B.Sc., COMPUTER SCIENCE

SYLLABUS

For Those Who Joined
From The Academic Year

2026 - 2027

MANONMANIAM SUNDARANAR UNIVERSITY,

Tirunelveli – 627 012

1. University Vision

"To provide quality education to reach the un-reached"

2. University Mission

❖ To conduct research, teaching and outreach programmes to improve conditions of human living

❖ To offer a wide variety of off-campus educational and training programs, including the use of information technology, to individuals and groups.

❖ To develop partnerships with industries and governments so as to improve the quality of the workplace and to serve as catalyst for economic and cultural development

❖ To provide quality / inclusive education, especially for the rural and un-reached segments of economically downtrodden students including women, socially oppressed and differently abled

3. Preamble

Bachelor of Computer Science is a undergraduate programme with courses designed to achieve high degrees of technical skills in problem solving and application development. The objective of this programme is to equip students with the potential to meet his/her carrier path with much confidence. Learning the courses leads to an understanding of the fundamentals of computer hardware and associated software. The courses in the programme are focused on the theories, concepts, algorithms, programming languages, applications and software tools. Cutting-edge technologies like AI and machine learning are also given importance in the programme. The data processing, digital signal processing, database management system and image processing are included in the courses of this programme to enable students to stand tall in the competitive world.

Aligned with BLOOM's Taxonomy, the curriculum, teaching methods, and evaluation methods are matched with suitable cognitive levels. The assessment of students' cognitive abilities and the evaluation of the attainment of expected course outcomes will be made possible by the Outcome Based Education (OBE) based evaluation methodologies.

4. Programme Educational Outcomes (PEOs)

In alignment with the Vision and Mission of the University, the following have been defined as the PEO for the undergraduates.

PEO1: Developing strong positive attitude to learn independently the concepts in the field of study

PEO2: Ensuring confidence among the learners to apply the knowledge and skills gained to solve real life issues

PEO3: Habituating ethical values among the learners to succeed in personal and professional life

5. Programme Outcomes (POs)

After the successful completion of Undergraduate Programme from the University, the learner should be able to

PO1: Comprehend the knowledge acquired and communicate the same to others.

PO2: Analyze and compare the factual data / situation to comprehend and to critically evaluate to find solution to the problem ahead.

PO3: Apply theories and philosophies learned in solving the problem in scientific manner.

PO4: Think reflectively on the earlier activities and attempt to self-directed lifelong learning process.

PO5: Understand multicultural existence and identify the means to prolong moral/ethical values in personal and professional life.

PO6: Expose the learner to digital technology to learn through multiple sources

PO7: Train the learner to be a responsible player in teams and impart leadership qualities in them.

6. Programme Specific Outcomes (PSOs)

PSO 1 : To develop the ability to understand the basic theories and concepts in computer science and to comprehend the fundamental principles.

PSO 2 : To identify and analyse suitable techniques and algorithms and to use them in developing programs and apply them in software tools in computer science.

PSO 3 : To apply fundamental theories in computer science to solve scientific and business problems.

PSO 4 : To think in a critical and logical manner to solve any problems in computer science that leads to acquire a lifelong learning process.

PSO 5 : To understand and commit to rules and responsibilities, data ethics, cyber regulations and norms of professional practices in computer science and industries.

PSO6: To give exposure to latest technologies available in related subjects from books, journals and digital resources.

PSO7: To equip with professional skills that enable them to work among teams and collaborate with other talents in other areas and to develop overall working expertise.

COURSE OUTCOMES

FOUR Course Outcomes (COs) for each course that can be achieved by the learners on completion of that course. K1, K2 and K3 are taken as Lower Order Thinking (LOT). K4, K5 and K6 are taken as Higher Order Thinking (HOT). Considering outcomes related to

i. K1 and K2 level of evaluation in all the Units as CO1.
ii. K3 level of evaluation in all the Units as CO2.
iii. K4 level of evaluation in all the Units as CO3.
iv. K5 and K6 level of evaluation in all the Units as CO4.

K1 – Learner can **remember** and recall.

K2 – Learner can **understand** and interpret.

K3 – Learner can **apply** in situations.

K4 – Learner can **analyze** and infer.

K5 – Learner can **evaluate** to judge.

K6 – Learner can **create** or develop new concepts.

7. Programme Details

7.1 Eligibility Criteria:

Candidates who have studied Mathematics as one of the subjects in HSC (Academic Stream) are eligible for this programme (as specified in the admission

guidelines given by the Directorate of Collegiate Education 2026-2027 www.tndce.tn.gov.in)

7.2 Medium of Instruction:

English

7.3 Duration of the Course:

B.Sc. Computer Science is a 3 year full-time under-graduate programme spread over six semesters.

8. Examination Scheme

8.1 Lecture Theory Courses :

8.1.1 Continuous Internal Assessment :

There is no passing minimum mark for continuous internal assessment (CIA).

The maximum mark for continuous internal assessment for all **lecture theory** courses is 25.

For the theory continuous internal assessment marks, out of 25, 5 marks are assigned for class assignment works, class quizzes and seminar presentations. The remaining 20 marks are assessed by conducting three periodical one-hour internal tests and calculating the average out of the marks obtained in the best two internal tests. The periodical internal test questions may consist of two objective type questions for 2 marks (2 x 1 = 2), two descriptive questions for 10 marks (2 x 5 = 10) and one descriptive question (preferably of HOTS) for 8 marks (1 x 8 = 8).

8.1.2 External Assessment :

The maximum mark for external assessment for all **lecture theory** courses is 75.

The assessment is based on the marks obtained by the end-semester theory examination conducted by the University. For theory courses, the passing minimum in the external assessment is 30 (out of 75).

The passing minimum mark for the lecture theory courses is **40 (out of 100)**, which is calculated by adding both continuous internal assessment and external assessment marks.

8.2 Practical Lab Courses :

8.2.1 Continuous Internal Assessment :

There is no passing minimum mark for continuous internal assessment (CIA).

The maximum mark for continuous internal assessment for all **practical lab** courses is 50.

For the practical continuous internal assessment marks, out of 50, 20 marks are allotted for the successful execution of all university practical assignments in time, 20 marks are allotted for an internal practical model test consisting of 2 university practical assignments and remaining 10 marks are allotted for the completion of the practical record workbook.

8.2.2 External Assessment :

The maximum mark for external assessment for all **practical lab** courses is 50.

The assessment is based on the marks obtained by the end-semester practical examination consisting of any 2 university practical assignments conducted by the University. For practical courses, the passing minimum in the external assessment is 20 (out of 50).

For the practical external assessment marks, out of 50, 20 marks are allotted for writing the procedure or algorithm, and the program for the two practical questions, 20 marks are allotted for debugging, execution and producing the correct results for both practical questions and remaining 10 marks are allotted for the neat practical record workbook. Duly signed record workbook is must for the appearance for any university practical examinations.

The passing minimum mark for the practical lab courses is **40 out of 100**, which is calculated by adding both continuous internal assessment and external assessment marks.

8.3 Projects:

Project titles should be selected based on the latest topics related to the curriculum and availability of resources in consultation with the assigned guide and department. Individual or group projects are allowed. The maximum strength in a group is restricted to 3 students. The guide should monitor the progress of the project.

8.3.1 Continuous Internal Assessment :

There is no passing minimum mark for continuous internal assessment.

The maximum mark for internal assessment is 50 for all projects. Out of which, 10 marks are allotted for the concept or idea, aim and comparison work of the proposed project

with the existing works, 20 marks are allotted for project design, implementation, execution and obtained results, 10 marks are allotted for project report preparation in a neat format and 10 marks are allotted for internal viva and project presentation.

8.3.2 External Assessment :

The passing minimum for external assessment mark for project courses is 20.

The maximum mark for external assessment is 50. Out of which 20 marks are allotted for writeup about the project (5 pages) including synopsis, outline of the design, attained objectives and possible future expansions, 20 marks are allotted for the project presentation using minimum 10 slides and 10 marks are allotted for external viva voce.

The passing minimum mark for the course is **40 out of 100**, which is calculated by adding both internal and external assessment marks.

9. Question Paper Pattern

Time : Three hours Maximum : 75 marks

PART A — (10 x 1 = 10 marks)

Compulsory TEN Objective type questions with four choices. Each question carries ONE mark. Out of TEN questions, any SIX questions are from lower order thinking (K1, K2 and K3) remaining FOUR questions from higher order thinking (K4, K5 and K6)

PART B — (5 x 5 = 25 marks)

FIVE questions, each of which has (a) and (b) options. The student must answer either (a) or (b) option. Both choices (a) and (b) should be at the same difficulty level. Each question carries FIVE marks. Out of FIVE questions any THREE questions are from lower order thinking (K1, K2 and K3) remaining TWO questions from higher order thinking (K4, K5 and K6).

PART C — (5 x 8 = 40 marks)

FIVE questions, each of which has (a) and (b) options. The student must answer either (a) or (b) option. Both choices (a) and (b) should be at the same difficulty level. Each question carries EIGHT marks. Out of FIVE questions any THREE questions are from lower order thinking (K1, K2 and K3) remaining TWO questions from higher order thinking (K4, K5 and K6)

10. Model Question Paper

Manonmaniam Sundaranar University

BSc Computer Science – Degree Examination, April 2026

Semester I, Part III

Object Oriented Programming with C++

Time : Three hours Maximum : 75 marks

PART A – (10 x 1 = 10 marks)

Answer **ALL** questions

Choose the correct answer :

No	Question	CO	K
1	_____ are the basic run time entities in an object-oriented system (a) Data (b) Objects (c) Classes (d) All the above	1	1
2	a=5;If(a = 0) cout << a << " is 0"; else cout << a << " is not 0 "; Output of above code a) 5 is not 0 c)5 is 0 c) 0 is 0 d) 0 is not 0	4	5
3	Constructors are used to (a) Initialize variables (b) Allocate memory (c) Both the above (d) None of the above	1	2
4	A destructor can have _____ arguments. (a) one (b) many (c) void (d) no	1	2
5	From the following, find out which one cannot use friend function (a) = (b) ( ) (c) [ ] (d) All the above	3	4
6	Grandparent base class is (a) an object (b) virtual (c) a class (d) all the above	3	4
7	We cannot use virtual (a) objects (b) classes (c) constructors (d) destructors	3	4
8	In C++, by default, the floating numbers are printed with _____ digits after the decimal points (a) 4 (b) 6 (c) 8 (d) 16	1	1
9	The stream state number uses _____ fields to store status (a) binary (b) bit field (c) non zero (d) file name	1	2
10	____ is generic programming (a) inheritance (b) polymorphism (c) data types (d) templates	1	2

PART B – (5 x 5 = 25 marks)

Answer **ALL** questions by choosing either (a) or (b)

No	Question	CO	K
11	(a) Recall in detail about object-oriented programming paradigm. Or (b) Illustrate the use of Inline Functions with example	1	2
12	(a) Explain how to access class members Or (b) Explain constructors with default arguments	2	3
13	(a) Compare overloading unary and binary operators Or (b) Overload a unary operator to find Transpose of a matrix.	3	4
14	(a) Compare polymorphism and overloading. Or (b) Why 'this' pointer is inevitable, explain with an example.	3	4
15	(a) How do you detect 'end of file'? Discuss Or (b) Explain the Standard Template Library and how it is working	2	3

PART C – (5 x 8 = 40 marks)

Answer **ALL** questions by choosing either (a) or (b)

No	Question	CO	K
16	(a) Discuss about the basic concepts of object-oriented programming Or (b) Elucidate in brief about else-if-ladder with example	1	2
17	(a) Examine in brief about friend functions with example. Or (b) Explain about parameterized constructor with example.	2	3
18	(a) Explain how to overload binary operator with example. Or (b) Explain in detail about type conversion with examples.	2	3
19	(a) Discuss about pointers to derived classes with examples Or (b) Elucidate virtual function with an example program	3	4
20	(a) Explain the importance of file opening and closing methods with example. Or (b) Analyse in brief about class templates syntax with example.	3	4

11. Entire Programme Structure

Credit Distribution for UG Programmes – B.Sc Computer Science

	Sem I	Cr	Ho	Sem II	Cr	Ho	Sem III	Cr	Ho	Sem IV	Cr	Ho	Sem V	Cr	Ho	Sem VI	Cr	Ho
Part – 1	Language – Tamil	3	6	Language – Tamil	3	6	Language – Tamil	3	6	Language – Tamil	3	6						
Part – 2	Language –English	3	6	Language –English	3	4	Language –English	3	6	Language –English	3	6						
Part – 3	1.3 Core Course – CC I	4	4	2.3 Core Course – CC III	4	4	3.3 Core Course – CC V	4	4	4.3 Core Course – CC VII	4	4	5.1 Core Course – CC IX	4	4	6.1 Core Course – CC XIV	4	4
	1.4 Core Course – CC II Practical	3	4	2.4 Core Course – CC IV Practical	3	4	3.4 Core Course – CC VI Practical	3	4	4.4 Core Course – CC VIII Practical	3	4	5.2 Core Course – CC X	4	4	6.2 Core Course – CC XV	4	4
													5.3 Core Course – CC XI	4	4	6.3 Core Course – CC XVI	4	4
													5.4 Core Course – CC XII Practical	3	6	6.4 Core Course – CC XVII Practical	3	6
													5.5 Core Course – CC XIII Mini Project	3	6	65 Core Course – CC XVIII Major Project	3	6
	1.5 Elective – Generic/ Discipline – EC I	4	4	2.5 Elective – Generic/ Discipline – EC II	4	4	3.5 Elective – Generic/ Discipline – EC III	4	4	4.5 Elective – Generic/ Discipline – EC IV	4	4	5.6 Elective – Generic/ Discipline – EC V	4	4	6.6 Elective – Generic/ Discipline – EC VI	4	4
Part – 4	1.6 Skill Enhancement – SEC I Practical	3	3	2.6 Skill Enhancement – SEC II Practical	2	3	3.6 Skill Enhancement – SEC IV Practical	2	2	4.6 Skill Enhancement – SEC VI Practical	2	2	5.7 Summer Internship / Industrial Training	1				
	1.7 Foundation Course	3	3	2.7 Skill Enhancement – SEC III	2	3	3.7 E.V.S.	2	2	4.7 Value Education	2	2						
				2.8 Naan Mudhalvan Course – English	2	2	3.8 Naan Mudhalvan / Skill Enhancement – SEC V	2	2	4.8 Naan Mudhalvan / Skill Enhancement – SEC VII	2	2	5.8 Naan Mudhalvan / Skill Enhancement – SEC VIII	2	2	6.7 Naan Mudhalvan / Skill Enhancement – SEC IX	2	2
Part – 5																6.8 Extension Activity	1	-
		23	**30**		**23**	**30**		**23**	**30**		**23**	**30**		**25**	**30**		**25**	**30**
	Total – 142 Credits																	

Manonmaniam Sundaranar University, Tirunelveli

OUTCOME BASED EDUCATION (OBE)
Choice Based Credit System

UG courses – B.Sc Computer Science – Curriculum Design

(For the academic year 2026-'27 to 2028-'29)

First Year – Semester I

	List of Courses	Credit	No. of Hours (L/T/P)	Page No
Part-1	Language – Tamil	3	6	
Part-2	Language – English	3	6	
Part-3	1.3 Core Course – CC I Theory – Object Oriented Programming with C++	4	4	17
	1.4 Core Course – CC II Practical – Object Oriented Programming with C++ Lab	3	4	20
	1.5 Elective Course – EC I Theory – Digital Logic Fundamentals / Digital Communication Systems	4	4	22 / 24
Part-4	1.6 Skill Enhancement Course – SEC I Practical – Office Automation Lab	3	3	26
	1.7 Foundation Course Theory – Problem Solving Techniques	3	3	29
		23	**30**	

First Year – Semester II

	List of Courses	Credit	No. of Hours (L/T/P)	Page No
Part-1	Language – Tamil	3	6	
Part-2	Language – English	3	4	
Part-3	2.3 Core Course – CC III Theory – Data Structure and Algorithms	4	4	31
	2.4 Core Course – CC IV Practical – Data Structure and Algorithms Lab	3	4	33
	2.5 Elective Course – EC II Theory – Discrete Mathematics / Probability and Statistics	4	4	35 / 37
Part-4	2.6 Skill Enhancement Course – SEC II Practical – Web Programming Lab	2	3	39
	2.7 Skill Enhancement Course – SEC III Theory – Computer Architecture	2	3	42
	2.8 Naan Mudhalvan Course – English	2	2	
		23	**30**	

Second Year – Semester III

	List of Courses	Credit	No. of Hours (L/T/P)	Page No
Part-1	Language – Tamil	3	6	
Part-2	Language – English	3	6	
Part-3	3.3 Core Course – CC V Theory – Java Programming	4	4	
	3.4 Core Course – CC VI Practical – Java Programming Lab	3	4	
	3.5 Elective Course – EC III Theory – Resource Management Techniques / Microprocessor Architecture / E-Commerce	4	4	
Part-4	3.6 Skill Enhancement Course – SEC IV Practical – PHP Programming Lab	2	2	
	3.7 Environmental Studies	2	2	
	3.8 Naan Mudhalvan / Skill Enhancement Course – SEC V – Software Tools for Office Automation	2	2	
		23	**30**	

Second Year – Semester IV

	List of Courses	Credit	No. of Hours (L/T/P)	Page No
Part-1	Language – Tamil	3	6	
Part-2	Language – English	3	6	
Part-3	4.3 Core Course – CC VII Theory – Database Management System	4	4	
	4.4 Core Course – CC VIII Practical – Database Management System Lab	3	4	
	4.5 Elective Course – EC IV Theory – Data Science / IOT Applications / Information Security	4	4	
Part-4	4.6 Skill Enhancement Course – SEC VI Practical – Advanced Excel Lab	2	2	
	4.7 Value Based Education	2	2	
	4.8 Naan Mudhalvan / Skill Enhancement Course – SEC VII – Internet Fundamentals	2	2	
		23	**30**	

Third Year – Semester V

	List of Courses	Credit	No. of Hours (L/T/P)	Page No
Part-3	5.1 Core Course – CC IX Theory – Software Engineering	4	4	
	5.2 Core Course – CC X Theory – Artificial Intelligence and Machine Learning	4	4	
	5.3 Core Course – CC XI Theory – Python Programming	4	4	
	5.4 Core Course – CC XII Practical – Python Programming Lab	3	6	
	5.5 Core Course – CC XIII Mini Project	3	6	
	5.6 Elective Course – EC V Theory – Cloud Computing / Image Processing / Natural Language Processing	4	4	
Part-4	5.7 Summer Internship / Industrial Training	1	-	
	5.8 Naan Mudhalvan / Skill Enhancement Course – SEC VIII – Programming in C	2	2	
		25	**30**	

Third Year – Semester VI

	List of Courses	Credit	No. of Hours (L/T/P)	Page No
Part-3	6.1 Core Course – CC XIV Theory – Computer Networks	4	4	
	6.2 Core Course – CC XV Theory – Operating System	4	4	
	6.3 Core Course – CC XVI Theory – .NET Programming	4	4	
	6.4 Core Course – CC XVII Practical – .NET Programming Lab	3	6	
	6.5 Core Course – CC XVIII Major Project	3	6	
	6.6 Elective Course – EC VI Theory – Cyber Forensics / Artificial Neural Networks / Blockchain and Cryptocurrency	4	4	
Part-4	6.7 Naan Mudhalvan / Skill Enhancement Course – SEC IX – Software Testing	2	2	
Part-5	6.8 Extension Activity	1	-	
		25	**30**	

Consolidated Semester wise and Component wise Credit distribution

Parts	Sem I	Sem II	Sem III	Sem IV	Sem V	Sem VI	Total Credits
Part - 1	3	3	3	3	-	-	12
Part - 2	3	3	3	3	-	-	12
Part - 3	11	11	11	11	22	22	88
Part - 4	6	6	6	6	3	2	29
Part - 5	-	-	-	-	-	1	1
Total	23	23	23	23	25	25	**142**

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

12. Course – PSO Mapping

Mapping of Courses with Programme Specific Outcomes (PSOs)

No	Title of the Course	Category	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7	Total Score
1.	Object Oriented Programming with C++	Core	3	3	3	2.5	1	3	2	17.5
2.	Object Oriented Programming with C++ Lab	Core	3	3	3	2.5	1	3	2	17.5
3.	Digital Logic Fundamentals	Elective	3	3	3	3	1	3	2	18
4.	Digital Communication Systems	Elective	3	2	2	2	2.25	3	2	16.25
5.	Office Automation Lab	SEC	3	3	3	3	1	3	2	18
6.	Problem Solving Techniques	FC	2.5	2.5	2.5	2	1	3	2	15.5
7.	Data Structure and Algorithms	Core	3	3	3	2.5	1	3	2	17.5
8.	Data Structure and Algorithms Lab	Core	3	3	3	2.5	1	3	2	17.5
9.	Discrete Mathematics	Elective	3	3	3	2	0	2	1	14
10.	Probability and Statistics	Elective	3	3	3	3	1	2	2	17
11.	Web Programming Lab	SEC	3	3	3	3	1	3	2	18
12.	Computer Architecture	SEC	3	3	2	2	0	2	1	13
13.	Java Programming	Core								
14.	Java Programming Lab	Core								
15.	Resource Management Techniques	Elective								
16.	Microprocessor Architecture	Elective								
17.	E-Commerce	Elective								
18.	PHP Programming Lab	SEC								
19.	Database Management System	Core								
20.	Database Management System Lab	Core								
21.	Data Science	Elective								
22.	IOT Applications	Elective								
23.	Information Security	Elective								
24.	Advanced Excel Lab	SEC								
25.	Software Engineering	Core								
26.	Artificial Intelligence and	Core								

	Machine Learning									
27.	Python Programming	Core								
28.	Python Programming Lab	Core								
29.	Mini Project	Core								
30.	Cloud Computing	Elective								
31.	Image Processing	Elective								
32.	Natural Language Processing	Elective								
33.	Computer Networks	Core								
34.	Operating System	Core								
35.	.NET Programming	Core								
36.	.NET Programming Lab	Core								
37.	Major Project	Core								
38.	Cyber Forensics	Elective								
39.	Artificial Neural Networks	Elective								
40.	Blockchain and Cryptocurrency	Elective								
Total Score of all courses contributing to PSOs										

Level of Contribution of the course towards attaining PSOs

0 – No Contribution

1 – Low Level

2 – Medium Level

3 – High Level

13. Detailed Syllabus with L-P-T Distribution of Hours

First Year – Semester I

CORE - Theory

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
CC1	**Object Oriented Programming with C++**	**Core - Theory**	4	-	-	-	**4**	25	75	**100**

COURSE OUTCOMES (COs)	
CO-1	To make students read and understand the concepts of Object-Oriented programming (OOP).
CO-2	To apply the OOP concepts using C++ programming language.
CO-3	To analyse the C++ programs and to infer the OOP concepts
CO-4	To evaluate the performance of C++ programs and to modify the programs. This will help the learner to write their own C++ programs.

UNIT	**Course Contents**	**No. of Hours**
I	**Principles of OOP:** Basic concepts of Object-Oriented Programming – Benefits and applications – Object Oriented Languages – A Simple C++ Program - Structure of C++ program. **Basic Elements of C++:** Token – Keywords – Identifiers and constants – Basic Data Types – User-defined Data Types – Enumerated Data Type – Storage Class – Derived Data Types – Symbolic Constants – Declaration 0f Variables – Reference Variables – Scope Resolution Operator – Memory Dereferencing Operator – Memory Management Operators – Manipulators – Type Case Operator – Expressions – Operator Precedence – Control Structures **Functions in C++:** The Main function – Function Prototyping – Call by Reference – inline functions – Default Arguments – Recursion – Function Overloading – Math Library Functions.	**12**
II	**Classes and Objects:** C Structures Revisited – Specifying a Class – Declaring Objects – Defining Member Function – Private Member Function – Memory Allocation for Objects – Static Data Member and Member Functions – Array of Objects – Object as Function Arguments – Friendly functions – Returning Objects – Pointers to Members. **Constructor and Destructors:** Constructor – Parameterized Constructors – Multiple Constructors in a Class – Dynamic Initialization of Objects – Copy Constructor – Constructing 2-Dimentional Arrays – Destructors.	**12**
III	**Operator Overloading:** Overloading unary, binary operators – Overloading Binary Operators using Friend – Rules – Type conversions. **Inheritance:** Types of Inheritance – Single Inheritance – Making a Private	**12**

	Member Inheritable – Multilevel Inheritance – Multiple Inheritance – Ambiguity Resolution in Inheritance – Hierarchal Inheritance – Hybrid Inheritance – Virtual Base Classes – Abstract Classes – Constructors in Derived Classes.	
IV	**Pointers:** Declaration and Initializing Pointers – Manipulation of Pointers – Pointer Expression and Pointer Arithmetic – Using Pointers with Arrays and Strings – Pointers to Functions – Pointer to Objects – this Pointer – Polymorphism – Pointers to derived Classes – Virtual Functions – Pure Virtual Functions. **Managing Console I/O Operations:** C++ Streams – Unformatted I/O Operations – Formatted Console I/O Operations – Managing Output with Manipulators.	**12**
V	**Files:** Introduction – File stream classes – Opening and Closing a File – Detecting End-of-File – File Modes – File Pointers and their manipulations – Sequential Input and Output Operations – Updating a File: Random Access – Error Handling during File Operations – Command Line Arguments **Templates:** Class Templates – Class Templates with Multiple Parameters – Function Templates – Member Function Templates	**12**
	TOTAL HOURS	**60**
Textbooks		
1.	E. Balagurusamy, "Object-Oriented Programming with C++", 8th Edition, McGraw Hill, 2020	
Reference Books		
1.	Bjarne Stroustrup, "The C++ Programming Language", 4th Edition, Pearson Education, 2022	
2.	Reema Thareja, "Object Oriented Programming with C++", 2nd Edition, Oxford University Press, 2025	
3.	Herbert Schildt, "The Complete Reference C++" 4th Edition, McGraw Hill Education, 2017	

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	2	1	3	2
CO 4	3	3	3	2	1	3	2
Total Score	12	12	12	10	4	12	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	2	1	3	2
CO 4	3	3	3	2	1	3	2
Total Score	12	12	12	10	4	12	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

First Year – Semester I

CORE - Practical

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
CC2	**Object Oriented Programming with C++ Lab**	**Core - Practical**	-	-	4	-	**3**	50	50	**100**

COURSE OUTCOMES (COs)	
CO-1	To make students read and understand the concepts of Object-Oriented programming (OOP).
CO-2	To apply the OOP concepts using C++ programming language.
CO-3	To analyse the C++ programs and to infer the OOP concepts
CO-4	To evaluate the performance of C++ programs and to modify the programs. This will help the learner to write their own C++ programs.

No.	**List of Exercises**	**No. of Hours**
1.	Write a C++ program to demonstrate Class and Objects. Create a class **Person** with data members: name, date of birth, etc. Write a member function to read the relevant data. Write another function to calculate the age. Create 2 objects and show the elder one	
2.	Write a C++ program to demonstrate function overloading. Find the area of equilateral triangle (3 equals sides and 3 equal internal angles), isosceles triangle (2 sides are of equal length, and 1 side is different) and scalene triangle (all 3 sides are of different lengths and all 3 interior angles are unequal).	
3.	Write a C++ program to demonstrate the concept of Passing Objects to Functions. Create a class **Time** with data members hour, minute and second. Write a member function to add two given times in the hour, minute and second format. Pass any 2 time-objects to the sum member function.	
4.	Write a C++ program to demonstrate the Friend Functions. Create 2 classes. Write friend functions to add, multiply and compare the values in 2 classes. Add a menu in the main program to select the above operations	
5.	Write a C++ program to demonstrate Constructor and Destructor. Create class **Employee** with basic details including address for communication. Use new operator to allocate memory to store the employee's address and delete operator to free the allocated memory	
6.	Write a C++ program to change the sign of values in a 3 x 3 matrix and to find its transpose. Use unary – operator to change the sign and unary ~ operator to do the transpose. Write a C++ program to demonstrate Unary Operator Overloading	
7.	Write a C++ program to demonstrate Binary Operator Overloading to add 2 complex numbers. If A and B are complex objects, find A + B, 5 + A and A + 5	
8.	Write a C++ program to demonstrate: Single Inheritance	
9.	Write a C++ program to demonstrate: Multiple Inheritance	

10.	Write a C++ program to demonstrate: Virtual Functions.	
11.	Write a C++ program to find the biggest, smallest and average of N numbers passed through Command Line Arguments	
12.	Write a C++ program to find the roots of the quadratic equation. Write code to avoid errors like Divide by Zero and square root of negative numbers	
13.	Write a C++ program to create an array of 5 fruits and display the name in alphabetical order using pointers	
14	Write a C++ program to create a text file. Prepare a simple resume in that file and close the file. Reopen the file in the read mode to display your resume.	
15.	Write a C++ program to open a binary random file and create N number of records. Display the contents of the record when the user specifies the record number.	
	TOTAL HOURS	**60**

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	2	1	3	2
CO 4	3	3	3	2	1	3	2
Total Score	12	12	12	10	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	2	1	3	2
CO 4	3	3	3	2	1	3	2
Total Score	12	12	12	10	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

First Year – Semester I

ELECTIVE - Theory

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
EC1(a)	**Digital Logic Fundamentals**	**Elective - Theory**	4	-	-	-	**4**	25	75	**100**

COURSE OUTCOMES (COs)	
CO-1	Students can understand the basics of number system and basic digital components.
CO-2	Students can apply K-Maps to optimize the logical equations
CO-3	Students can analyze and find minimal component circuits.
CO-4	Students can design digital circuits for the given logical equations

UNIT	Course Contents	No. of Hours
I	**Introduction:** Analog vs digital – Binary System – The Basic Gates NOT, OR, AND – Universal Logic Gate NOR, NAND – AND-OR-Invert Gates **Number Systems and Codes:** Binary Number System – Binary to Decimal Conversion – Decimal to Binary Conversion – Octal Numbers – Hexadecimal Numbers – The ASCII Code – The Excess-3 Code – The Gray Code.	**12**
II	**Combinational Logic Circuits**: Boolean Laws and Theorems – Sum of Products Method – Truth Table to Karnaugh Map – Pairs, Quads and Octets – Karnaugh Simplifications – Don't-Care Conditions – Product of Sums Method –Product of Sums Simplification.	**12**
III	**Data Processing Circuits:** Multiplexers – De-multiplexers – 1-of-16 Decoder – BCD-to-Decimal Decoder – Seven-Segment decoder – Encoders – Exclusive-OR gates – Parity Generators and Checkers. **Arithmetic Circuits:** Binary Addition – Binary Subtraction – Unsigned Binary Numbers – Sign-Magnitude Numbers – 2's Complement Representation –2 's Complement Arithmetic – Arithmetic Building Blocks.	**12**
IV	**Clocks and Timing Circuits:** Clock Waveforms – Pulse-forming Circuits **Flip-Flops:** RS Flip Flops – Gated Flip flops – Edge Triggered RS Flip Flops – Edge Triggered D Flip Flops – Edge Triggered JK Flip Flops – JK Master Slave Flip Flops	**12**
V	**Registers:** Types of Registers – Serial_In-Serial_Out – Serial_In-Parallel_Out – Parallel_In-Serial_Out – Parallel_In-Parallel_Out – Universal Shift Register.	**12**
	TOTAL HOURS	**60**

Textbooks	
1.	Donald P. Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", 7th Edition, Tata McGraw Hill, 2011
Reference Books	
1.	Anand Kumar A, "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Private Limited
2.	Morris Mano M and Micheal D. Ciletti, "Digital Design", 8th Edition, Pearson Education

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	3	1	3	2
CO 4	3	3	3	3	1	3	2
Total Score	12	12	12	12	4	12	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	3	1	3	2
CO 4	3	3	3	3	1	3	2
Total Score	12	12	12	12	4	12	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

First Year – Semester I

ELECTIVE - Theory

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
EC1(b)	**Digital Communication Systems**	**Elective - Theory**	4	-	-	-	**4**	25	75	**100**

COURSE OUTCOMES (COs)	
CO-1	Students can understand the basics of digital communication system.
CO-2	Students can apply principles like error detection and correction techniques while transferring data.
CO-3	Students can analyze and find suitable protocols for communication.
CO-4	Students can delve deeper into digital communication systems to design advanced features.

UNIT	**Course Contents**	**No. of Hours**
I	**Introduction to Electronic Communication:** Communication Systems – Types of Electronic Communication – Modulation and Multiplexing – Electromagnetic Spectrum – Bandwidth – Communication Applications – Jobs and Careers in the Communication Industry **Electronic Fundamentals for Communications:** Gain, Attenuation and Decibels – Fourier Theory – Amplitude Modulation Concepts – Basic Principles of Frequency Modulation – Principles of Phase Modulation	**12**
II	**Digital Communication Techniques:** Digital Transmission of Data – Parallel and Serial Transmission – Data Conversion – Pulse Modulation – Digital Signal Processing **Digital Data Transmission:** Digital Codes – Principles of Digital Transmission – Broadband Modem Techniques – Error Detection and Correction – Protocols	**12**
III	**Fundamentals of Networking, LAN and Ethernet:** Network Fundamentals – LAN Hardware – Ethernet LANs – Advanced Ethernet **Internet Technologies:** Internet Applications – Internet Transmission Systems – Storage-Area Networks – Internet Security	**12**
IV	**Satellite Communications:** Satellite Orbits – Satellite Communication Systems – Satellite Subsystems – Ground Stations – Satellite Applications – Global Navigation Satellite Systems	**12**
V	**Cell Phone Technologies:** Cellular Telephone Systems – Overview of Cellular Industry – 2G and 3G Digital Cell Phone Systems – Long term evolution and 4G Cellular Systems – Base Stations	**12**
	TOTAL HOURS	**60**

Textbooks	
1.	Louis E. Frenzel, "Principles of Electronic Communication Systems", 4th Edition, McGraw Hill, 2016
Reference Books	
1.	Simon Haykin, "Digital Communication Systems", Wiley India, 2021
2.	Wayne Tomasi, "Electronic Communications Systems", 5th Edition, Pearson Education, 2008

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	2	2	2	3	3	2
CO 2	3	2	2	2	2	3	2
CO 3	3	2	2	2	2	3	2
CO 4	3	2	2	2	2	3	2
Total Score	12	8	8	8	9	12	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2	2	2	3	3	2
CO 2	3	2	2	2	2	3	2
CO 3	3	2	2	2	2	3	2
CO 4	3	2	2	2	2	3	2
Total Score	12	8	8	8	9	12	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

First Year – Semester I

SKILL ENHANCEMENT - Practical

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
SEC1	**Office Automation Lab**	**Skill - Practical**	-	-	3	-	**3**	50	50	**100**

COURSE OUTCOMES (COs)

CO-1	To make the students gain knowledge about document files, spreadsheets, presentations and databases.
CO-2	To process data using formulas and functions
CO-3	Analyse data using charts and graphs in spreadsheets
CO-4	Students can create and design presentations, create databases and design tables.

No.	List of Exercises	No. of Hours
1	Prepare your **resume** for a job in a detailed neat document. Highlight your credentials and strengths. Use proper page setting features to improve the readability. Use Numbering, Bullets and Tables whenever required	
2	Prepare a **month calendar** in a document (Refer Microsoft Outlook Templates). Mark the public holiday and specify the reason below the calendar.	
3	Prepare a write-up about your college. Highlight the activities and facilities in various departments. Use Spell Check, Find and Replace, indent, header and footer, and page numbers.	
4	Prepare a document to show the **alphabet picture chart**. Show all 26 alphabets in a table with relevant pictures	
5	Prepare a **semester-wise mark statement** for a computer science class for 10 students using any spreadsheet. Display the total and percentage for each student and rank them based on the student's total mark. Give proper headings. Display the column headings in bold and italics as required.	

	Input Data												Use Formula								
	Semester 1					Semester 2					Sem 3	Sem 4	Sem 5	Sem 6	Total - Semester-wise								
	C++	C++ Lab	DLF	OA Lab	PST	DS	DS Lab	DM	Web Prog	CA					Semester 1	Semester 2	Semester 3	Semester 4	Semester 5	Semester 6	Total	Percentage	Rank
Student 1	50	60				70	75								110	145					255	63.75	5
Student 2	52	95				68	71								147	139					286	71.50	3
Student 3	82	88				72	95								170	167					337	84.25	1
Student 4	58	62				65	79								120	144					264	66.00	4
Student 5	82	63				74	93								145	167					312	78.00	2
Student 6																							
Student 7																							
Student 8																							
Student 9																							
Student 10																							

6	Prepare a spreadsheet with 2 columns: name and one-line address [door_number, street_name] (20 rows). Use the following functions with various arguments **Text Function:** upper, lower, proper, trim, left, right, mid, clean, text, value, replace, substitute, find and concat Display the results in the next 14 columns.	
7	Prepare a spreadsheet with necessary input data columns: date, time, day, hour, etc (20 rows). Use the following functions with various arguments **Date Function:** date, today, now, datevalue, day, month, year, eomonth, weekday, datedif and workday **Time Function:** hour, minute, second, time and timevalue Display the results in the subsequent columns	
8	Prepare a spreadsheet with necessary input data columns (20 rows). Use the following functions with various arguments **Math Function:** abs, floor, ceiling, round, even, sign, mod, log, product, rand, sin, cos, tan, sum and base Display the results in the subsequent columns	
9	Prepare a spreadsheet with input data columns (20 rows). Use the following functions with various arguments **Statistical Function:** min, max, average, median, mode, stdev, var, count, countif, counta, rank and percentile Display the results in the subsequent columns	
10	Enter the subject-wise (Tamil, English, Mathe, Physics, Chemistry, Computer Science) HSC marks for 20 students. Use any spreadsheet to plot the following charts. a) Percentage (10 bins) vs frequency. b) Line graph of marks obtained for each subject c) Pie chart (% of students with distinction, first class, second class, …) d) 2-D graph showing marks obtained by a student for each subject e) 3-D Graph showing marks obtained by a student for each semester	
11	Prepare a presentation to display the sport day celebration in your campus. Create minimum 8 slides that include introduction, events, participants, winners, prize distribution and closing. Add pictures, animations and transitions	
12	Prepare a presentation to show a script of a short story or advertisement with minimum 8 slides. Add characters, dialogues and scenes. Use animation for character movement and speech.	
13.	Create a **Student** database with a table of fields: age, date of birth, gender, class, place, pin code etc. Apply validation rules for age (17-25), date of birth (valid date), pin code (6 digits), etc. Display your data with proper formatting.	
14	Create the **Employee** database with a table of fields: EmployeeID, Name, Designation, Department, Salary, etc and populate data through an input form. Generate a report containing the list of employees with designation and department.	
15.	Create a **Mobile Shop** database with a table of fields ProductID, brand, model, year of manufacturing, price, discount, etc and use queries to display (i) products available in a specific brand (ii) products available within a price range. (iii) products with offers and discounts	
	TOTAL HOURS	**45**

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	3	1	3	2
CO 4	3	3	3	3	1	3	2
Total Score	12	12	12	12	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	3	1	3	2
CO 4	3	3	3	3	1	3	2
Total Score	12	12	12	12	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

First Year – Semester I

FOUNDATION COURSE - Theory

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
FC1	**Problem Solving Techniques**	**FC - Theory**	3	-	-	-	**3**	25	75	**100**

COURSE OUTCOMES (COs)	
CO-1	To make students understand the concepts behind programming languages
CO-2	To apply the concepts while using programming languages
CO-3	Students can analyse language features and identify the best to use.
CO-4	Help students to create new principles in programming languages

UNIT	Course Contents	No. of Hours
I	**Introduction**: History, characteristics and limitations of Computer. Hardware/Anatomy of Computer: CPU, Memory, Secondary storage devices, Input Devices and Output devices. Types of Computers: PC, Workstation, Minicomputer, Main frame and Supercomputer. Software: System software and Application software.	**9**
II	**Programming Languages:** Machine language, Assembly language, High-level language, 4GL and 5GL – Features of good programming language. Translators: Interpreters and Compilers. Data: Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC).	**9**
III	**Structured Programming: Algorithm:** Features of good algorithm, Benefits and drawbacks of algorithm. **Flowcharts:** Advantages and limitations of flowcharts, when to use flowcharts, flowchart symbols and types of flowcharts.	**9**
IV	**Pseudocode:** Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. **Selection Structures:** Relational and Logical Operators – Selecting from Several Alternatives – Applications of Selection Structures.	**9**
V	**Repetition Structures:** Counter Controlled Loops – Nested Loops– Applications of Repetition Structures. **Data:** Numeric Data and Character Based Data. **Arrays:** One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	**9**
	TOTAL HOURS	**45**

Textbooks	
1.	Stewart Venit, Introduction to Programming: Concepts and Design, Fourth Edition, 2010, Dream Tech Publishers.

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	2	1	3	2
CO 2	3	3	3	2	1	3	2
CO 3	2	2	2	2	1	3	2
CO 4	2	2	2	2	1	3	2
Total Score	10	10	19	8	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	2	1	3	2
CO 2	3	3	3	2	1	3	2
CO 3	2	2	2	2	1	3	2
CO 4	2	2	2	2	1	3	2
Total Score	10	10	19	8	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

First Year – Semester II

CORE - Theory

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	External	Total
CC3	**Data Structure and Algorithms**	**Core - Theory**	4	-	-	-	**4**	25	75	**100**

COURSE OUTCOMES (COs)	
CO-1	Learn and understand the concepts of ADTs, linear and nonlinear data structures.
CO-2	Solve problems using the learned data structures and algorithms.
CO-3	Should be able to select suitable algorithm based on the nature of the problem.
CO-4	Can create new algorithms after critically evaluating the problem

UNIT	**Course Contents**	**No. of Hours**
I	**Introduction to Data Structures and Algorithms-** Classification of Data Structure – Operations on Data Structure – Abstract Data Type – Algorithms – Design approaches – Control structure uses in data structure – Time and Space Complexity – Big O notation **Arrays-** Introduction – Declaration of Arrays – Accessing the elements of an array – Sorting values in Arrays – Operations on Arrays – Declaring, initializing and accessing Two-dimensional Arrays – Multi-dimensional Arrays – Sparse Matrices – Applications	**12**
II	**Linked List-** Basic Terminologies – Memory Allocation – Singly Linked List – Circular Linked List – Doubly Linked List – Applications of linked lists **Stack-** Introduction – Array Representation of Stacks – Operations on a Stack – Linked Representation of Stacks – Operations on a Linked Stack – Multiple Stacks – Applications of Stacks – Reversing a List – Evaluating arithmetic expressions – Recursion	**12**
III	**Queue-** Array Representation of Queues – Linked Representation – Types of Queues – Circular Queue – Dequeue – Priority Queue – Multiple Queues – Applications of Queues. **Tree-** Terminology – Types of Trees – Creating Binary Tree from General Tree – Traversing a Binary Tree – Huffman's Tree – Application of Trees – Binary Search Tree – Operations on Binary Search Trees – Threaded Binary Trees	**12**
IV	**Heap-** Binary Heap – Applications of heap. **Graph-** Graph Terminologies – Directed Graphs – Representation of Graph – Breadth first traversal – Depth first traversal – Shortest Path Algorithms – Minimum Spanning Trees – Prim's Algorithm – Applications of graphs.	**12**
V	**Searching-** Linear Search – Binary Search	**12**

	Sorting- Bubble Sort – Selection Sort – Merge Sort – Quick Sort **Hashing-** Hash Tables – Hash functions – Different Hash Functions – Collision Resolution by Open Addressing	
	TOTAL HOURS	**60**
Textbooks		
1.	Reema Thareja, — Data Structures Using C, Oxford Universities Press, 2014, 2nd Edition	
2	Mark Allen Weiss, — Data Structures and Algorithm Analysis in C++, Pearson Education, 2014, 4th Edition.	
Reference Books		
1.	Thomas H. Cormen, Chales E. Leiserson, Ronald L. Rivest, Clifford Stein, — Introduction To Algorithms, McGraw Hill, 2009, 3rd Edition.	
2.	Aho, Hopcroft and Ullman,— Data Structures and Algorithms, Pearson Education, 2003	
3.	Ellis Horowitz, Satraj Sahni —Fundamentals of Computer Algorithms, Universities Press; Second edition (1 January 2008)	

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	2	1	3	2
CO 4	3	3	3	2	1	3	2
Total Score	12	12	12	10	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	2	1	3	2
CO 4	3	3	3	2	1	3	2
Total Score	12	12	12	10	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

First Year – Semester II

CORE - Practical

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
CC4	**Data Structure and Algorithms Lab**	**Core - Practical**	-	-	4	-	**3**	50	50	**100**

COURSE OUTCOMES (COs)	
CO-1	Realize the concepts by implementing data structure and algorithms.
CO-2	Use data structure and algorithms to solve real life problems.
CO-3	Able to choose suitable algorithm to solve a problem
CO-4	Can write their own programs by using the data structure and algorithms.

No.	**List of Exercises**	**No. of Hours**
1.	Implement Linear (Singly) Linked List. Write code to add a new node at the beginning, add a new node at the end, delete a node from the beginning and delete a node from the end.	
2.	Implement Doubly Linked List. Write code to add a new node at the beginning, add a new node at the end, delete a node from the beginning and delete a node from the end.	
3.	Implementation of Stack – Push, Pop and Peek.	
4.	Implementation of Queue – Enqueue, Dequeue and Peek.	
5.	Implementation of Binary Tree Traversals using recursion. a) Pre-order b) In-order c) Post-order	
6.	Implementation of Breadth First Search algorithm.	
7.	Implementation of Depth First Search algorithm.	
8.	Search for an element in a list using Binary Search	
9.	Implementation of Merge Sort	
10.	Implementation of Quick Sort	
	TOTAL HOURS	**60**

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	2	1	3	2
CO 4	3	3	3	2	1	3	2
Total Score	12	12	12	10	4	12	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	2	1	3	2
CO 4	3	3	3	2	1	3	2
Total Score	12	12	12	10	4	12	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

First Year – Semester II

ELECTIVE - Theory

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
EC2(a)	**Discrete Mathematics**	**Elective - Theory**	4	-	-	-	**4**	25	75	**100**

COURSE OUTCOMES (COs)	
CO-1	Students understand how to solve problems based on discrete mathematics
CO-2	Students can apply direct methods for solving linear systems
CO-3	Students can select suitable methods to solve a problem
CO-4	Students can write their own programs to solve problems using known programming languages.

UNIT	**Course Contents**	**No. of Hours**
I	**Set Theory**- Sets and elements – Specifications of sets – Identity and Cardinality – Set Inclusion – Equality of sets – proper sets – Power sets – Universal set – Operations on sets – ordered pairs – Cartesian product of sets	**12**
II	**Relations and Functions**- Definition – example – Relations on sets – Equivalence Relations – Equivalence Class – Functions	**12**
III	**Mathematical Logic-** 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	**12**
IV	**Matrix Algebra –** 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.	**12**
V	**Adjoint and Inverse of a Matrix** – Singular and Non-singular Matrices – Adjoint of a Square Matrix – Properties of Adjoin to a Matrix – Properties of Inverse of a Matrix.	**12**
	TOTAL HOURS	**60**

Textbooks	
1.	Discrete Mathematics, Swapan Kumar, Chakraborty and Bikash Kanti 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.

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	2	0	2	1
CO 2	3	3	3	2	0	2	1
CO 3	3	3	3	2	0	2	1
CO 4	3	3	3	2	0	2	1
Total Score	12	12	12	8	0	8	4

0 – No Correlation 1 – Low 2 - Medium 3 – High

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	2	0	2	1
CO 2	3	3	3	2	0	2	1
CO 3	3	3	3	2	0	2	1
CO 4	3	3	3	2	0	2	1
Total Score	12	12	12	8	0	8	4

0 – No Correlation 1 – Low 2 - Medium 3 – High

First Year – Semester II

ELECTIVE - Theory

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
EC2(b)	**Probability and Statistics**	**Elective - Theory**	4	-	-	-	**4**	25	75	**100**

COURSE OUTCOMES (COs)	
CO-1	Students acquire knowledge on basics of probability and statistics.
CO-2	Students apply theorems on real life problems
CO-3	Students can choose suitable models to solve a problem
CO-4	Students can write their own programs for solving real life problems.

UNIT	**Course Contents**	**No. of Hours**
I	**Probability**- Definition of probability – independent events – conditional probability – Bayes Theorem. Random variables: Discrete and continuous random variables – distribution function – roperties – probability mass function and probability density function – discrete and continuous probability distributions.	**12**
II	**Multiple Random Variables** - Joint, marginal and conditional distribution functions – independence of random variables – transformation of random variables and their distribution functions. Mathematical expectation: Expectation – properties – conditional expectation and conditional variance. Moment generating function, characteristic function, probability generating function and their properties.	**12**
III	**Convergence** in probability, weak law of large numbers – Bernoulli's theorem, Khintchine's theorem (statements only) – Central limit theorem.	**12**
IV	**Discrete Distributions** Bernoulli, Binomial, Poisson, Geometric and Negative binomial distributions – Multinomial distribution. Moments – probability generating function, moment generating function, characteristic function and properties.	**12**
V	**Continuous Distributions** Uniform, Normal, Cauchy and Lognormal distributions – concepts, moments, moment generating function, characteristic function and properties. Sampling distributions: Chi-square, t and F distributions	**12**
	TOTAL HOURS	**60**

Textbooks	
1.	Goon, A.M., M. K. Gupta and B. Das Gupta (2017) Fundamentals of Statistics- Vol. I., World Press, Ltd, Kolkata.
2	Gupta, S.C. and V.K. Kapoor (2020) Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
Reference Books	
1.	Robert, V. Hogg, Joseph W. McKean and Allen T. Craig (2013) Introduction to Mathematical Statistics (Seventh Edition), Pearson Education, New York
2.	Bhuyan K.C. (2010), Probability Distribution Theory and Statistical Inference, New Central Book Agency (P) Ltd., New Delhi.

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	3	1	2	2
CO 2	3	3	3	3	1	2	2
CO 3	3	3	3	3	1	2	2
CO 4	3	3	3	3	1	2	2
Total Score	12	12	12	12	4	8	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	3	1	2	2
CO 2	3	3	3	3	1	2	2
CO 3	3	3	3	3	1	2	2
CO 4	3	3	3	3	1	2	2
Total Score	12	12	12	12	4	8	8

0 – No Correlation 1 – Low 2 - Medium 3 – High

First Year – Semester II

SKILL ENHANCEMENT – Practical

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
SEC2	**Web Programming Lab**	**Skill - Practical**	-	-	3	-	**2**	50	50	**100**

COURSE OUTCOMES (COs)	
CO-1	Students realize the concepts behind Web Pages.
CO-2	Students apply the HTML,CSS and JavaScript to develop Web Pages.
CO-3	Students choose suitable HTML elements to design a Web Page
CO-4	Students write their own programs using JavaScript.

No.	**List of Exercises**	**No. of Hours**
1.	Create a website for an education institution. Use internal **links** and add images.	
2.	Design a month calendar using table tag. Apply **styles**.	
3.	Create a HTML document to list five flowers. Use external links to connect the description about each flower in separate HTML files. Add pictures wherever possible. Use **.css file** to separate the design and styles.	
4.	Write an HTML code to display a list of 5 cars in a **frame**, Link each one to a brief Description in second frame. The left frame should display the list and the right frame should display the description about the selected car. Add pictures.	
5.	Create a simple HTML **form** to read the UG application form details. Implement major form elements. Display the entered data in another page using **script** when the submit button is pressed.	
6.	Apply the following **transformation** using css (i) Translate an image along x axis and y axis (ii) Rotate (a) a text element and (b) an image element in both clockwise and counterclockwise direction using CSS. (iii) Resize a text object using scale transformation (iv) Distort an image object using skew transformation	
7.	Create a simple **calculator** using HTML as shown below. Write **script** for the buttons – Add, Subtract, …	

	Calculator Value 1 Value 2 Add Substract Multiply Divide Mod Result	
8.	Create a **Unit Converter** using HTML as shown below. Write script for the convert button Unit Converter From To 10 Metre Centimetre Inch Convert 1000 Centimetre Metre Inch	
9.	Create a **website** for a shop (textile or jewelry or automobile). Embed Audio and Video in the HTML page	
10.	Build a simple **questionnaire** consisting of 8 multiple choice questions with 4 choices for each question. Show the score of the user.	
	TOTAL HOURS	**45**

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	3	1	3	2
CO 4	3	3	3	3	1	3	2
Total Score	12	12	12	12	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	3	3	1	3	2
CO 2	3	3	3	3	1	3	2
CO 3	3	3	3	3	1	3	2
CO 4	3	3	3	3	1	3	2
Total Score	12	12	12	12	4	12	8

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

First Year – Semester II

SKILL ENHANCEMENT - Theory

Subject Code	Subject Name	Category	Hours				Credits	Marks		
			L	T	P	S		CIA	Exter - nal	Total
SEC3	**Computer Architecture**	**Skill - Theory**	3	-	-	-	**2**	25	75	**100**

COURSE OUTCOMES (COs)	
CO-1	Students understand the computer hardware processing units (CPU.
CO-2	Students apply arithmetic and logic operation
CO-3	Students study various addressing modes
CO-4	Students can develop suitable algorithms for arithmetic operations.

UNIT	**Course Contents**	**No. of Hours**
I	**Basic Computer Organization and Design**: Instruction Codes – Computer Registers – Computer Instructions – Instruction cycle – Control memory.	**9**
II	**Central Processing Unit:** General register organization – Stack organization – Instruction formats – Addressing modes – Data transfer and manipulations**.**	**9**
III	**Computer Arithmetic**: Hardware implementation and algorithm for addition, subtraction, Multiplication, Division.	**9**
IV	**Arithmetic and Interface**: Booth multiplication algorithm - Floating point arithmetic – Input-output interface – Direct Memory Access.	**9**
V	**Memory Organisation:** Memory Hierarchy – Main memory – Auxiliary Memory – Associative Memory – Cache Memory.	**9**
	TOTAL HOURS	**45**

Textbooks	
1.	Computer System Architecture- Morris Mano, Third Edition, PHI Private Ltd.

Reference Books	
1.	Computer System Architecture - John P. Hayes
2.	Computer Organization - C. Hamacher, Z. Vranesic, S. Zaky

3.	Computer Architecture and Parallel Processing- Hwang K

CO – PO Mapping (Course Articulation Matrix):

CO / PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7
CO 1	3	3	2	2	0	2	1
CO 2	3	3	2	2	0	2	1
CO 3	3	3	2	2	0	2	1
CO 4	3	3	2	2	0	2	1
Total Score	12	12	12	8	0	8	4

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**

CO – PSO Mapping (Course Articulation Matrix):

CO / PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	3	2	2	0	2	1
CO 2	3	3	2	2	0	2	1
CO 3	3	3	2	2	0	2	1
CO 4	3	3	2	2	0	2	1
Total Score	12	12	12	8	0	8	4

0 – No Correlation **1 – Low** **2 - Medium** **3 – High**