMH 2005

**Reference Book(s):**


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20PC1CC2</td>
<td>Advanced Web Technologies</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 39, Relationship: High
SEMESTER – I

Course Code: 20PCS1CC3
Exam Hours: 3
Instruction Hours: 6
Internal Marks: 25
Credits: 4
External Marks: 75

CORE COURSE 3 – ADVANCED DATABASE MANAGEMENT SYSTEMS

Course Outcomes:

On successful completion of the course, students will able to

CO1: Demonstrate an understanding of the elementary & advanced features of DBMS & RDBMS
CO2: Attain a good practical understanding of the SQL
CO3: Develop clear concepts about Relational Model
CO4: Examine techniques pertaining to Database design practices
CO5: Execute various advance SQL queries related to Transaction Processing & Locking using concept of concurrency control

Unit - I

Unit - II
Distributed and Object based Databases: Architecture, Distributed data storage, Distributed transactions, Commit protocols, Concurrency control, Query Processing. Complex Data Types, Structured Types and Inheritance, Table Inheritance, array and Multiset, Object Identity and Reference Types, Object Oriented versus Object Relational.

Unit - III

Unit - IV

Unit - V
Temporal Databases: Introduction, Intervals, Packing and Unpacking Relations, Generalizing the relational Operators, Database Design, Integrity Constraints,
Multimedia Databases: Multimedia Sources, Multimedia Database Queries, Multimedia Database Applications.

Text Book(s):

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20PC1CC3</td>
<td>Advanced Database Management Systems</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1 PO2 PO3 PO4 PO5 PSO1 PSO2 PSO3 PSO4 PSO5</td>
<td></td>
</tr>
<tr>
<td>CO1</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
</tr>
<tr>
<td>CO2</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
</tr>
<tr>
<td>CO4</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓</td>
<td></td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High
SEMESTER – I

Course Code: 20PCS1CC4
Instruction Hours: 6
Credits: 4

Exam Hours: 3
Internal Marks: 25
External Marks: 75

CORE COURSE 4 - COMPILER DESIGN

Course Outcomes:

On successful completion of the course, students will able to

**CO1:** Understand the major phases of compilation and to understand the knowledge of Lex tool & YAAC tool
**CO2:** Develop the parsers and experiment the knowledge of different parsers design without automated tools
**CO3:** Construct the intermediate code representations and generation
**CO4:** Apply for various optimization techniques for dataflow analysis
**CO5:** Use the knowledge of patterns, tokens & regular expressions for solving a problem in the field of data mining

Unit – I

Unit – II
Syntax Analysis - The role of the parser - Context-free grammars - Writing a grammar - Top down Parsing - Bottom-up Parsing - LR parsers- LALR parsers.

Unit – III

Unit – IV

Unit – V
Text Book(s):


Reference Book(s):


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20PC1CC4</td>
<td>Compiler Design</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 38, Relationship: High
SEMESTER - I

Course Code: 20PCS1CP1
Instruction Hours: 6
Credits: 4

Exam Hours: 3
Internal Marks: 40
External Marks: 60

CORE PRACTICAL 1 – ADVANCED WEB TECHNOLOGIES LAB

Course Outcomes:

On successful completion of this course, Students will be able to:

**CO1**: Develop to build a complete web application using .NET Framework
**CO2**: Create interactive web pages using web controls
**CO3**: Able to connect with databases using ADO.NET and ASP.NET
**CO4**: Develop a simple web application using server side PHP programming and database connectivity using MYSQL
**CO5**: Able to create a complete web application with all the required modules

1. Create a welcome Cookie (Hit for a page) and display different image and text content each time when the user hit the page
2. List a table of content and navigate within the pages.
3. Demonstrate Request and Response object using HTML Form.
4. Database Connection to display all the values in the table in a webpage using ADO.NET.
5. Query textbox and Displaying records & Display records by using database
6. Write LINQ queries to access the database.
7. Write a program to get the information from the user and display it in a message box.
8. Write a program to receive user feedback using Form and stored it in a database.
9. Create a web service using ASP.NET
10. Write a component based programming using advanced ASP.NET
### Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>20PCS1CP1</td>
<td>Advanced Web Technologies Lab</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High
SEMESTER – II

Course Code: 20PCS2CC5
Instruction Hours: 6
Credits: 5
Exam Hours: 3
Internal Marks: 25
External Marks: 75

CORE COURSE 6 – DISTRIBUTED OPERATING SYSTEM

Course Outcomes:

On successful completion of the course, students will able to

**CO1:** Clear understanding on several resource management techniques like distributed shared memory and other resources

**CO2:** Knowledge to understand hardware, software and communication in distributed OS

**CO3:** Understand the different Distributed Systems and the challenges involved in Design of the Distributed Systems

**CO4:** Able to design and implement algorithms of distributed shared memory and commit protocols

**CO5:** Able to design and implement fault tolerant distributed systems

Unit - I

Unit - II

Unit - III

Unit - IV
Unit - V
Process Synchronization – Processor Scheduling – Memory management –
Reliability/Fault Tolerance – Database Operating Systems – concepts – Features of
Android OS, Ubuntu, Google Chrome OS and Linux operating systems.

Text Book(s):
2. Distributed Operating System – Andrew S. Tanenbaum, PHI.

Reference Book(s):
   Addison Wesley 2001

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PC2CC5</td>
<td>Distributed Operating System</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 38, Relationship: High
CORE COURSE 6 – ADVANCED JAVA PROGRAMMING

Course Outcomes:

On successful completion of the course, students will able to

- **CO1**: Knowledge of the structure and model of the Java programming language
- **CO2**: Use the Java programming language for various programming technologies
- **CO3**: Develop software in the Java programming language
- **CO4**: Evaluate user requirements for software functionality required to decide whether the Java programming language can meet user requirements
- **CO5**: Propose the use of certain technologies by implementing them in the Java programming language to solve the given problem

**Unit - I**
Design Patterns: Introduction to Design patterns - Catalogue for Design Pattern - Factory Method Pattern, Prototype Pattern, Singleton Pattern- Adapter Pattern- Proxy Pattern- Decorator Pattern- Command Pattern- Template Pattern- Mediator Pattern

**Unit - II**

**Unit - III**
JDBC -Introduction - JDBC Architecture - JDBC Classes and Interfaces – Database Access with MySQL -Steps in Developing JDBC application - Creating a New Database and Table with JDBC - Working with Database Metadata; Java Networking Basics of Networking - Networking in Java- Socket Program using TCP/IP - Socket Program using UDP- URL and Inet address classes.

**Unit - IV**
Unit - V
Collection Framework – Array List class – Linked List class – Array List vs. Linked List - List Iterator interface - Hash Set class- Linked Hash Set class-Tree Set class Priority Queue class - Map interface-Hash Map class- Linked Hash Map class -Tree Map class - Comparable interface -Comparator interface-Comparable vs. Comparator

Text Book(s):

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PC2CC6</td>
<td>Advanced Java Programming</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High
SEMESTER – II

Course Code: 20PCS2EC1:1
Instruction Hours: 6
Credits: 5

Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 1 (1) - ADVANCED COMPUTER NETWORKS

Course Outcomes:

On successful completion of this course students will be able to

CO1: Basic understanding of computer networks and concepts of the OSI reference model, TCP-IP reference model
CO2: Impact the knowledge for use protocols, network interfaces and design/performance issues in local area networks and wide area networks
CO3: Understand the wireless networking concepts, and be familiar with contemporary Issues in networking technologies
CO4: To be familiar with network tools and network programming
CO5: Develop current research problems and research methods in advance computer networks

Unit - I

Unit - II

Unit - III

Unit - IV
Network layer - design issues - Routing algorithms - Congestion control algorithms – Quality of Service – Network layer of Internet- IP protocol – IP Address – Internet Control Protocol

Unit - V
Text Book(s):

Reference Book(s):

Website, E-learning resources
1) http://peasonhighered.com/tanenbaum

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PCS2EC1:1</td>
<td>Advanced Computer Networks</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 38, Relationship: High
SEMESTER – II

Course Code: 20PCS2EC1:2
Instruction Hours: 6
Credits: 5
Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 1 (2) – CLOUD COMPUTING

Course Outcomes:

On successful completion of this course students will be able to

CO1: Articulate the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing

CO2: Ability to explain the core issues of cloud computing such as security, privacy and interoperability

CO3: Choose the appropriate technologies, algorithms, and approaches for the related issues and identify problems, and explain, analyze, and evaluate various cloud computing solutions

CO4: Provide the appropriate cloud computing solutions and recommendations according to the applications used

CO5: Attempt to generate new ideas and innovations in cloud computing and collaboratively research and write a research paper, and present the research online.

Unit – I
COMPUTING BASICS

Unit - II
VIRTUALIZATION, CLOUD SERVICES AND PLATFORMS
Virtualization: Virtualization- Characteristics- taxonomy-types- Pros and Cons- Examples Architecture: Reference model- types of clouds- Compute Service - Storage Services - Cloud Database Services - Application Services - Content Delivery Services - Analytics Services - Deployment And Management Service - Identity And Access Management Services - Open Source Private Cloud Software.

Unit – III
CLOUD APPLICATION DESIGN AND DEVELOPMENT
Unit – IV
PYTHON FOR CLOUD


Unit – V
BIG DATA ANALYTICS, MULTIMEDIA CLOUD & CLOUD SECURITY


Text Book(s):


Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PCS2EC1:2</td>
<td>Cloud Computing</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 37, Relationship: High
SEMESTER – II

Course Code: 20PCS2EC1:3  
Instruction Hours: 6  
Credits: 5  
Exam Hours: 3  
Internal Marks: 25  
External Marks: 75

ELECTIVE COURSE 1 (3) – WEB SERVICES

Course Outcomes:

On successful completion of this course students will be able to

**CO1:** Understand the design principles and application of SOAP and REST based web services.

**CO2:** Design collaborating web services according to a specification.

**CO3:** Implement an application that uses multiple web services in a realistic business scenario

**CO4:** Use industry standard open source tools such as Apache Axis2, Tomcat, Derby and Eclipse to build, test, deploy and execute web services and web applications that consume them

**CO5:** Indentify and select the appropriate framework components in creation of web service solution

Unit – I
Overview of Distributed Computing, Introduction to web services – Industry standards, Technologies and concepts underlying web services – their support to web services. Applications that consume web services.

Unit – II
XML – its choice for web services – network protocols to back end databases- technologies – SOAP, WSDL – exchange of information between applications in distributed environment – locating remote web services – its access and usage. UDDI specification – an introduction

Unit - III
A brief outline of web services – conversation – static and interactive aspects of system interface and its implementation, work flow – orchestration and refinement, transactions, security issues – the common attacks – security attacks facilitated within web services quality of services – Architecting of systems to meet users requirement with respect to latency, performance, reliability, QOS metrics, Mobile and wireless services – energy consumption, network bandwidth utilization, portals and services management.

Unit – IV
Building real world enterprise applications using web services – sample source codes to develop web services – steps necessary to build and deploy web services and client applications to meet customer’s requirement – Easier development, customization, maintenance, transactional requirements, seamless porting to multiple devices and platforms.
Unit - V
Deployment of Web services and applications onto Tomcat application server and axis SOAP server (both are free wares) – Web services platform as a set of enabling technologies for XML based distributed computing.

Text Book(s):


Reference Book(s):


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PCS2EC1:3</td>
<td>Web Services</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 39, Relationship: High
ELECTIVE COURSE 2 (I) – OBJECT ORIENTED SYSTEMS DEVELOPMENT

Course Outcomes:

On successful completion of this course students will be able to

CO1: Show how the object-oriented approach differs from the traditional approach to systems analysis and design

CO2: Analyze, design, document the requirements through use case driven approach

CO3: Explain the importance of modeling and how the Unified Modeling Language (UML) represents an object-oriented system using a number of modeling views

CO4: Recognize the difference between various object relationships: inheritance, association and aggregation

CO5: Show the role and function of test cases, testing strategies and test plans in developing object-oriented software

Unit – I

Unit – II

Unit – III

Unit – IV
Object Oriented Design - Object Oriented Design Process and Design Axioms - OOD

Unit – V


**Text Book(s):**


**Reference Book(s):**


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PCS2EC2:1</td>
<td>Object Oriented System Development</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 37, Relationship: High
SEMESTER – II

Course Code: 20PCS2EC2:2
Instruction Hours: 6
Credits: 5

Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 2 (2) - MOBILE COMPUTING

Course Outcomes:

On successful completion of this course students will be able to

CO1: Ability to explain the principles and theories of mobile computing technologies.
CO2: Describe infrastructures and technologies of mobile computing technologies
CO3: Impact he knowledge to develop applications in different domains that mobile computing offers to the public, employees, and businesses
CO4: Understand the Mobile Ad hoc networks and its routing
CO5: Describe the possible future of mobile computing technologies, securities and applications

Unit - I
Basics of mobile - Mobile device profiles - Middleware and gateways - Wireless Internet - Smart clients - Three-tier Architecture- Design considerations for mobile computing— Mobility and Location based services.

Unit - II
Mobile computing through Internet - Mobile-enabled Applications - Developing Mobile GUIs – VUIs and Mobile Applications – Characteristics and benefits -Multichannel and Multi modal user interfaces – Synchronization and replication of Mobile Data - SMS architecture – GPRS – Mobile Computing through Telephony.

Unit - III

Unit - IV

Unit - V
Text Book(s):

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PCS2EC2:2</td>
<td>Mobile Computing</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 36, Relationship: High
Course Code: 20PCS2EC2:3
Instruction Hours: 6
Credits: 5
Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 3 (3) – WIRELESS NETWORKS

Course Outcomes:

On successful completion of the course, the Students will be able to

**CO1:** To Conversant with the latest 3G/4G and WiMAX networks and its architecture.

**CO2:** Analyze security, energy efficiency, mobility, scalability, and their unique characteristics in wireless networks

**CO3:** Understand the transmission of voice and data through various networks.

**CO4:** To design and implement wireless network environment for any Application using latest wireless protocols and standards

**CO5:** To implement different type of applications for smart phones and mobile devices with latest network strategies

**Unit - I**


**Unit - II**


**Unit - III**


**Unit - IV**

Unit - V

Text Book(s):

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PCS2EC2:3</td>
<td>Wireless Networks</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (COS)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 39, Relationship: High
SEMESTER - II

Course Code: 20PCS2CP2
Instruction Hours: 6
Credits: 4

Exam Hours: 3
Internal Marks: 40
External Marks: 60

CORE PRACTICAL 2 – ADVANCED JAVA LAB

Course Outcomes:

On successful completion of the course, students will able to

CO1: Provides knowledge of Internet Programming, using Java Applets
CO2: Ability to use a full set of GUI widgets and other components, including windows, menus, buttons, checkboxes, text fields, scrollbars and scrolling lists, using AWT and Swings
CO3: Develop the applications using Java Data Base Connectivity (JDBC)
CO4: Impact the knowledge for creation of dynamic web pages, using Servlets and JSP.
CO5: Understand the frameworks; this gives the opportunity to reuse the codes for quick development

1. Write java program to create and display singly linked list
2. Write a java program to developing Applet Program with Passing Values through Parameters
3. Write a java program to create a button and click on the button, the application terminates using swing
4. Write a java program to generate mouse move events using swing
5. Write a java program to update customer information using JDBC with MYSQL connection
6. Write a java program to generate simple plain text using servlet
7. Write a java program to display the cookie id using servlet
8. Write a java program to create JSP page for basic arithmetic functions
9. Write a JSP Program to validate username and password
10. Write a java program for using TCP socket client/server communication
Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>20PCS2CP2</td>
<td>Advanced Java Lab</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High
SEMESTER - III

Course Code: 20PCS3CC7
Exam Hours: 3
Instruction Hours: 6
Internal Marks: 25
Credits: 5
External Marks: 75

CORE COURSE 7 - CRYPTOGRAPHY AND NETWORK SECURITY

Course Outcomes:

On successful completion of the course, students will be able to

**CO1:** Understand the fundamentals of networks security, security architecture, threats and vulnerabilities

**CO2:** Apply the different cryptographic operations of symmetric and public key cryptographic algorithms

**CO3:** Apply the various Authentication schemes to simulate different applications.

**CO4:** Understand various Security practices and System security standards

**CO5:** Be able to digitally sign emails and files

Unit - I


Unit - II


Unit - III


Unit - IV

Unit - V

**Intruders:** Intruders, Intrusion Detection, Password Management. **Malicious Software:** Virus and Related Threats, Virus Countermeasures, Distributed Denial of Service Attacks. **Firewalls:** Firewall Design Principles, Trusted Systems, Common Criteria for Information Technology Security Evaluation.

**Text Book(s):**


**Reference Book(s):**


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3CC7</td>
<td>Cryptography and Network Security</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (√) = 40, Relationship: High
SEMESTER - III

Course Code: 20PCS3CC8
Instruction Hours: 6
Credits: 5

Exam Hours: 3
Internal Marks: 25
External Marks: 75

CORE COURSE 8 - DIGITAL IMAGE PROCESSING

Course Outcomes:

On successful completion of the course, students will able to

**CO1:** Review the fundamental concepts of a digital image processing system and Analyze images in the frequency domain using various transforms.

**CO2:** Evaluate the techniques for image enhancement and image restoration. Categorize various compression techniques.

**CO3:** Interpret Image compression standards, and Interpret image segmentation and representation techniques.

**CO4:** Gain idea to process various image used in various fields such as weather forecasting, Diagnosis of various decease using image such as tumor, cancer etc.

**CO5:** Understand the rapid advances in Machine vision..

Unit – I

**Fundamentals:** Image Sensing and Acquisition, Image Sampling and Quantization, relationship between Pixels; Random noise; Gaussian Markov Random Field, $\sigma$-field, Linear and Non-linear Operations; Image processing models: Causal, Semi-causal, Non-causal models.


Unit – II

**Spatial Domain:** Enhancement in spatial domain: Point processing; Mask processing; Smoothing Spatial Filters; Sharpening Spatial Filters; Combining Spatial Enhancement Methods.

**Frequency Domain:** Image transforms: FFT, DCT, Karhunen-Loeve transform, Hotlling’s $T^2$ transform, Wavelet transforms and their properties. Image filtering in frequency domain

Unit – III

**Edge Detection:** Types of edges; threshold; zero-crossing; Gradient operators: Roberts, Prewitt, and Sobel operators; residual analysis based technique; Canny edge detection. Edge features and their applications.

Unit – IV

**Image Compression:** Fundamentals, Image Compression Models, Elements of Information Theory. Error Free Compression: Huff-man coding; Arithmetic coding; Wavelet transform based coding; Lossy Compression: FFT; DCT; KLT; DPCM;
MRFM based compression; Wavelet transform based; Image Compression standards.

Unit – V

**Image Segmentation:** Detection and Discontinuities: Edge Linking and Boundary Deduction; Threshold; Region-Based Segmentation. Segmentation by Morphological watersheds- The use of motion in segmentation, Image Segmentation based on Color-Morphological Image Processing: Erosion and Dilation, Opening and Closing, Hit-Or-Miss Transformation, Basic Morphological Algorithms, Gray-Scale Morphology.

**Text Book(s):**

**Reference Book(s):**

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3CC8</td>
<td>Digital Image Processing</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>❌</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 38, Relationship: High
SEMESTER – III

Course Code: 20PCS3EC3:1
Instruction Hours: 6
Credits: 5
Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 3 (1) - THEORY OF COMPUTATION

Course Outcomes:
On successful completion of the course, students will able to

**CO1**: Analyze and design finite automata, pushdown automata, Turing machines, formal languages, and grammars.

**CO2**: Demonstrate their understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving.

**CO3**: Understanding the basic results of the Theory of Computation, state and explain the relevance of the Church-Turing thesis.

**CO4**: Recognize and comprehend formal reasoning about languages

**CO5**: Able to subdivide problem space based on input subdivision using constraints

**Unit - I**

**Unit - II**
Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.

**Unit - III**

**Unit - IV**
Normal forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM. A language that is not Recursively Enumerable (RE)

**Unit - V**
An undecidable problem RE – Undecidable problems about Turing Machine – Post’s Correspondence Problem – The classes P and NP
Text Book(s):


Reference Book(s):


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3EC31</td>
<td>Theory of Computation</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 39, Relationship: High
SEMESTER – III

Course Code: 20PCS2EC3:2
Instruction Hours: 6
Credits: 5
Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 3 (2) - OPTIMIZATION TECHNIQUES

Course Outcomes:

On successful completion of the course, students will able to

**CO1:** Solve optimization problems using classical optimization techniques

**CO2:** Solve simple non-linear multivariable optimization problems

**CO3:** Describe clearly a problem, identify its parts and analyze the individual functions.
   Feasibility study for solving an optimization problem

**CO4:** Evaluate and measure the performance of an algorithm, Discovery, study and solve optimization problems.

**CO5:** Understand optimization techniques using algorithms, and Investigate, study, develop, organize and promote innovative solutions for various applications.

Unit – I
Linear Programming Problem (LPP): Formulations and graphical solution of (2 variables) canonical and standard terms of linear programming problem. Simplex method, two phase simplex method

Unit – II
Duality in LPP- dual problem to primal- primal to dual problem- duality simplex method-Revised simplex method-revised simplex algorithm-revised simplex method versus simplex method

Unit – III

Unit – IV
Replacement Problem: Replacement policy for equipment that deteriorate gradually, Replacement of item that fail suddenly- Individual and group replacement, Problems in mortality and staffing.

Unit – V
Text Book(s):

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3EC3:2</td>
<td>Optimization Techniques</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 38, Relationship: High
SEMESTER – III

Course Code: 20PCS3EC3:3
Instruction Hours: 6
Credits: 5

Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 3 (3) - EMBEDDED SYSTEMS

Course Outcomes:

On Successful completion of the course, students will able to

CO1: Describe the differences between the general computing system and the embedded system, also recognize the classification of embedded systems.

CO2: Be familiar with working on a team to create and apply embedded systems,

CO3: Become aware of interrupts, hyper threading and software optimization.

CO4: Design real time embedded systems using the concepts of RTOS.

CO5: interpret application specifications and make practical recommendations on resource selection for embedded systems

Unit - I
Introduction to Embedded system - Embedded system vs General computing systems - History - Classification - Major Application Areas - Purpose of Embedded systems - Smart running shoes: The innovative bonding of lifestyle with embedded technology. Characteristics and Quality Attributes of Embedded systems

Unit - II
Elements of an Embedded system - core of the embedded system: General purpose and domain specific processors, ASICs, PLDs, COTS - Memory - Sensors and Actuators - Communication Interface: Onboard and External Communication Interfaces - Embedded Firmware - Reset circuit, Brown-out protection circuit, Oscillator unit, Real-time clock, and Watchdog timer - PCB and Passive Components

Unit - III
Embedded Systems - Washing machine: Application-specific - Automotive: Domain specific. Hardware Software Co-Design - Computational Models - Embedded Firmware Design Approaches - Embedded Firmware Development Languages - Integration and testing of Embedded Hardware and firmware

Unit - IV
RTOS based Embedded System Design: Operating System Basics - Types of operating Systems - Tasks, process and Threads - Multiprocessing and Multitasking - Task Scheduling- Task Communication - Task Synchronisation - Device Drivers - choosing an RTOS.
Unit - V
Components in embedded system development environment, Files generated during compilation, simulators, emulators and debugging - Objectives of Embedded product Development Life Cycle - Different Phases of EDLC - EDLC Approaches - Trends in Embedded Industry - Case Study: Digital Clock.

Text Book(s):

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3EC3:3</td>
<td>Embedded Systems</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO2</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO3</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO4</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO5</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Number of matches (✔) = 37, Relationship: High
SEMESTER – III

Course Code: 20PCS3EC4:1
Instruction Hours: 6
Credits: 5

Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 4 (1) – WAP and XML

Course Outcomes:

On Successful completion of the course, students will able to

**CO1:** Apply XML concepts to develop Web application.
**CO2:** Develop SOA application using XML and Web Services.
**CO3:** Extract information from the web sites using XML programming
**CO4:** Explain the basic concepts of wireless network and wireless generations.
**CO5:** Indentify and select the appropriate framework components in creation of web service solution

**Unit - I**

**Unit - II**

**Unit - III**

**Unit - IV**

**Unit - V**
Text Book(s):
2. Eliotte Rusty Harlod “XML TM Bible”, Books India (P) Ltd, 2000(For Unit IV & V)

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3EC4:1</td>
<td>WAP and XML</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO2</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO3</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO4</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>CO5</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

Number of matches (✔) = 36, Relationship: High
SEMESTER – III

Course Code: 20PCS3EC4:2  Exam Hours: 3
Instruction Hours: 6  Internal Marks: 25
Credits: 5  External Marks: 75

ELECTIVE COURSE 4 (2) – STATISTICAL COMPUTING

Course Outcomes:

On successful completion of the course the students will be able to

**CO1:** Design and implement Monte Carlo methods to evaluate integrals and perform simulations.

**CO2:** Design and conduct appropriate resampling methods to estimate sampling variance for statistical estimates.

**CO3:** Data analytics from a database formed from the real world problem

**CO4:** Predict the exact reason for the real time issues

**CO5:** Be life-long learners who are able to independently expand their mathematical or statistical expertise when needed, or for interest’s sake.

**Unit - I**

**Correlation** - Definition of Correlation- Scatter Diagram- Kari Pearson’s Coefficient of Linear Correlation- Coefficient of Correlation and Probable Error of r- Coefficient of Determination - Merits and Limitations of Coefficient of Correlation- Spearman’s Rank Correlation(7.1-7.9.4).

**Unit - II**


**Unit - III**


**Unit - IV**

**Sampling and Sampling Distributions** - Data Collection- Sampling and Non-Sampling Errors – Principles of Sampling-- Merits and Limitations of Sampling- Methods of Sampling- Parameter and Statistic- Sampling Distribution of a Statistic- Examples of Sampling Distributions- Standard Normal, Student’s t, Chi-Square ($x^2$) and Snedecor’s F-Distributions(14.1-14.16).
Unit - V
Statistical Inference- Estimation and Testing of Hypothesis - Statistical Inference- Estimation- Point and interval- Confidence interval using normal, \( t \) and \( x^2 \) Distributions- Testing of Hypothesis- Significance of a mean - Using \( t \) Distribution(15.1-15.10.2).

Text Book(s):

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3EC4:2</td>
<td>Statistical Computing</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High
SEMESTER – III
Course Code: 20PCS3EC4:3
Instruction Hours: 6
Credits: 5
Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 4 (3)—SOFTWARE PROJECT MANAGEMENT

Course Outcomes:

On successful completion of the course the students will be able to

CO1: Analyze the scope, cost, timing, and quality of the project, at all times focused on project success as defined by project stakeholders.

CO2: Align the project to the organization's strategic plans and business justification throughout its lifecycle.

CO3: Identify project goals, constraints, deliverables, performance criteria, control needs, and resource requirements in consultation with stakeholders.

CO4: Implement project management knowledge, processes, lifecycle and the embodied concepts, tools and techniques in order to achieve project success.

CO5: Apply project management concepts through working in a group as team leader or active team member on an IT project.

Unit - I
**Project Management Framework:** Introduction: Project - Project management - Relationship among Project, Program and Portfolio management - Project and operations management- Role of project manager - Project management body of knowledge - Enterprise Environmental factors. Project life cycle and Organization: Overview of project life cycle - Projects vs Operational Work - Stakeholders - Organizational influences on project management. The Standard for Project Management of a Project: Project management processes for a project: Common project management process interactions - Projects management process groups - Initiating process group - planning process group - Executing process group - Monitoring and controlling process group - Closing process group.

Unit - II

Unit - III
**The Project Management Knowledge Areas:** Project integration management: Develop project charter - Develop project management plan - Direct and manage project execution - Monitor and control project work - Perform integrated change control - Close project or phase. Project scope management: Collect requirements -
Define Scope - Create WBS - Verify Scope - Control Scope. Project team management: Define activities - Sequence activities - Estimate activity resources - Estimate Activity Durations - Develop Schedule - Control Schedule.

**Unit - IV**

**Unit - V**

**Text Book(s):**

**Reference Book(s):**
5. Adapt projects in response to issues that arise internally and externally.
Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3EC4:3</td>
<td>Software Project Management</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Number of matches (✓) = 38, Relationship: High
SEMESTER – III

Course Code: 20PCS3CP3
Instruction Hours: 6
Credits: 4
Exam Hours: 3
Internal Marks: 40
External Marks: 60

CORE PRACTICAL 3 – IMAGE PROCESSING-LAB

Course Outcomes:

On successful completion of the course the students will be able to

**CO1:** Understand the need for image transforms different types of image transforms and their properties.
**CO2:** Develop any image processing application and understand the rapid advances in Machine vision.
**CO3:** Learn different techniques employed for the enhancement of images and feature extraction techniques
**CO4:** Learn different causes for image degradation and overview of image restoration techniques.
**CO5:** Understand the need for image compression and to learn the spatial and frequency domain techniques of image compression.

1. Create a program to display grayscale image using read and write operation.
2. Create a vision program to find histogram value and display histogram of a grayscale and color image.
3. Create a vision program for Nonlinear Filtering technique using edge detection
4. Create a vision program to determine the edge detection of an image using different operators.
5. Create a program to discretize an image using Fourier transformation.
6. Create a program to eliminate the high frequency components of an image.
7. Create a color image and perform read and write operation.
8. Obtain the R, B, G color values and resolved color values from a color box by choosing any color.
9. Create a program performs discrete wavelet transform on image.
10. Create a program for segmentation of an image using watershed transforms.
Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>20PCS3CP3</td>
<td>Image Processing Lab</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High
CORE COURSE 9 – INTERNET OF THINGS

Course Outcomes:

On successful completion of the course the students will be able to

**CO1:** Gain the basic knowledge about IoT and able to use IoT related products in real life.

**CO2:** It helps to rely less on physical resources and started to do their work smarter.

**CO3:** Understand the concepts of Internet of Things Analyze basic protocols in wireless sensor network

**CO4:** Design IoT applications in different domain and analyze their performance

**CO5:** Implement basic IoT applications on embedded platform

Unit - I
**INTRODUCTION To IoT:** Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels and Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology.

Unit - II
**IoT ARCHITECTURE:** M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture - IoT reference model - Domain model - information model - functional model - communication model- IoT reference architecture

Unit - III

Unit - IV

Unit - V
**APPLICATIONS:** The Role of the Internet of Things for Increased Autonomy and Agility in Collaborative Production Environments - Resource Management in the Internet of Things: Clustering, Synchronization and Software Agents. Applications - Smart Grid – Electrical Vehicle Charging
Text Book(s):


Reference Book(s):


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>20PCS4CC9</td>
<td>Internet of Things</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High
SEMESTER – IV

Course Code: 20PCS4CC10
Instruction Hours: 6
Credits: 5

Exam Hours: 3
Internal Marks: 25
External Marks: 75

CORE COURSE 10- MACHINE LEARNING

Course Outcomes:

On successful completion of the course the students will be able to

**CO1:** Have a good understanding of the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.

**CO2:** Identify machine learning techniques suitable for a given problem

**CO3:** Have an understanding of the strengths and weaknesses of many popular machine learning approaches.

**CO4:** Appreciate the underlying mathematical relationships within and across Machine Learning algorithms and the paradigms of supervised and un-supervised learning.

**CO5:** Design and implement various machine learning algorithms in a range of real-world applications

Unit- I
INTRODUCTION

Unit- II

Unit - III

Unit - IV
INSTANT BASED LEARNING: K- Nearest Neighbour Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

Unit - V
ADVANCED LEARNING :
Text Book(s):


Reference Book(s):


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>20PCS4CC10</td>
<td>Machine Learning</td>
<td>6</td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High
SEMESTER – IV

Course Code: 20PCS4EC5:1
Instruction Hours: 6
Credits: 4

Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 5(1) – DATA MINING

Course Outcomes:

On successful completion of the course the students will be able to

- **CO1**: Understand Data Warehouse fundamentals, Data Mining Principles
- **CO2**: Identify appropriate data mining algorithms to solve real world problems
- **CO3**: Compare and evaluate different data mining techniques like classification, prediction, clustering and association rule mining
- **CO4**: Describe complex data types with respect to spatial and web mining.
- **CO5**: Benefit the user experiences towards research and innovation. Integration.

**Unit - I**
**Data Mining And Data Preprocessing**: Data Mining – Motivation – Definition – Data Mining on Kind of Data – Functionalities – Classification – Data Mining Task Primitives – Major Issues in Data Mining – Data Preprocessing – Definition – Data Clearing – Integration and Transformation – Data Reduction.

**Unit - II**

**Unit - III**
**Frequent Patterns, Associations And Classification**: The Apriori Algorithm – Definition of Classification and Prediction – Classification by Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Lazy Learners – K-Nearest Neighbor – Other Classification Methods.

**Unit - IV**
**Cluster Analysis**: Definition – Types of data in Cluster Analysis – Categorization of major Clustering Techniques – Partitioning Methods - Hierarchical Clustering – BIRCH - ROCK – Grid Based Methods – Model Based Clustering Methods – Outlier Analysis.

**Unit - V**
**Spatial, Multimedia, Text And Web Data**: Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web – Data Mining Applications – Trends in Data Mining.
Text Book(s):


Reference Book(s):


Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>20PCS4EC5:1</td>
<td>Data Mining</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (√) = 40, Relationship: High
SEMESTER – IV

Course Code: 20PCS4EC5:2
Instruction Hours: 6
Credits: 4
Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 5 (2) – SOFT COMPUTING

Course Outcomes:

On successful completion of the course the students will be able to

**CO1:** Comprehend the fuzzy logic and the concept of fuzziness involved in various systems and fuzzy set theory.

**CO2:** Understand the concepts of fuzzy sets, knowledge representation using fuzzy rules, approximate reasoning, fuzzy inference systems, and fuzzy logic.

**CO3:** Impact the fundamental theory and concepts of neural networks, Identify different neural network architectures, algorithms, applications and their limitations.

**CO4:** Understand appropriate learning rules for each of the architectures and learn several neural network paradigms and its applications.

**CO5:** Reveal different applications of these models to solve engineering and other problems.

**Unit - I**

**Unit - II**

**Unit - III**

**Unit - IV**
Unit - V

Text Book(s):

Reference Book(s):

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>20PCS4EC5:2</td>
<td>Soft Computing</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 38, Relationship: High
SEMESTER – IV

Course Code: 20PCS4EC5:3
Instruction Hours: 6
Credits: 4

Exam Hours: 3
Internal Marks: 25
External Marks: 75

ELECTIVE COURSE 5 (3) - DATA SCIENCE AND BIG DATA ANALYTICS

Course Outcomes:

On successful completion of the course the students will be able to

**CO1:** Understand the key issues in big data management and its associated applications in intelligent business and scientific computing.

**CO2:** Acquire fundamental enabling techniques and scalable algorithms like Hadoop, Map Reduce and NO SQL in big data analytics

**CO3:** Interpret business models and scientific computing paradigms, and apply software tools for big data analytics.

**CO4:** Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc..

**CO5:** Apply Hadoop ecosystem components and participate data science and big data analytics projects

Unit - I

Unit - II

Unit - III

Unit - IV

Unit - V

Text Book(s):
1. Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data”, EMC Education Services Published by John Wiley & Sons, Inc. 2015

Reference Book(s):
Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>20PCS3EC5:3</td>
<td>Data Science and Big Data Analytics</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 38, Relationship: High
SEMESTER – IV

Course Code: 20PCS4CP4
Instruction Hours: 6
Credits: 4

Exam Hours: 3
Internal Marks: 40
External Marks: 60

CORE PRACTICAL 10- MACHINE LEARNING LAB

Course Outcomes:

On successful completion of the course the students will be able to

CO1: Gain knowledge about basic concepts of Machine Learning
CO2: Identify machine learning techniques suitable for a given problem
CO3: Solve the problems using various machine learning techniques
CO4: Apply Dimensionality reduction techniques.
CO5: Design application using machine learning techniques.

1. Write a program to implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file

2. Write a program for a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Write a program to demonstrate the working of the decision tree based ID3 algorithm. use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample

4. Write a program to build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets

5. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets

6. Write a program to assuming set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task. Built-in Java classes/API can be used to write the program. Calculate the accuracy, precision, and recall for your data set

7. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data
Set. use Java/Python ML library classes/API

8. Write a program to apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.

9. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.

10. Write a program to implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>20PCS4CP4</td>
<td>Machine Learning Lab</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (√) = 39, Relationship: High
SEMESTER - IV

DISSERTATION AND VIVA VOCE (INDUSTRY/RESEARCH)

Course Code: 20PCS4PW
Instruction Hours: 6
Credits: 4

Course Outcomes:

On successful completion of the course the students will be able to

CO1: Demonstrate a sound technical knowledge of their selected project topic.
CO2: Undertake problem identification, formulation and solution.
CO3: Design solutions to complex problems utilizing a systems approach and enable to:
   Conduct the science projects.
CO4: Communicate large in written an oral forms.
CO5: Demonstrate the knowledge, skills and attitudes of a student

<table>
<thead>
<tr>
<th>S.No</th>
<th>Work Description</th>
<th>Maximum Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dissertation</td>
<td>80</td>
</tr>
<tr>
<td>2</td>
<td>Viva voce</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>100</td>
</tr>
</tbody>
</table>

Note: PASSING MINIMUM – 50 MARKS

I Review – December last week

- Confirmation letter from the company
- Project type & title
- Company profile
- Synopsis
- Contact number & mail_id of the external guide
- S/w selection

II Review – January 3rd week

- Data or System flow diagram
- Documentation of first three chapters
- Database design
- Input design – Forms
- Output design – Reports

III Review – February 3rd week

- Complete coding
- Test plan with demo
- Rough documentation of the entire project

**IV Review – March 1st week**

- Corrected rough draft
- Explanation of the entire project
- Execution of Implementation Work

**Note:**

- Attending all the review is compulsory
- PPT and necessary Documentation should be brought for each Review
- Font size in documentation has to be 12, Times New Roman, Space 1.5
- Document should be neatly aligned and justified
- No change can be made in the review marks later
  - Internal mark will be submitted at the same day of review to controller section.

Relationship Matrix for Course Outcomes, Programme Outcomes and Programme Specific Outcomes:

<table>
<thead>
<tr>
<th>Semester</th>
<th>Code</th>
<th>Title of the Course</th>
<th>Hours</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>20PCS4PW</td>
<td>Dissertation And Viva Voce (Industry/Research)</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Outcomes (Cos)</th>
<th>Programme Outcomes (POs)</th>
<th>Programme Specific Outcomes (PSOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PO1</td>
<td>PO2</td>
</tr>
<tr>
<td>CO1</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO2</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO3</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO4</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CO5</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

Number of matches (✓) = 40, Relationship: High