

**B.Sc.,  
INFORMATION TECHNOLOGY**

**SYLLABUS**

**FROM THE ACADEMIC YEAR  
2023 – 2024**

**TAMILNADU STATE COUNCIL FOR HIGHER  
EDUCATION, CHENNAI – 600 005**

## 1. Introduction

### **B.Sc. Information Technology**

Education is the key to development of any society. Role of higher education is crucial for securing right kind of employment and also to pursue further studies in best available world class institutes elsewhere within and outside India. Quality education in general and higher education in particular deserves high priority to enable the young and future generation of students to acquire skill, training and knowledge in order to enhance their thinking, creativity, comprehension and application abilities and prepare them to compete, succeed and excel globally. Learning Outcomes-based Curriculum Framework (LOCF) makes it student-centric, interactive and outcome-oriented with well-defined aims, objectives and goals to achieve. LOCF also aims at ensuring uniform education standard and content delivery across the state which will help the students to ensure similar quality of education irrespective of the institute and location.

Computer Science is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic science and engineering. Computer science is a discipline that spans theory and practice and it requires thinking both in abstract terms and in concrete terms. Nowadays, practically everyone is a computer user, and many people are even computer programmers. Computer Science can be seen on a higher level, as a science of problem solving and problem solving requires precision, creativity, and careful reasoning. The ever-evolving discipline of computer science also has strong connections to other disciplines. Many problems in science, engineering, health care, business, and other areas can be solved effectively with computers, but finding a solution requires both computer science expertise and knowledge of the particular application domain. Computer science has a wide range of specialties. These include Computer Architecture, Software Systems, Graphics, Artificial Intelligence,

Computational Science, and Software Engineering. Drawing from a common core of computer science knowledge, each specialty area focuses on specific challenges. Computer Science is practiced by mathematicians, scientists and engineers. Mathematics, the origins of Computer Science, provides reason and logic. Science provides the methodology for learning and refinement. Engineering provides the techniques for building hardware and software.

The Students completing this programme will be able to present Software application clearly, make abstract ideas precise by formulating them in the Computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

<b>LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME</b>	
<b>Programme:</b>	<b>B.Sc., Information Technology</b>
<b>Programme Code:</b>	
<b>Duration:</b>	<b>3 years [UG]</b>
<b>Programme Outcomes:</b>	<p><b>PO1: Disciplinary knowledge:</b> Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study</p> <p><b>PO2: Communication Skills:</b> Ability to express thoughts and ideas effectively; Communicate with others using appropriate media; confidently share one’s views; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.</p> <p><b>PO3: Critical thinking:</b> Capability to apply analytic; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.</p> <p><b>PO4: Problem solving:</b> Capacity to extrapolate from what one</p>

has learned and apply their competencies to solve different kinds of non-familiar problems and apply to real life situations.

**PO5: Analytical reasoning:** Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

**PO6: Research-related skills:** A sense of inquiry and capability for asking relevant/appropriate questions, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate and test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation

**PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team

**PO8: Scientific reasoning:** Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

**PO9: Reflective thinking:** Critical sensibility to lived experiences, with self-awareness and reflexivity of both self and society.

**PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate and use appropriate software for analysis of data.

**PO 11 Self-directed learning:** Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

**PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

**PO 13: Moral and ethical awareness/reasoning:** Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and

	<p>sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.</p> <p><b>PO 14: Leadership readiness/qualities:</b> Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.</p> <p><b>PO 15: Lifelong learning:</b> Ability to acquire knowledge and skills, including learning “how to learn”, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.</p>
<b>Programme Specific Outcomes:</b>	<p><b>PSO1:</b> To enable students to apply basic microeconomic, macroeconomic and monetary concepts and theories in real life and decision making.</p> <p><b>PSO 2:</b> To sensitize students to various economic issues related to Development, Growth, International Economics, Sustainable Development and Environment.</p> <p><b>PSO 3:</b> To familiarize students to the concepts and theories related to Finance, Investments and Modern Marketing.</p> <p><b>PSO 4:</b> Evaluate various social and economic problems in the society and develop answer to the problems as global citizens.</p> <p><b>PSO 5:</b> Enhance skills of analytical and critical thinking to analyze effectiveness of economic policies.</p>

	<b>PO 1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>
<b>PSO 1</b>	S	S	L	S	S	S	M	S
<b>PSO 2</b>	S	S	S	S	S	L	S	S
<b>PSO3</b>	M	S	M	S	M	S	L	S
<b>PSO 4</b>	S	S	S	S	S	S	S	S
<b>PSO 5</b>	L	S	S	S	S	S	S	M

**S – Strong, M- Medium, L- Low**

### **Highlights of the Revamped Curriculum:**

- Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive

examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.

- The Core subjects include latest developments in education and scientific front, practical training, devising mathematical models and algorithms for providing solutions to real life situations. The curriculum also facilitates peer learning with advanced mathematical topics in the final semester, catering to the needs of stakeholders with research aptitude.
- The General Studies and Mathematics based problem solving skills are included as mandatory components in the 'Training for Competitive Examinations' course at the final semester, a first of its kind.
- The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
- The Industrial Statistics course is newly introduced in the fourth semester, to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
- The Internship during the second year vacation will help the students gain valuable work experience that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
- Project with viva-voce component in the fifth semester enables application of conceptual knowledge to practical situations. The innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
- State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest.

**Value additions in the Revamped Curriculum:**

<b>Semester</b>	<b>Newly introduced Components</b>	<b>Outcome/ Benefits</b>
<b>I</b>	<b>Foundation Course</b> To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning Literature and analysing the world through the literary lens gives rise to a new perspective.	<ul style="list-style-type: none"> <li>➤ Instill confidence</li> <li>➤ Create interest for the subject</li> </ul>
<b>I,II,III,IV</b>	<b>Skill Enhancement papers (Discipline centric / Generic/ Entrepreneurial)</b>	<ul style="list-style-type: none"> <li>➤ Industry ready graduates</li> <li>➤ Skilled human resource</li> <li>➤ Equipped with essential skills to be employable</li> </ul>
		<ul style="list-style-type: none"> <li>➤ Training on language and communication skills enable to gain knowledge and exposure in the competitive world.</li> </ul>
		<ul style="list-style-type: none"> <li>➤ Discipline centric skill will improve the Technical know-how of solving real life problems.</li> </ul>
<b>III,IV,V&amp; VI</b>	Elective papers	<ul style="list-style-type: none"> <li>➤ Strengthening the domain knowledge</li> <li>➤ Introducing the stakeholder to the State-of-Art techniques from the streams of multi-disciplinary, cross disciplinary and interdisciplinary nature</li> <li>➤ Exposure to industry moulds students into solution providers</li> <li>➤ Self-learning is enhanced</li> <li>➤ Developing a research framework and presenting their independent and Intellectual ideas effectively.</li> </ul>
<b>Extra Credits: For Advanced Learners/ Honors degree</b>		<ul style="list-style-type: none"> <li>➤ To cater to the needs of peer learners/ research aspirants</li> </ul>
<b>Skills acquired from the Courses</b>		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System for all UG courses including Lab Hours**

**First Year – Semester-I**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>No. of Hours</b>
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses [in Total]	13	14
Part-4	Skill Enhancement Course SEC-1	2	2
	Foundation Course	2	2
		<b>23</b>	<b>30</b>

**Semester-II**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>No. of Hours</b>
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-2	2	2
	Skill Enhancement Course -SEC-3 (Discipline / Subject Specific)	2	2
		<b>23</b>	<b>30</b>

**Second Year – Semester-III**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>No. of Hours</b>
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	14
Part-4	Skill Enhancement Course -SEC-4 (Entrepreneurial Based)	1	1
	Skill Enhancement Course -SEC-5 (Discipline / Subject Specific)	2	2
	E.V.S	-	1
		<b>22</b>	<b>30</b>



**Semester-IV**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>No. of Hours</b>
Part-1	Language – Tamil	3	6
Part-2	English	3	6
Part-3	Core Courses & Elective Courses including laboratory [in Total]	13	13
Part-4	Skill Enhancement Course -SEC-6 (Discipline / Subject Specific)	2	2
	Skill Enhancement Course -SEC-7 (Discipline / Subject Specific)	2	2
	E.V.S	2	1
		<b>25</b>	<b>30</b>

**Third Year  
Semester-V**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>No. of Hours</b>
<b>Part-3</b>	Core Courses including Project / Elective Based	22	26
<b>Part-4</b>	Value Education	2	2
	Internship / Industrial Visit / Field Visit	2	2
		<b>26</b>	<b>30</b>

**Semester-VI**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>No. of Hours</b>
<b>Part-3</b>	Core Courses including Project / Elective Based & LAB	18	28
<b>Part-4</b>	Extension Activity	1	-
	Professional Competency Skill	2	2
		<b>21</b>	<b>30</b>

**Consolidated Semester wise and Component wise Credit distribution**

<b>Parts</b>	<b>Sem I</b>	<b>Sem II</b>	<b>Sem III</b>	<b>Sem IV</b>	<b>Sem V</b>	<b>Sem VI</b>	<b>Total Credits</b>
<b>Part I</b>	3	3	3	3	-	-	12
<b>Part II</b>	3	3	3	3	-	-	12
<b>Part III</b>	13	13	13	13	22	18	92
<b>Part IV</b>	4	4	3	6	4	1	22
<b>Part V</b>	-	-	-	-	-	2	2
<b>Total</b>	23	23	22	25	26	21	<b>140</b>

**\* Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

<b>MethodsofEvaluati on</b>		
<b>InternalEv aluation</b>	ContinuousInternalAssessmentTest	25 Marks
	Assignments	
	Seminars	
	AttendanceandClassParticipation	
<b>ExternalEv aluation</b>	EndSemesterExamination	75 Marks
	Total	100 Marks
<b>MethodsofAssesm ent</b>		
<b>Recall(K1)</b>	Simpledefinitions,MCQ,Recallsteps,Conceptdefinitions	
<b>Understand /Comprehend( K2)</b>	MCQ,True/False,Shortessays,Conceptexplanations,Shortsumma ryor Overview	
<b>Application (K3)</b>	Suggestidea/conceptwithexamples,Suggestformulae, Solveproblems, Observe,Explain	
<b>Analyze(K4)</b>	Problem- solvingquestions,Finishaprocedureinmanysteps,Differentiate betweenvariousideas,Mapknowledge	
<b>Evaluate(K5)</b>	Longer essay/Evaluationessay,Critiqueorjustifywithprosandcons	
<b>Create(K6)</b>	Checkknowledgeinspecificoroffbeatsituations,Discussion,Debatin gorPresentations	

**Eligibility for Admission to B.Sc., Information Technology:**

Candidates who have studied Mathematics in HSC areeligible for this programme (item no. 11 of G.O. (D) No. 147, Higher Education (G1) Department dated 05.05.2023)

**Template for Curriculum Design for UG Programme in B.Sc Information Technology**

**Credit Distribution for UG Programme in Information Technology**

**B.Sc Information Technology**

**First Year**

**Semester-I**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>Hours per week (L/T/P)</b>
<b>Part-I</b>	<b>Language – Tamil</b>	<b>3</b>	<b>6</b>
<b>Part-II</b>	<b>English</b>	<b>3</b>	<b>6</b>
<b>Part-III</b>	<b>Core Courses 3 (CC1, CC2-1, CC2 -2)</b>		
	<b>CC1 PROGRAMMING IN C</b>	<b>5</b>	<b>5</b>
	<b>CC2-1C Programming Practical</b>	<b>3</b>	<b>3</b>
	<b>CC2-2 Office Automation Practical</b>	<b>2</b>	<b>2</b>
<b>Part-IV</b>	<b>Elective Course 1</b>	<b>3</b>	<b>4</b>
	<b>EC1 Numerical Methods/Discrete Mathematics</b>		
<b>Part-IV</b>	<b>Skill Enhancement Course SEC-1</b>	<b>2</b>	<b>2</b>
	<b>Introduction to HTML / Web Designing</b>		
	<b>Foundation Course FCFundamentals of Computers</b>	<b>2</b>	<b>2</b>
		<b>23</b>	<b>30</b>

**Semester-II**

<b>Part</b>	<b>List of Courses</b>	<b>Credit</b>	<b>Hours per week (L/T/P)</b>
<b>Part-I</b>	<b>Language – Tamil</b>	<b>3</b>	<b>6</b>
<b>Part-II</b>	<b>English</b>	<b>3</b>	<b>6</b>
<b>Part-III</b>	<b>Core Courses 2 (CC3, CC4-1, CC4-2)</b>		
	<b>CC3 JAVAPROGRAMMING</b>	<b>5</b>	<b>5</b>
	<b>CC4-1 Java Programming &amp; Data Structures Practical</b>	<b>3</b>	<b>3</b>
	<b>CC4-2 PHP Scripting Practical</b>	<b>2</b>	<b>2</b>
<b>Part-IV</b>	<b>Elective Course 1 ( Generic / Discipline Specific) EC2</b>	<b>3</b>	<b>4</b>
	<b>Data Structures/ Optimization Techniques</b>		
<b>Part-IV</b>	<b>Skill Enhancement Course -SEC-2</b>	<b>2</b>	<b>2</b>
	<b>Robotics and its Applications / Quantitative Aptitude/</b>		
	<b>Skill Enhancement Course -SEC-3 (Discipline Specific / Generic)Software Testing/ Cyber Forensics</b>	<b>2</b>	<b>2</b>
		<b>23</b>	<b>30</b>

**FIRST YEAR – SEMESTER – I**

**CORE COURSE– I: PROGRAMMING IN C**

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	5	0	0	1	5	5	25	75	100
<b>Learning Objectives</b>									
<b>LO1</b>	To familiarize the students with the understanding of code organization								
<b>LO2</b>	To improve the programming skills								
<b>LO3</b>	Learning the basic programming constructs.								
<b>Prerequisites:</b>									
Unit	Contents								No. of Hours
I	<b>Studying Concepts of Programming Languages-</b> Language Evaluation Criteria - Language design - Language Categories - Implementation Methods – Programming Environments - Overview of C: History of C- Importance of C- Basic Structure of C Programs- Executing a C Program- Constants, Variables and Data types - Operators and Expressions - Managing Input and Output Operations								15
II	<b>Decision Making and Branching:</b> Decision Making and Looping - Arrays - Character Arrays and Strings								15
III	<b>User Defined Functions:</b> Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions- Recursion								15
IV	<b>Structures and Unions:</b> Introduction- Defining a Structure- Declaring Structure Variables Accessing Structure Members- Structure Initialization- Arrays of Structures- Arrays within Structures- Unions- Size of Structures.								15
V	<b>Pointers:</b> Understanding Pointers- Accessing the Address of a Variable- Declaring Pointer Variables- Initializing of Pointer Variables- Accessing a Variable through its Pointer- Chain of Pointers- Pointer Expressions- Pointer and Scale Factor- Pointer and Arrays- Pointers and Character Strings- Array of Pointers- Pointer as Function Arguments- Functions Returning Pointers- Pointers to Functions- <b>File Management in C</b>								15
<b>TOTAL</b>								<b>75</b>	
CO	Course Outcomes								
CO1	Outline the fundamental concepts of C programming languages, and its features								
CO2	Demonstrate the programming methodology.								

CO3	Identify suitable programming constructs for problem solving.
CO4	Select the appropriate data representation, control structures, functions and concepts based on the problem requirement.
CO5	Evaluate the program performance by fixing the errors.
<b>Textbooks</b>	
➤	Robert W. Sebesta, (2012), —Concepts of Programming Languages, Fourth Edition, Addison Wesley (Unit I : Chapter – 1)
➤	E. Balaguruswamy, (2010), —Programming in ANSI C, Fifth Edition, Tata McGraw Hill Publications
<b>Reference Books</b>	
1.	Ashok Kamthane, (2009), —Programming with ANSI & Turbo C, Pearson Education
2.	Byron Gottfried, (2010), —Programming with C, Schaums Outline Series, Tata McGraw Hill Publications
<b>NOTE: Latest Edition of Textbooks May be Used</b>	
<b>Web Resources</b>	
1.	<a href="http://www.tutorialspoint.com/cprogramming/">http://www.tutorialspoint.com/cprogramming/</a>
2.	<a href="http://www.cprogramming.com/">http://www.cprogramming.com/</a>
3.	<a href="http://www.programmingsimplified.com/c-program-examples">http://www.programmingsimplified.com/c-program-examples</a>
4.	<a href="http://www.programiz.com/c-programming">http://www.programiz.com/c-programming</a>
5.	<a href="http://www.cs.cf.ac.uk/Dave/C/CE.html">http://www.cs.cf.ac.uk/Dave/C/CE.html</a>
6.	<a href="http://fresh2refresh.com/c-programming/c-function/">http://fresh2refresh.com/c-programming/c-function/</a>

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	2	2
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>11</b>	<b>15</b>	<b>10</b>	<b>10</b>

### CC2-1: CORE PRACTICAL I :C Programming Practical

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	0	0	3	I	3	3	25	75	100
<b>Learning Objectives</b>									
<b>LO1</b>	The Course aims to provide exposure to problem-solving through C programming								
<b>LO2</b>	It aims to train the student to the basic concepts of the C -Programming language								
<b>LO3</b>	Apply different concepts of C language to solve the problem								
<b>Prerequisites:</b>									
<b>Contents</b>									
1. Programs using Input/ Output functions 2. Programs on conditional structures 3. Command Line Arguments 4. Programs using Arrays 5. String Manipulations 6. Programs using Functions 7. Recursive Functions 8. Programs using Pointers 9. Files 10. Programs using Structures & Unions									
<b>CO</b>	<b>Course Outcomes</b>								
CO1	Demonstrate the understanding of syntax and semantics of C programs.								
CO2	Identify the problem and solve using C programming techniques.								
CO3	Identify suitable programming constructs for problem solving.								
CO4	Analyze various concepts of C language to solve the problem in an efficient way.								
CO5	Develop a C program for a given problem and test for its correctness.								

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	2	2
CO2	3	3	2	3	2	2
CO3	3	3	3	3	2	2
CO4	3	3	2	3	2	2
CO5	3	3	2	3	3	2
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>11</b>	<b>15</b>	<b>11</b>	<b>10</b>

### CC2-2: Core Practical 2

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	<b>Office Automation Practical</b>	Core Practical 2		Y	2	I	2	2	25	75	100
<b>Course Objective</b>											
C1	Understand the basics of computer systems and its components.										
C2	Understand and apply the basic concepts of a word processing package.										
C3	Understand and apply the basic concepts of electronic spreadsheet software.										
C4	Understand and apply the basic concepts of database management system.										
C5	Understand and create a presentation using PowerPoint tool.										
<b>Exercises</b>											
<p><b>MS – Word</b></p> <ol style="list-style-type: none"> <li>1. Prepare a word document for spell checking and Thesaurus.</li> <li>2. Apply Cut, Copy and Paste operations in a document.</li> <li>3. Find a word and Replace with another in a document.</li> <li>4. Insert Header with College Name, Footer with Page No., and Footnote in a document.</li> <li>5. Insert mathematical symbols using Microsoft equation 3.0.</li> <li>6. Preparing Newspaper format (Apply Alignment, Font, Property, Line spacing, Picture Format).</li> <li>7. Prepare a Bio-Data and insert the contents of qualification within the table.</li> <li>8. Mail Merge</li> <li>9. Macro.</li> </ol> <p><b>MS – Excel</b></p> <ol style="list-style-type: none"> <li>1. Apply formulas and functions</li> <li>2. Prepare a chart for population growth.</li> <li>3. Create a Pivot table.</li> <li>4. Apply ascending and descending order</li> <li>5. Apply auto format</li> </ol> <p><b>MS – PowerPoint</b></p> <ol style="list-style-type: none"> <li>1. Create a power point presentation with 3 slides.</li> <li>2. Create a design template with 3 slides.</li> <li>3. Create a presentation with animation.</li> <li>4. Create a power point presentation with 4 slides. Set slide transition time of 3seconds and Display your presentation.</li> <li>5. Create a presentation with auto content wizard.</li> </ol> <p><b>MS – Access</b></p> <ol style="list-style-type: none"> <li>1. Create an employee database.</li> <li>2. Create a student database. Set primary key.</li> <li>3. Prepare salary list.</li> <li>4. Create a report.</li> </ol>											

	5. Create Mailing labels.	
<b>Web Resources</b>		
1.	<a href="https://www.udemy.com/course/office-automation-certificate-course/">https://www.udemy.com/course/office-automation-certificate-course/</a>	
2.	<a href="https://www.javatpoint.com/automation-tools">https://www.javatpoint.com/automation-tools</a>	

**Mapping with Programme Outcomes:**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>
<b>CO 1</b>	M	S	M			M		L
<b>CO 2</b>	S	M	S			M		
<b>CO 3</b>		S	S		M		L	
<b>CO 4</b>			S	L	M		M	
<b>CO 5</b>				M		S	M	S

**S-Strong      M-Medium      L-Low**



**EC1: Elective Course 1 A NUMERICAL METHODS**

**COURSE OBJECTIVE:**

**L T P C**  
**4 0 0 3**

1. To introduce the concept of solving equations using different methods
2. To understand the use of Assignment and Transportation problems

**Unit I:**

Curve Fitting: Introduction, Method of Least squares, Curve Fitting, Fitting a Straight Line

**Unit II:**

Solution of Algebraic and Transcendental Equations: Bisection method, Regula Falsi method, Newton Raphson Method

**Unit III:**

Solution of Simultaneous Linear Equations: Solution of Simultaneous Linear Equations: Gauss Elimination method, Gauss-Jordan method, Gauss Seidel Method, Jacobi's method

**Unit IV:**

Numerical Differentiation & Integration: Differentiation: Using Newton's Forward Difference, Newton's Backward Difference, Newton's Divided Difference (First Order Differentiation only)

Integration: Using Trapezoidal rule, Simpson's 1/3 & Simpson's 3/8 rules

**Unit V:**

Solution of Ordinary Differential Equations: Runge-Kutta 2nd Order and 4th Order methods, Predictor-Corrector Methods: Milne and Adam's methods.

**COURSE OUTCOME:**

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

1. Obtain numerical solutions of algebraic and transcendental equations
2. Solve system of linear equations numerically using direct and iterative methods
3. Solve ordinary differential equations
4. Compute integration using Simpson's & Trapezoidal Rule
5. Apply numerical methods in real life problems

**CO - PO - PSO Mapping**

NUMERICAL METHODS											
CO	PO					PSO					COGNITIVE LEVEL
	1	2	3	4	5	1	2	3	4	5	
CO 1	S	S	S	M	S	S	S	M	S	S	K - 2
CO 2	S	S	M	S	S	S	S	S	S	S	K - 6
CO 3	S	S	M	S	S	S	S	S	S	S	K - 4
CO 4	S	S	M	S	S	S	S	S	S	S	K - 6
CO 5	S	S	M	S	S	S	S	S	S	S	K - 6

Strongly Correlated – S, Moderately Correlated – M, Weekly Correlated - L

## **TEXT BOOKS**

1. B.S. Grewal, "Numerical Methods in Engineering & Science", Khanna Publishers, Fifth Edition, April 1999.
2. M.K. Venkataraman, "Numerical Methods in Science & Engineering", National Publishing Co., 2005'

**EC1: Elective Course : 1 B**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
	<b>DISCRETE MATHEMATICS</b>	Elective	Y	4	-	I	3	25	75	100

**COURSE OUTCOMES**

On Successful completion of the course, the student will be able to

- CO1: To recall basic concepts for clear understanding of mathematical principles
- CO2: To explain practical problems.
- CO3: To construct matrices using discrete mathematics
- CO4: To analyze techniques to draw graph using mathematics
- CO5: To design graphs using the representations

**Unit – I: RELATIONS****12 Hours**

Introduction to Relations – Binary relation – Classification of Relations – Composition of Relations – Inverse of Relation – Closure operation on Relations – Matrix representation of Relation - digraphs.

**Unit – II: FUNCTIONS****12 Hours**

Introduction to Functions – Addition and Multiplication of Functions - Classifications of Functions – Composition of Function – Inverse Function.

**Unit – III: MATHEMATICAL LOGIC****12 Hours**

Introduction – Statement (Propositions) – Laws of Formal Logic –Basic Set of Logical operators/operations - Propositions and Truth Tables – Algebra Propositions - Tautologies and Contradictions – Logical Equivalence – Logical Implication – Normal Forms.

**Unit – IV: MATRIX ALGEBRA****12 Hours**

Introduction – Definition of a Matrix - Types of Matrices – Operations on Matrices – Related Matrices – Transpose of a Matrix – Symmetric and Skew-symmetric Matrices – Complex Matrix  
– Conjugate of a Matrix – Determinant of a Matrix – Typical Square Matrices – Adjoint and Inverse of a Matrix – Singular and Non-singular Matrices – Adjoint of a Square Matrix – Properties of Adjoint of a Matrix – Properties of Inverse of a Matrix.

**Unit – V: GRAPH****12 Hours**

Introduction – Graph and Basic Terminologies – Types of Graphs – Sub Graph and Isomorphic Graph – Operations on Graphs – Representation of Graph.

**Text Book:**

**DISCRETE MATHEMATICS, Swapan Kumar Chakraborty and BikashKanti Sarkar, OXFORD University Press.**

**Reference Books:**

**1. DISCRETE MATHEMATICS, Third Edition, Seymour Lipschutz and Marc Lars Lipson, Tata McGraw Hill Education Private Limited.**

2. Discrete Mathematical Structures with Applications to Computer Science by J.P.Tremblay, R.Manohar TMH edition
3. [https://www.tutorialspoint.com > discrete\\_mathematics](https://www.tutorialspoint.com/discrete_mathematics)

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	3	3	3	3
CO 3	3	3	3	3	3	3
CO 4	3	3	3	3	2	3
CO 5	3	3	2	3	3	2
Weightage of course contributed to each PSO	15	15	14	15	14	14

**S-Strong-3 M-Medium-2 L-Low-1**

**SEC1: Skill Enhancement Course : 1 A**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	Exter	Total
	<b>INTRODUCTION TO HTML</b>		Y	2	-	I	2	25	75	100
<b>Learning Objectives</b>										
LO1	Insert a graphic within a web page.									
LO2	Create a link within a web page.									
LO3	Create a table within a web page.									
LO4	Insert heading levels within a web page.									
LO5	Insert ordered and unordered lists within a web page. Create a web page.									
<b>UNIT</b>	<b>Contents</b>								<b>No. Of. Hours</b>	
I	Introduction :WebBasics: WhatisInternet–Webbrowsers–WhatisWebpage – HTMLBasics:Understandingtags.								<b>6</b>	
II	TagsforDocumentstructure(HTML,Head,BodyTag).Blockleveltextelements:Headingsparagraph(<p> tag)– Fontstyleelements:(bold,italic,font,small,strong,strike,bigtags)								<b>6</b>	
III	Lists:Typesoflists:Ordered,Unordered– NestingLists– Othertags:Marquee,HR,BR-UsingImages –CreatingHyperlinks.								<b>6</b>	
IV	Tables:CreatingbasicTable,Tableelements,Caption–Tableandcellalignment– Rowspan,Colspan–Cellpadding.								<b>6</b>	
V	Frames:Frameset–TargetedLinks–Noframe–Forms:Input, Textarea,Select,Option.								<b>6</b>	
<b>TOTAL HOURS</b>								<b>30</b>		
<b>Course Outcomes</b>								<b>Programme Outcomes</b>		
CO	On completion of this course, students will									
CO 1	Knows the basic concept in HTML Concept of resources in HTML								PO1, PO2, PO3, PO4, PO5, PO6	
CO 2	Knows Design concept. Concept of Meta Data Understand the concept of save the files.								PO1, PO2, PO3, PO4, PO5, PO6	
CO 3	Understand the page formatting. Concept of list								PO1, PO2, PO3, PO4, PO5, PO6	

CO 4	Creating Links. Know the concept of creating link to email address	PO1, PO2, PO3, PO4, PO5, PO6
CO 5	Concept of adding images Understand the table creation.	PO1, PO2, PO3, PO4, PO5, PO6
<b>Textbooks</b>		
1	“Mastering HTML5 and CSS3 Made Easy”, TeachUComp Inc., 2014.	
2	<b>Thomas Michaud, “Foundations of Web Design: Introduction to HTML &amp; CSS”</b>	
<b>Web Resources</b>		
1	<a href="https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf">https://www.teachucomp.com/samples/html/5/manuals/Mastering-HTML5-CSS3.pdf</a>	
2	<a href="https://www.w3schools.com/html/default.asp">https://www.w3schools.com/html/default.asp</a>	

**Mapping with Programme Outcomes:**

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO 1	3	3	3	3	3	3
CO 2	3	3	2	3	3	3
CO 3	2	3	3	3	3	3
CO 4	3	3	3	3	3	3
CO 5	3	3	3	2	3	3
<b>Weightage of course contributed to each PSO</b>	14	15	14	14	15	15

**S-Strong-3 M-Medium-2 L-Low-1**

**SEC 1: Skill Enhancement Course : 1 B**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst.	Marks		
									CIA	External	Total
	<b>WEB DESIGNING</b>	Specific Elective	Y	2	-	I	2	2	25	75	100
<b>Course Objective</b>											
C1	Understand the basics of HTML and its components										
C2	To study about the Graphics in HTML										
C3	Understand and apply the concepts of XML and DHTML										
C4	Understand the concept of JavaScript										
C5	To identify and understand the goals and objectives of the Ajax										
UNIT	Details							No. of Hours	Course Objective		
I	HTML: HTML-Introduction-tag basics- page structure-adding comments working with texts, paragraphs and line break. Emphasizing test- heading and horizontal rules-list-font size, face and color-alignment links-tables-frames.							6	C1		
II	Forms & Images Using Html: Graphics: Introduction-How to work efficiently with images in web pages, image maps, GIF animation, adding multimedia, data collection with html forms textbox, password, list box, combo box, text area, tools for building web page front page.							6	C2		
III	XML & DHTML: Cascading style sheet (CSS)-what is CSS-Why we use CSS-adding CSS to your web pages-Grouping styles-extensible markup language (XML).							6	C3		
IV	Dynamic HTML: Document object model (DCOM)-Accessing HTML & CSS through DCOM Dynamic content styles & positioning-Event bubbling-data binding. JavaScript: Client-side scripting, What is JavaScript, How to develop JavaScript, simple JavaScript, variables, functions, conditions, loops and repetition,							6	C4		
V	Advance script, JavaScript and objects, JavaScript own objects, the DOM and web browser environments, forms and validations.							6	C5		
<b>Total</b>								<b>60</b>			

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
1	Develop working knowledge of HTML	PO1, PO3, PO6, PO8
2	Ability to Develop and publish Web pages using Hypertext Markup Language (HTML).	PO1,PO2,PO3,PO6
3	Ability to optimize page styles and layout with Cascading Style Sheets (CSS).	PO3, PO5
4	Ability to develop a java script	PO1, PO2, PO3, PO7
5	An ability to develop web application using Ajax.	P02, PO6, PO7
Text Book		
1	Pankaj Sharma, “Web Technology”, SkKataria& Sons Bangalore 2011.	
2	Mike Mcgrath, “Java Script”, Dream Tech Press 2006, 1st Edition.	
3	Achyut S Godbole&AtulKahate, “Web Technologies”, 2002, 2nd Edition.	
Reference Books		
1.	Laura Lemay, RafeColburn , Jennifer Kyrnin, “Mastering HTML, CSS &Javascript Web Publishing”, 2016.	
2.	DT Editorial Services (Author), “HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery)”, Paperback 2016, 2nd Edition.	
Web Resources		
1.	NPTEL & MOOC courses titled Web Design and Development.	
2.	<a href="https://www.geeksforgeeks.org">https://www.geeksforgeeks.org</a>	

### Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S		M			L		M
CO 2	S	M	L			M		
CO 3			S		M			
CO 4	S	M	M				L	
CO 5		M				L	M	

S-Strong M-Medium L-Low



**FC1: Foundation Course -I Fundamentals of Computers**

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	2	0	0	1	2	2	25	75	100
<b>Learning Objectives</b>									
<b>LO1</b>	To analyze a problem with appropriate problem solving techniques								
<b>LO2</b>	To understand the main principles of imperative, functional and logic oriented programming languages and								
<b>LO3</b>	To increase the ability to learn new programming languages.								
<b>Prerequisites:</b> Basic knowledge about programming concepts									
Unit	Contents								No. of Hours
I	<b>Introduction:</b> Characteristics of Computers - Evolution of Computers <b>Basic Computer Organization:</b> I/O Unit - Storage Unit - Arithmetic Logic Unit - Control Unit - Central Processing Unit								6
II	<b>Computer Software:</b> Types of Software - System Architecture <b>Computer Languages:</b> Machine Language - Assembly Language - High Level Language - Object Oriented Languages								6
III	<b>Problem Solving Concepts:</b> Problem Solving in Everyday life - Types of Problems - Problem solving with computers - Difficulties with Problem Solving								6
IV	<b>Problem Solving concepts for the computer:</b> Constant Variables - Data Types - Functions - Operators - Expressions and Equations - <b>Organizing the Solution:</b> Analyzing the problem - Algorithm - Flowchart - Pseudo code								6
V	<b>Programming Structure:</b> Structuring a solution - Modules and their function - Local and Global variables - Parameters - Return values - Sequential Logic Structure - Problem solving with Decision - Problem Solving with Loops								6
<b>TOTAL</b>									<b>30</b>
CO	Course Outcomes								
CO1	Outline the Computer fundamentals and various problem solving concepts in Computers								
CO2	Describe the basic computer organization, software, computer languages, software development life cycle and the need of structured programming in solving a computer problem								
CO3	Identify the types of computer languages, software, computer problems and examine how to set up expressions and equations to solve the problem.								

CO4	Choose most appropriate programming languages, constructs and features to solve the problems in diversified domains.
CO5	Analyze the design of modules and functions in structuring the solution and various Organizing tools in problem solving.
<b>Textbooks</b>	
➤	Pradeep K.Sinha and Priti Sinha, (2004) —Computer Fundamentals, Sixth Edition, BPB Publications. (Unit I : Chapter 1 & 2, Unit II : Chapter 10 & 12)
➤	Maureen Sprankle and Jim Hubbard, (2009) —Problem Solving and Programming Concept, Ninth Edition, Prentice Hall. (Unit III: Chapter 1,2 &3) Unit IV : Chapter 3, Unit V : Chapter 4,5 ,6,7 & 8)
<b>Reference Books</b>	
1.	R.G. Dromey, (2007), —How to Solve it by Computer, Prentice Hall International Series in Computer Science.
2.	C. S. V. Murthy, (2009), —Fundamentals of Computers, Third Edition, Himalaya Publishing House.
<b>NOTE: Latest Edition of Textbooks May be Used</b>	
<b>Web Resources</b>	
1.	<a href="http://www.tutorialspoint.com/computer_fundamentals/">http://www.tutorialspoint.com/computer_fundamentals/</a>
2.	<a href="http://www.comptechdoc.org/basic/basicitut/">http://www.comptechdoc.org/basic/basicitut/</a>
3.	<a href="http://www.homeandlearn.co.uk/">http://www.homeandlearn.co.uk/</a>
4.	<a href="http://www.top-windows-tutorials.com/computer-basics/">http://www.top-windows-tutorials.com/computer-basics/</a>
5.	<a href="https://www.programiz.com/article/flowchart-programming">https://www.programiz.com/article/flowchart-programming</a> (Algorithm and flow chart)

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	2	2	3
CO2	3	2	2	2	3	2
CO3	3	3	3	3	2	2
CO4	3	2	2	2	2	3
CO5	3	3	2	2	3	2
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>12</b>	<b>11</b>	<b>11</b>	<b>12</b>	<b>12</b>

**FIRST YEAR – SEMESTER – II**

**CC3: Core Course 3: JAVAPROGRAMMING**

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	5	0	0	II	5	5	25	75	100
<b>Learning Objectives</b>									
L O 1	To provide knowledge on fundamentals of object-oriented programming								
L O 2	to have the ability to use the SDK environment to create, debug and run servlet programs								
<b>Prerequisites:</b> Basic knowledge about programming concepts									
Unit	Contents							No. of Hours	
I	Fundamentals of Object-Oriented Programming: Introduction – Object Oriented Paradigm – Concepts of Object-Oriented Programming – Benefits of OOP – Evolution: Java History - Java Features - Differs from C and C++ - Overview of Java Language: Java Program - Structure – Tokens – Java Statements – Java Virtual Machine – Command Line Arguments							15	
II	Constants, Variables and Data Types – Operators and Expressions – Decision making and Branching – Looping – Arrays - Strings – Collection Interfaces and classes							15	
II I	Classes objects and methods: Introduction – Defining a class – Method Declaration – Constructors - Method Overloading – Static Members – Nesting of methods – Inheritance – Overriding – Final variables and methods – Abstract methods and classes							15	
I V	Multiple Inheritance: Defining Interfaces – Extending Interfaces – Implementing Interfaces – Packages: Creating Packages – Accessing Packages – Using a Package – Managing Errors and Exceptions - Multithreaded Programming							15	
V	Layout Managers -JDBC – Java Servlet: - Servlet Environment Role – Servlet API – Servlet Life Cycle – Servlet Context – HTTP Support – HTML to Servlet Communication							15	
<b>TOTAL</b>							<b>75</b>		
C	<b>Course Outcomes</b>								

<b>O</b>	
C O 1	Outline the basic terminologies of OOP, programming language techniques, JDBC and Internet programming concepts
C O 2	Solve problems using basic constructs, mechanisms, techniques and technologies of Java
C O 3	Analyse and explain the behavior of simple programs involving different techniques such as Inheritance, Packages, Interfaces, Exception Handling and Thread and technologies such as JDBC and Servlets
C O 4	Assess various problem-solving strategies involved in Java to develop a high-level application.
C O 5	Design GUI based JDBC applications and able to develop Servlets using suitable OOP concepts and techniques
<b>Textbooks</b>	
	E Balagurusamy (2010), "Programming with Java", Tata McGraw Hill Edition India Private Ltd, 4th Edition
	C Xavier, "Java Programming – A Practical Approach", Tata McGraw Hill Edition Private Ltd
<b>Reference Books</b>	
	P. Naughton and H. Schildt (1999), "Java 2 The Complete Reference", TMH, 3rd Edition
	Jaison Hunder & William Crawford (2002), "Java Servlet Programming", O'Reilly
	Jim Keogh (2002), "J2EE: The Complete Reference", Tata McGraw Hill Edition.
<b>NOTE: Latest Edition of Textbooks May be Used</b>	
<b>Web Resources</b>	
	<a href="http://javabeginnerstutorial.com/core-java/">http://javabeginnerstutorial.com/core-java/</a>
	<a href="http://www.tutorialspoint.com/java/">http://www.tutorialspoint.com/java/</a>
	<a href="http://beginnersbook.com/java-tutorial-for-beginners-with-examples/">http://beginnersbook.com/java-tutorial-for-beginners-with-examples/</a>
	<a href="http://www.homeandlearn.co.uk/java/java.html">http://www.homeandlearn.co.uk/java/java.html</a>
	<a href="http://www.journaldev.com/1877/servlet-tutorial-java(UnitV:ServletAPI)">http://www.journaldev.com/1877/servlet-tutorial-java(UnitV:ServletAPI)</a>

<b>CO/PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
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CO1	3	2	2	2	2	2
CO2	2	3	2	2	2	2
CO3	2	3	3	3	2	2
CO4	2	3	2	2	2	2
CO5	3	3	2	2	2	2
<b>Weightage ofcoursecontributedtoea chPSO</b>	<b>12</b>	<b>14</b>	<b>11</b>	<b>11</b>	<b>10</b>	<b>10</b>

### CC4-1: Java Programming & Data Structures Practical

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	0	0	3	II	3	3	25	75	100
<b>Learning Objectives</b>									
<b>LO1</b>	To design and develop applications using different Java programming language techniques, JDBC & Servlets								
<b>LO2</b>	To organize and manipulate the data with the help of fundamental data structures								
<b>Prerequisites:</b>									
<b>Contents</b>									
<ol style="list-style-type: none"> <li>1. Basic Programs</li> <li>2. Arrays</li> <li>3. Strings</li> <li>4. ArrayList, HashSet and Vector collection classes</li> <li>5. Classes and Objects</li> <li>6. Interfaces</li> <li>7. Inheritance</li> <li>8. Packages</li> <li>9. Exception Handling</li> <li>10. Threads</li> <li>11. LinkedList</li> <li>12. Stacks</li> <li>13. Queue</li> <li>14. Sorting</li> <li>15. Binary Tree Representation</li> <li>16. Working with Database using JDBC</li> <li>17. Web application using Servlet</li> </ol>									
<b>CO</b>	<b>Course Outcomes</b>								
CO1	Identify and explain the ways of solving the simple problems								

CO2	Use appropriate software development environment to write, compile and execute object-oriented Java programs
CO3	Analyze and identify necessary mechanisms of Java needed to solve real-world problem
CO4	Test for defects and validate a Java program with different inputs
CO5	Design, develop and compile Core Java , GUI , JDBC and servlet applications that utilize OOP and data structure concepts

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	3	3	2	2
CO2	3	3	3	3	2	2
CO3	3	3	3	2	2	3
CO4	3	3	3	3	3	2
CO5	3	3	2	3	2	2
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>14</b>	<b>14</b>	<b>11</b>	<b>11</b>

**CC4-2: PHP SCRIPTING – PRACTICAL**

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks			
							CIA	External	Total	
	0	0	2	II	2	2	25	75	100	
<b>Learning Objectives</b>										
<b>LO1</b>	To enable the student to understand, analyze and build dynamic web pages using PHP with MySQL database									
<b>Prerequisites:</b>										
	<b>Contents</b>							<b>No. of Hours</b>		
	Exercises: 1. Control Structures 2. Working with Forms.							5		
	3. String Manipulations 4. Arrays 5. Functions 6. Sorting							10		
	7. Classes and Objects 8. Cookies and Sessions 9. Graphics							10		
	10. Working with single table 11. Working with multiple tables							5		
<b>TOTAL</b>							<b>30</b>			
<b>CO</b>	<b>Course Outcomes</b>									
CO1	Demonstrates simple programs using PHP and jQuery									
CO2	Apply the interface setup, styles & themes for the given application									
CO3	Analyze the problem and add necessary user interface components, multimedia components and web data source into the application									
CO4	Evaluate the results by implementing the correct techniques on the web form									
CO5	Construct web applications with the facilitated components in PHP and jQuery									
<b>Textbooks</b>										
➤	Kevin Tatroe, Peter MacIntyre, Rasmus Lerdorf, “Programming PHP”, O’Reilly Publications, Third Edition									
➤	Joel Murach, Ray Harris (2010), “PHP and MySQL”, Shroff Publishers & Distributors									

<b>Reference Books</b>	
1.	W.Jason Gilmore(2010), “BeginningPHP&MySql”,Apress
2.	LarryUllman (2008), “PHP6 and MySQL5”, Pearson Education
3.	John Coggeshall(2006), “PHP5”,Pearson Education
4.	MichaleC.Glass(2004),“BeginningPHP,Apache, MySQLWebDevelopment”,Wiley DreamTechPress
5.	Robin Nixon (2013),“LearningPHP,MySQL, JavaScript &CSS”, O‘Reilly, 2 <sup>nd</sup> Edition
<b>NOTE: Latest Edition of Textbooks May be Used</b>	
<b>Web Resources</b>	
1.	<a href="http://www.w3schools.com/jquery/">http://www.w3schools.com/jquery/</a>
2.	<a href="http://www.ccc.comnet.edu/faculty/sfreeman/cst%20250/jqueryNotes.pdf">http://www.ccc.comnet.edu/faculty/sfreeman/cst%20250/jqueryNotes.pdf</a>
3.	<a href="http://www.w3schools.com/php/">http://www.w3schools.com/php/</a>
4.	<a href="http://www.tutorialspoint.com/php/">http://www.tutorialspoint.com/php/</a>
5.	<a href="http://www.tutorialspoint.com/mysql/">http://www.tutorialspoint.com/mysql/</a>

<b>CO/PSO</b>	<b>PSO 1</b>	<b>PSO 2</b>	<b>PSO 3</b>	<b>PSO 4</b>	<b>PSO 5</b>	<b>PSO 6</b>
<b>CO1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>2</b>
<b>CO2</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO4</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>
<b>CO5</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>2</b>
<b>Weightage ofcoursecontributedtoeachPSO</b>	<b>15</b>	<b>11</b>	<b>11</b>	<b>12</b>	<b>11</b>	<b>13</b>



**EC2 A: Elective Course DATA STRUCTURES**

Subject Code	L	T	P	S	Credits	Inst. Hours	Marks		
							CIA	External	Total
	4	0	0	II	3	4	25	75	100
<b>Learning Objectives</b>									
<b>LO1</b>	To become familiar with the various data structures and their applications								
<b>LO2</b>	to increase the understanding of basic concepts of the design and use of algorithms								
<b>Prerequisites:</b>									
Unit	Contents								No. of Hours
I	Introduction and overview: Basic Terminology – Data Structures – Operations - Algorithms: Complexity – Time Space – Algorithmic Notation – Control Structures – Complexity of Algorithms – Notations Arrays: Representation – Operations - Linear Search – Binary Search								12
II	Stack: Representation – Arithmetic expressions: Polish Notation – Recursion: Towers of Hanoi - Queue –Priority Queue - Linked Lists: Introduction – Representation of Linked Lists – Traversing a Linked Lists – Searching a Linked List								12
III	Insertion into a Linked List – Deletion into Linked List – Header Linked Lists – Two-way Lists –Doubly Linked List - Trees : Binary Trees – Representation – Traversal using Recursion – Binary Search Trees								12
IV	Sorting : Bubble Sort Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Heap Sort								12
V	Graph – Graph Theory Terminology –Sequential Representation – Warshalls Algorithm – Shortest Path – Linked Representation - Traversals – Dynamic Programming – All Pairs Shortest Path - Greedy – Knapsack – Back Tracking – 8 Queens								12
<b>TOTAL</b>								<b>60</b>	
<b>THEORY 100%</b>									
CO	Course Outcomes								
CO1	Outline the different fundamental concepts of data structures								
CO2	Make use of different memory representation for data storage and apply various operations								
CO3	Construct an algorithm for different data structure operations.								
CO4	Analyse the data structures applications.								
CO5	Discover suitable techniques to provide solution for solving the problems.								

<b>Textbooks</b>	
➤	Seymour Lipschutz (1986), —Theory and Problems of Data Structures, Tata McGraw-Hill Edition
<b>Reference Books</b>	
1.	E.Horowitz, S.Sahni, S.Rajasekaran (1998), —Computer Algorithms, Galgotia Publications.
2.	Robert Kruse, C.L.Tondo, Bruce Leung, —Data Structures and Program Design in C, Second Edition, Prentice Hall Publications
<b>NOTE: Latest Edition of Textbooks May be Used</b>	
<b>Web Resources</b>	
1.	<a href="http://www.cs.sunysb.edu/~skiena/214/lectures/">http://www.cs.sunysb.edu/~skiena/214/lectures/</a>
2.	<a href="http://datastructures.itgo.com/graphs/dfsdfs.htm">http://datastructures.itgo.com/graphs/dfsdfs.htm</a>
3.	<a href="http://oopweb.com/Algorithms/Documents/PLDS210/VolumeFrames.html">http://oopweb.com/Algorithms/Documents/PLDS210/VolumeFrames.html</a>
4.	<a href="http://discuss.codechef.com/questions/48877/data-structures-and-algorithms">http://discuss.codechef.com/questions/48877/data-structures-and-algorithms</a>
5.	<a href="http://code.tutsplus.com/tutorials/algorithms-and-data-structures--cms-20437">http://code.tutsplus.com/tutorials/algorithms-and-data-structures--cms-20437</a>
6.	<a href="https://www.tutorialspoint.com/data_structures_algorithms/insertion_sort_algorithm.htm">https://www.tutorialspoint.com/data_structures_algorithms/insertion_sort_algorithm.htm</a> (Unit IV : Insertion Sorting)

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	2	2	3	3	3
CO2	3	3	2	3	3	3
CO3	3	3	3	3	3	2
CO4	3	3	2	3	3	3
CO5	3	3	2	3	3	2
<b>Weightage of course contributed to each PSO</b>	<b>15</b>	<b>14</b>	<b>11</b>	<b>15</b>	<b>15</b>	<b>13</b>

**S-Strong    M-Medium    L-Low**

**EC2 B: Elective Course**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OPTIMIZATION TECHNIQUES**

*Course objectives:*

1. To apply various optimization techniques for decision making.
2. To introduce the use of variables for formulating complex mathematical models in management, science and industrial applications

*Course Outcome:*

On successful completion of the course, the learners will be able to CO1. Formulate and solve Linear Programming Problems.  
CO2. Analyze the usage of Sequencing Problems.  
CO3. Evaluate Queueing Models.  
CO4. Apply PERT and CPM techniques to find the optimal solution.

**UNIT I**

**12 hours**

INTRODUCTION-LINEAR PROGRAMMING PROBLEM

The Nature and Meaning of OR – Management – Applications of OR – Modeling in OR – General methods for solving OR models – Scope of OR.

Linear Programming Problem: Formulation of LP problems – Graphical solution of LP problems – General formulation of LPP – Slack and Surplus variables – Standard form of LPP – Some important forms of LPP – Simplex Method I.

**UNIT II**

**12 hours**

ASSIGNMENT PROBLEMS

Assignment Problem: Mathematical formulation–Hungarian method–Unbalanced assignment problem – Various types

**UNIT III**

**12 hours**

TRANSPORTATION PROBLEMS

Transportation Model: Mathematical formulation – Matrix form–Methods for finding Initial Basic Feasible solution and Optimal solution – Degeneracy in Transportation Problems – Unbalanced Transportation Problem.

**UNIT IV**

**12 hours**

SEQUENCING PROBLEMS AND QUEUEING MODELS

Sequencing Problems: Assumptions – Solutions to Sequencing Problems: Processing n jobs through 2 machines – Processing n jobs through 3 machines – Processing n jobs on m machines.

Queueing Models: Queueing System – Transient and Steady States–Kendal’s Notation for representing Queueing Models – Various Models in

Queuing System – Birth and Death Model.

**UNIT V**

**12 hours**

**PERT AND CPM TECHNIQUES**

PERT and CPM Techniques: Basic Steps – Network Diagram representation– Rules for drawing Network Diagram – Labeling Fulkerson’s I–J Rule – Time Estimates and Critical Path in Network Analysis – Examples on optimum duration and minimum duration cost – PERT.

**CO-PO –PSO Mapping**

OPTIMIZATION TECHNIQUES											
CO	PO					PSO					COGNITIVE LEVEL
	1	2	3	4	5	1	2	3	4	5	
CO1	S	S	S	M	S	S	S	M	S	S	K-2
CO2	S	S	M	S	S	S	S	S	S	S	K-1
CO3	S	S	M	S	S	S	S	S	S	S	K-3
CO4	S	S	M	S	S	S	S	S	S	S	K-5
CO5	S	S	M	S	S	S	S	S	S	S	K-6

Strongly Correlated–S, Moderately Correlated–M, Weekly Correlated-L

**TEXT BOOK**

S.D.Sharma, “Operations Research”, Tenth Edition, Pearson, 2017.

**REFERENCE BOOKS**

1. Hamdy A Taha, “Operations Research”, Ninth Edition, 2016.
2. V.Sundaresan, K.S.Ganapathy Subramanian, K.Ganesan, “Resource Management Techniques”, Ninth Edition, A. R.Publications, 2015.

**Skill Enhancement Course: SEC2 A**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	<b>Robotics and Its Applications</b>		Y	2	-	-	2	2	25	75	100
<b>Course Objective</b>											
C1	To understand the robotics fundamentals										
C2	Understand the sensors and matrix methods										
C3	Understand the Localization: Self-localizations and mapping										
C4	To study about the concept of Path Planning, Vision system										
C5	To learn about the concept of robot artificial intelligence										
UNIT	Details							No. of Hours	Course Objective		
I	Introduction: Introduction, brief history, components of robotics, classification, workspace, work-envelop, motion of robotic arm, end-effectors and its types, service robot and its application, Artificial Intelligence in Robotics.							6	CO1		
II	Actuators and sensors :Types of actuators, stepper-DC-servo-and brushless motors- model of a DC servo motor-types of transmissions-purpose of sensor-internal and external sensor-common sensors-encoders tachometers-strain gauge based force torque sensor-proximity and distance measuring sensors  Kinematics of robots: Representation of joints and frames, frames transformation, homogeneous matrix, D-H matrix, Forward and inverse kinematics: two link planar (RR) and spherical robot (RRP). Mobile robot Kinematics: Differential wheel mobile robot							6	CO2		
III	Localization: Self-localizations and mapping - Challenges in localizations – IR based localizations – vision based localizations – Ultrasonic based localizations - GPS localization systems.							6	CO3		
IV	Path Planning: Introduction, path planning-overview-road map path planning-cell decomposition path planning potential field path planning-obstacle avoidance-case studies  Vision system: Robotic vision systems-image representation-object							6	CO4		

	recognition-and categorization-depth measurement- image data compression-visual inspection-software considerations		
V	Application: Ariel robots-collision avoidance robots for agriculture-mining-exploration-underwater-civilian- and military applications-nuclear applications-space Applications-Industrial robots-artificial intelligence in robots-application of robots in material handling-continuous arc welding-spot welding-spray painting-assembly operation-cleaning-etc.	6	CO5
<b>Total</b>			
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
CO	On completion of this course, students will		
1	Describe the different physical forms of robot architectures.		PO1
2	Kinematically model simple manipulator and mobile robots.		PO1, PO2
3	Mathematically describe a kinematic robot system		PO4, PO6
4	Analyze manipulation and navigation problems using knowledge of coordinate frames, kinematics, optimization, control, and uncertainty.		PO4, PO5, PO6
5	Program robotics algorithms related to kinematics, control, optimization, and uncertainty.		PO3, PO8
<b>Text Book</b>			
1	RichardD.Klafter. Thomas Achmielewski and MickaelNegin, Robotic Engineering and Integrated Approach, Prentice Hall India-Newdelhi-2001		
2	SaeedB.Nikku, Introduction to robotics, analysis, control and applications, Wiley-India, 2 nd edition 2011		
<b>Reference Books</b>			
1.	Industrial robotic technology-programming and application by M.P.Groover et.al, McGrawhill2008		
2.	Robotics technology and flexible automation by S.R.Deb, THH-2009		
<b>Web Resources</b>			
1.	<a href="https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm">https://www.tutorialspoint.com/artificial_intelligence/artificial_intelligence_robotics.htm</a>		
2.	<a href="https://www.geeksforgeeks.org/robotics-introduction/">https://www.geeksforgeeks.org/robotics-introduction/</a>		

**Mapping with Programme Outcomes:**

	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>
<b>CO 1</b>	S					
<b>CO 2</b>	M	S				
<b>CO 3</b>				S		S
<b>CO 4</b>				S	S	M
<b>CO 5</b>			S			

**S-Strong**

**M-Medium**

**L-Low**

**Skill Enhancement Course: SEC 2 B**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks			
									CIA	External	Total	
	<b>Quantitative Aptitude</b>	Specific Elective	Y	2	-	-	2	2	25	75	100	
<b>Course Objective</b>												
C1	To understand the basic concepts of numbers											
C2	Understand and apply the concept of percentage, profit & loss											
C3	To study the basic concepts of time and work, interests											
C4	To learn the concepts of permutation, probability, discounts											
C5	To study about the concepts of data representation, graphs											
UNIT	Details							No. of Hours	Course Objective			
I	Numbers-HCF and LCM of numbers-Decimal fractions-Simplification-Squareroot and cuberoots - Average-problems on Numbers.							6	CO1			
II	Problems on Ages - Surds and Indices - percentage - profits and loss - ratio and proportion-partnership-Chainrule.							6	CO2			
III	Time and work - pipes and cisterns - Time and Distance - problems on trains -Boats and streams - simple interest - compound interest - Logarithms - Area-Volume and surfacearea -races and Games of skill.							6	CO3			
IV	Permutation and combination-probability-True Discount-Bankers Discount – Height and Distances-Oddmanout& Series.							6	CO4			
V	Calendar - Clocks - stocks and shares - Data representation - Tabulation - BarGraphs-Piecharts-Linegraphs.							6	CO5			
	<b>Total</b>							<b>60</b>				
<b>Course Outcomes</b>								<b>Programme Outcome</b>				
CO	On completion of this course, students will											
1	understand the concepts, application and the problems of numbers							PO1				



2	To have basic knowledge and understanding about percentage, profit & loss related processings	PO1, PO2
3	To understand the concepts of time and work	PO4, PO6
4	Speaks about the concepts of probability, discount	PO4, PO5, PO6
5	Understanding the concept of problem solving involved in stocks & shares, graphs	PO3, PO8
<b>Text Book</b>		
1	“QuantitativeAptitude”,R.S.AGGARWAL.,S.Chand&CompanyLtd.,	
<b>Reference Books</b>		
1.		
<b>Web Resources</b>		
1.	<a href="https://www.javatpoint.com/aptitude/quantitative">https://www.javatpoint.com/aptitude/quantitative</a>	
2.	<a href="https://www.toppr.com/guides/quantitative-aptitude/">https://www.toppr.com/guides/quantitative-aptitude/</a>	

**Mapping with Programme Outcomes:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
<b>CO 1</b>	S							
<b>CO 2</b>	M	S						
<b>CO 3</b>				S		S		
<b>CO 4</b>				S	S	M		
<b>CO 5</b>			S					S

**S-Strong      M-Medium      L-Low**

**Skill Enhancement Course: SEC 3 A**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	<b>SoftwareTesting</b>		Y	2	-	-	2	2	25	75	100
<b>Course Objective</b>											
<b>C1</b>	To study fundamental concepts in software testing										
<b>C2</b>	To discuss various software testing issues and solutions in software unit test, integration and system testing.										
<b>C3</b>	To study the basic concept of Data flow testing and Domain testing.										
<b>C4</b>	To Acquire knowledge on path products and path expressions.										
<b>C5</b>	To learn about Logic based testing and decision tables										
UNIT	Details						No. of Hours	Course Objective			
<b>I</b>	Introduction: Purpose–Productivity and Quality in Software–TestingVsDebugging–Model for Testing–Bugs–Types of Bugs – Testing and Design Style.						6	C1			
<b>II</b>	Flow / Graphs and Path Testing – Achievable paths – Path instrumentation Application Transaction FlowTesting Techniques.						6	C2			
<b>III</b>	Data Flow Testing Strategies - Domain Testing;Domains and Paths – Domains and Interface Testing.						6	C3			
<b>IV</b>	Linguistic –Metrics – Structural Metric – Path Products and Path Expressions.SyntaxTesting–Formats–Test Cases						6	C4			
<b>V</b>	Logic Based Testing–Decision Tables–Transition Testing–States, State Graph, StateTesting.						6	C5			
	<b>Total</b>						<b>30</b>				
<b>Course Outcomes</b>							<b>Program Outcomes</b>				
<b>CO</b>	On completion of this course, students will										
<b>1</b>	Students learn to apply software testing knowledge and engineering methods						PO1				
<b>2</b>	Have an ability to identify the needs of software test automation, and define and develop a test tool to						PO1, PO2				

	support test automation.	
3	Have an ability understand and identify various software testing problems, and solve these problems by designing and selecting software test models, criteria, strategies, and methods.	PO4, PO6
4	Have basic understanding and knowledge of contemporary issues in software testing, such as component-based software testing problems	PO4, PO5, PO6
5	Have an ability to use software testing methods and modern software testing tools for their testing projects.	PO3, PO8
<b>Text Book</b>		
1	B.Beizer,“SoftwareTestingTechniques”,IIEdn.,DreamTechIndia,NewDelhi,2003.	
2	K.V.K.Prasad,“SoftwareTestingTools”,DreamTech.India,NewDelhi,2005	
<b>Reference Books</b>		
1.	I.Burnstein,2003,“PracticalSoftwareTesting”,SpringerInternationalEdn.	
2.	E. Kit, 1995, “Software Testing in the Real World: Improving the Process”,PearsonEducation,Delhi.	
3.	R. RajaniandP.P.Oak,2004,“SoftwareTesting”,TataMcgrawHill,NewDelhi.	
<b>Web Resources</b>		
1.	<a href="https://www.javatpoint.com/software-testing-tutorial">https://www.javatpoint.com/software-testing-tutorial</a>	
2.	<a href="https://www.guru99.com/software-testing.html">https://www.guru99.com/software-testing.html</a>	

**Mapping with Programme Outcomes:**

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
CO 1	S							
CO 2	M	S						
CO 3				S		S		
CO 4				S	S	M		
CO 5			S					S

**Skill Enhancement Course: SEC 3 B**

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
	<b>Cyber Forensics</b>	Specific Elective	Y	2	-	-	2	2	25	75	100
<b>Course Objective</b>											
<b>C1</b>	Understand the definition of computer forensics fundamentals.										
<b>C2</b>	To study about the Types of Computer Forensics Evidence										
<b>C3</b>	Understand and apply the concepts of Duplication and Preservation of Digital Evidence										
<b>C4</b>	Understand the concepts of Electronic Evidence and Identification of Data										
<b>C5</b>	To study about the Digital Detective, Network Forensics Scenario, Damaging Computer Evidence.										
<b>UNIT</b>	<b>Details</b>						<b>No. of Hours</b>		<b>Course Objective</b>		
<b>I</b>	<b>Overview of Computer Forensics Technology:</b> Computer Forensics Fundamentals: What is Computer Forensics? Use of ComputerForensics in Law Enforcement, Computer Forensics Assistance to HumanResources/Employment Proceedings, Computer Forensics Services, Benefits of professionalForensics Methodology, Steps taken by Computer Forensics Specialists. Types of Computer.Forensics Technology: Types of Business Computer Forensic, Technology–Types ofMilitary Computer Forensic Technology–Types of Law Enforcement–Computer Forensic. Technology–Types of Business Computer Forensic Technology.						6		C1		
<b>II</b>	<b>Computer Forensics Evidence and capture:</b> Data Recovery: Data Recovery Defined, Data Back–up and Recovery, The Role of Back –up in Data Recovery, The Data –Recovery Solution. Evidence Collection and Data Seizure: Collection Options,						6		C2		

	Obstacles, Types of Evidence, The Rules of Evidence, Volatile Evidence, General Procedure, Collection and Archiving, Methods of Collections, Artefacts, Collection Steps, Controlling Contamination: The chain of custody.		
<b>III</b>	<b>Duplication and Preservation of Digital Evidence:</b> Processing steps, Legal Aspects of collecting and Preserving Computerforensic Evidence. Computer image Verification and Authentication: Special needs of Evidential Authentication, Practical Consideration, Practical Implementation.	6	C3
<b>IV</b>	<b>Computer Forensics Analysis:</b> Discovery of Electronic Evidence: Electronic Document Discovery: A Powerful New Litigation Tool. Identification of Data: Time Travel, Forensic Identification and Analysis of Technical Surveillance Devices.	6	C4
<b>V</b>	<b>Reconstructing Past Events:</b> How to Become a Digital Detective, Useable File Formats, Unusable File Formats, Converting Files. Networks: Network Forensics Scenario, a technical approach, Destruction Of E-Mail, Damaging Computer Evidence, Documenting The Intrusion on Destruction of Data, System Testing.	6	C5
	<b>Total</b>	<b>30</b>	
<b>Course Outcomes</b>		<b>Programme Outcomes</b>	
<b>CO</b>	On completion of this course, students will		
<b>1</b>	Understand the definition of computer forensics fundamentals.		PO1
<b>2</b>	Evaluate the different types of computer forensics technology.		PO1, PO2

<b>3</b>	Analyze various computer forensics systems.	PO4, PO6
<b>4</b>	Apply the methods for data recovery, evidence collection and data seizure.	PO4, PO5, PO6
<b>5</b>	Gain your knowledge of duplication and preservation of digital evidence.	PO3, PO8
<b>Text Book</b>		
<b>1</b>	John R. Vacca, "Computer Forensics: Computer Crime Investigation", 3/E ,Firewall Media, New Delhi, 2002.	
<b>Reference Books</b>		
<b>1.</b>	Nelson, Phillips Enfinger, Steuart, "Computer Forensics and Investigations" Enfinger, Steuart, CENGAGE Learning, 2004.	
<b>2.</b>	Anthony Sammes and Brian Jenkinson, "Forensic Computing: A Practitioner's Guide", Second Edition, Springer-Verlag London Limited, 2007.	
<b>3.</b>	.Robert M.Slade, " Software Forensics Collecting Evidence from the Scene of a Digital Crime", TMH 2005.	
<b>Web Resources</b>		
<b>1.</b>	<a href="https://www.vskills.in">https://www.vskills.in</a>	
<b>2.</b>	<a href="https://www.hackingarticles.in/best-of-computer-forensics-tutorials/">https://www.hackingarticles.in/best-of-computer-forensics-tutorials/</a>	

### Mapping with Programme Outcomes:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8
<b>CO 1</b>	S							
<b>CO 2</b>	M	S						
<b>CO 3</b>				S		S		
<b>CO 4</b>				S	S	M		
<b>CO 5</b>			S					S

**S-Strong      M-Medium      L-Low**