

B.Sc.,
COMPUTER SCIENCE

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

SYLLABUS

FROM THE ACADEMIC YEAR
2023 - 2024

TAMILNADU STATE COUNCIL FOR HIGHER
EDUCATION, CHENNAI – 600 005

1. Introduction

B.Sc. Computer Science

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) which 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.

Programme Outcome, Programme Specific Outcome and Course Outcome

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. The key core areas of study in Mathematics include Algebra, Analysis (Real & Complex), Differential Equations, Geometry, and Mechanics. The

Students completing this programme will be able to present Software application clearly and precisely, 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, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

2. Programme Outcomes (PO) of B.Sc. degree programme in Computer Science

- Scientific aptitude will be developed in Students
- Students will acquire basic Practical skills & Technical knowledge along with domain knowledge of different subjects in the Computer Science & humanities stream.
- Students will become employable; Students will be eligible for career opportunities in education field, Industry, or will be able to opt for entrepreneurship.
- Students will possess basic subject knowledge required for higher studies, professional and applied courses.
- Students will be aware of and able to develop solution oriented approach towards various Social and Environmental issues.
- Ability to acquire in-depth knowledge of several branches of Computer Science and aligned areas. This Programme helps learners in building a solid foundation for higher studies in Computer Science and applications.
- The skills and knowledge gained leads to proficiency in analytical reasoning, which can be utilized in modelling and solving real life problems.
- Utilize computer programming skills to solve theoretical and applied problems by critical understanding, analysis and synthesis.

- To recognize patterns and to identify essential and relevant aspects of problems.
- Ability to share ideas and insights while seeking and benefitting from knowledge and insight of others.
- Mould the students into responsible citizens in a rapidly changing interdependent society.

The above expectations generally can be pooled into 6 broad categories and can be modified according to institutional requirements:

PO1: Knowledge

PO2: Problem Analysis

PO3: Design / Development of Solutions

PO4: Conduct investigations of complex problems

PO5: Modern tool usage

PO6: Applying to society

3. Programme Specific Outcomes of B.Sc. Degree Programme in Computer Science

PSO1: Think in a critical and logical based manner

PSO2: Familiarize the students with suitable software tools of computer science and industrial applications to handle issues and solve problems in mathematics or statistics and real time application related sciences.

PSO3: Know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand.

PSO4: Understand, formulate, develop programming model with logical approaches to a
Address issues arising in social science, business and other contexts.

PSO5: Acquire good knowledge and understanding to solve specific theoretical and applied problems in advanced areas of Computer science and Industrial statistics.

PSO6: Provide students/learners sufficient knowledge and skills enabling them to undertake further studies in Computer Science or Applications or Information Technology and its allied areas on multiple disciplines linked with Computer Science.

PSO7: Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.

PSO8: Develop a range of generic skills helpful in employment, internships& societal activities.

PSO9: Get adequate exposure to global and local concerns that provides platform for further exploration into multi-dimensional aspects of computing sciences.

Mapping of Course Learning Outcomes (CLOs) with Programme Outcomes (POs) and Programme Specific Outcomes (PSOs) can be carried out accordingly, assigning the appropriate level in the grids: (put tick mark in each row)

PO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
PO1	✓					
PO2		✓				
PO3			✓			
PO4				✓		
PO5					✓	
PO6						✓

4. 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 the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising mathematical models and algorithms for providing solutions to industry / 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 Computer Science 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 the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such 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 – Statistics with R Programming, Data Science, Machine learning. Internet of Things and Artificial Intelligence etc..

5. Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome / Benefits
I	<p>Foundation Course To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning abstract Mathematics and simulating mathematical concepts to real world.</p>	<ul style="list-style-type: none"> • Instil confidence among students • Create interest for the subject
I, II, III, IV	<p>Skill Enhancement papers (Discipline centric / Generic / Entrepreneurial)</p>	<ul style="list-style-type: none"> • Industry ready graduates • Skilled human resource • Students are equipped with essential skills to make them employable • Training on Computing / Computational skills enable the students gain knowledge and exposure on latest computational aspects • Data analytical skills will enable students gain internships, apprenticeships, field work involving data collection, compilation, analysis etc. • Entrepreneurial skill training will provide an opportunity for independent livelihood • Generates self – employment • Create small scale entrepreneurs • Training to girls leads to women empowerment • Discipline centric skill will improve the Technical knowhow of solving real life problems using ICT tools
III, IV, V & VI	<p>Elective papers- An open choice of topics categorized under Generic and Discipline Centric</p>	<ul style="list-style-type: none"> • Strengthening the domain knowledge • Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature • Students are exposed to Latest topics on Computer Science / IT, that require strong mathematical background • Emerging topics in higher education / industry /

		communication network / health sector etc. are introduced with hands-on-training, facilitates designing of mathematical models in the respective sectors
IV	Industrial Statistics	<ul style="list-style-type: none"> • Exposure to industry moulds students into solution providers • Generates Industry ready graduates • Employment opportunities enhanced
II year Vacation activity	Internship / Industrial Training	<ul style="list-style-type: none"> • Practical training at the Industry/ Banking Sector / Private/ Public sector organizations / Educational institutions, enable the students gain professional experience and also become responsible citizens.
V Semester	Project with Viva – voce	<ul style="list-style-type: none"> • Self-learning is enhanced • Application of the concept to real situation is conceived resulting in tangible outcome
VI Semester	Introduction of Professional Competency component	<ul style="list-style-type: none"> • Curriculum design accommodates all category of learners; ‘Mathematics for Advanced Explain’ component will comprise of advanced topics in Mathematics and allied fields, for those in the peer group / aspiring researchers; • ‘Training for Competitive Examinations’ –caters to the needs of the aspirants towards most sought - after services of the nation viz, UPSC, CDS, NDA, Banking Services, CAT, TNPSC group services, etc.
Extra Credits: For Advanced Learners / Honors degree		<ul style="list-style-type: none"> • To cater to the needs of peer learners / research aspirants

B.Sc. Computer Science Curriculum Design

First Year

Semester-I

Part	List of Courses	Credit	Hours per week (L/T/P)
Part-I	Language – Tamil	3	6
Part-II	English	3	6
Part-III	CC1 - Python Programming	5	5
	CC2 - Practical :i) Python Programming ii) Office Automation	3 2	3 2
	Elective Course 1 (Generic / Discipline Specific) – Discrete Mathematics	3	4
Part-IV	Skill Enhancement Course- SEC-1 Office Automation	2	2
	Foundation Course FC - Problem Solving Techniques	2	2
		23	30

Semester-II

Part	List of Courses	Credit	Hours per week(L/T/P)
Part-I	Language -Tamil	3	6
Part-II	English	3	6
Part-III	CC3 - Data Structure and Algorithms	5	5
	CC4 - Practical:i) Data Structure and Algorithms ii) Web Design	3 2	3 2
	Elective Course 2 (Generic / Discipline Specific) – Digital Logic Fundamentals	3	4
Part-IV	Skill Enhancement Course- SEC-2 Introduction To HTML	2	2
	Skill Enhancement Course – SEC-3 (Discipline Specific / Generic) Understanding Internet	2	2
		23	30

FIRST SEMESTER

CORE PAPER

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC1	Python programming	Core	5	-	-	-	5	25	75	100
Learning Objectives										
LO1	To make students understand the concepts of Python programming.									
LO2	To apply the OOPs concept in PYTHON programming.									
LO3	To impart knowledge on demand and supply concepts									
LO4	To make the students learn best practices in PYTHON programming									
LO5	To know the costs and profit maximization									
UNIT	Contents									No. of Hours
I	Basics of Python Programming: History of Python-Features of Python-Literal-Constants-Variables - Identifiers–Keywords-Built-in Data Types-Output Statements – Input Statements-Comments – Indentation- Operators-Expressions-Type conversions. Python Arrays: Defining and Processing Arrays – Array methods.									15
II	Control Statements: Selection/Conditional Branching statements: if, if-else, nested if and if-elif-else statements. Iterative Statements: while loop, for loop, else suite in loop and nested loops. Jump Statements: break, continue and pass statements.									15
III	Functions: Function Definition – Function Call – Variable Scope and its Lifetime-Return Statement. Function Arguments: Required Arguments, Keyword Arguments, Default Arguments and Variable Length Arguments- Recursion. Python Strings: String operations- Immutable Strings - Built-in String Methods and Functions - String Comparison. Modules: import statement- The Python module – dir() function – Modules and Namespace – Defining our own modules.									15
IV	Lists: Creating a list -Access values in List-Updating values in Lists-Nested lists -Basic list operations-List Methods. Tuples: Creating, Accessing, Updating and Deleting Elements in a tuple – Nested tuples–Difference between lists and tuples. Dictionaries: Creating, Accessing, Updating and Deleting Elements in a Dictionary – Dictionary Functions									15

	and Methods - Difference between Lists and Dictionaries.	
V	Python File Handling: Types of files in Python - Opening and Closing files-Reading and Writing files: write() and writelines() methods- append() method – read() and readlines() methods – with keyword – Splitting words – File methods - File Positions- Renaming and deleting files.	15
TOTAL HOURS		75
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Learn the basics of python, Do simple programs on python, Learn how to use an array.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Develop program using selection statement, Work with Looping and jump statements, Do programs on Loops and jump statements.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Concept of function, function arguments, Implementing the concept strings in various application, Significance of Modules, Work with functions, Strings and modules.	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Work with List, tuples and dictionary, Write program using list, tuples and dictionary.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Usage of File handlings in python, Concept of reading and writing files, Do programs using files.	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	ReemaThareja, “Python Programming using problem solving approach”, First Edition, 2017, Oxford University Press.	
2	Dr. R. NageswaraRao, “Core Python Programming”, First Edition, 2017, Dream tech Publishers.	
Reference Books		
1.	VamsiKurama, “Python Programming: A Modern Approach”, Pearson Education.	
2.	Mark Lutz, ”Learning Python”, Orielly.	
3.	Adam Stewarts, “Python Programming”, Online.	
4.	Fabio Nelli, “Python Data Analytics”, APress.	
5.	Kenneth A. Lambert, “Fundamentals of Python – First Programs”, CENGAGE Publication.	
Web Resources		

1.	https://www.programiz.com/python-programming
2.	https://www.guru99.com/python-tutorials.html
3.	https://www.w3schools.com/python/python_intro.asp
4.	https://www.geeksforgeeks.org/python-programming-language/
5.	https://en.wikipedia.org/wiki/Python_(programming_language)

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	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	14	15	15	13	14

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

Subject Code	Subject Name	Category	L	T	P	S	Credits	Marks		
								CIA	External	Total
CC2	Python Programming	Core	-	-	3	-	3	25	75	100
Learning Objectives										
LO1	Be able to design and program Python applications.									
LO2	Be able to create loops and decision statements in Python.									
LO3	Be able to work with functions and pass arguments in Python.									
LO4	Be able to build and package Python modules for reusability.									

LO5	Be able to read and write files in Python.	
LAB EXERCISES		Required Hours
<p>1. Write a Python program to read and print values of variables of different data types.</p> <p>2. Write a Python program to perform addition, subtraction, multiplication, division, integer division and modulo division on two integer numbers.</p> <p>3. Write a Python program to determine whether the character entered is a vowel or not using conditional statement.</p> <p>4. Write a Python program to calculate the factorial of a number using loop.</p> <p>5. Write a Python program to calculate the square root of a number. Use break, continue and pass statements.</p> <p>6. Write a Python program using function and return statement to check whether a number is even or odd.</p> <p>7. Write a Python program to print the Fibonacci series using recursion.</p> <p>8. Write a Python program to reverse the order of the items in the array.</p> <p>9. Write a Python program that accepts a string from the user and redisplay the same string after removing vowels from it.</p> <p>10. Write a Python program to remove all duplicates from a list.</p> <p>11. Write a Python program that has a list of numbers. (both positive and negative). Make new tuple that has only positive values from this list.</p> <p>12. Write a Python program that creates a dictionary of radius of a circle and its circumference.</p>		60
Course Outcomes		
On completion of this course, students will		
CO1	Demonstrate the understanding of syntax and semantics of PYTHON language	
CO2	Identify the problem and solve using PYTHON programming techniques.	
CO3	Identify suitable programming constructs for problem solving.	
CO4	Analyze various concepts of PYTHON language to solve the problem in an efficient way.	
CO5	Develop a PYTHON program for a given problem and test for its correctness.	

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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	1	3	2	3
CO 3	3	3	3	3	2	2
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	14

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
CC4	Office Automation LAB	Core	-	-	2	-	2	2	25	75	100
Learning Objectives											
LO1	To understand the concepts of MS word										
LO2	To learn the features of Word										
LO3	To do calculations in excel										
LO4	To Design invitations etc using Word										
LO5	To understand and design presentations										
Sl. No	Contents									No. of	

		Hours
	<ol style="list-style-type: none"> 1. Usage of Numbering, Bullets, Indents and Headers in a Word Document 2. Prepare a Calendar in a Word Document 3. Design a wedding invitation in Word Document 4. Usage of Spell Check, Find and Replace 5. Picture Insertion and Alignment 6. Prepare a semester wise mark statement for a computer class of 20 students using any spreadsheet' worksheet. Total, average and rank the student marks. Give proper headings. Make the column headings bold and italic. 7. Consider the sample employee worksheet and calculate their salary. 8. Use any spreadsheet to use mathematical, statistical and logical functions 9. Use any spreadsheet to plot a chart for marks obtained by the students (out of 5) vs. frequency (total number of students in class is 50). 10. Create a database for a Telephone Directory. Create a table named phone book with relevant fields. Enter a minimum of 10 records. 11. Create a student database and create validation rules for fields like age, date of birth, pincode etc. 12. Enter data to the student database using a form. 13. Create a query and add criteria to the query. 14. Create a tabular auto report. Customize a report in report design 	60

Reference Books:

1. Microsoft Office 2016 Step By Step, Lambert, Joan , Frye, Curtis D., Phi Learning
2. *Microsoft Access 2016* Step By Step, By Lambert, Joan Phi Learning
3. *Microsoft Excel 2016* Step By Step, Curtis Frye, Phi Learning
4. Browse the Internet for Open Source Office Software

CourseCode-Elective Course	Discrete Mathematics		Credits 3
LectureHours:(L) perweek - 4	TutorialHours:75 (T)perweek	Hours: (P)perweek	Total:(L+T+P) perweek: 4
CourseCategory: Elective	Year&Semester:I Year I Semester	AdmissionYear:	
Pre-requisite	Basic Knowledge of Programming concept		
<p>Course Outcomes:(for students: To know what they are going to learn)</p> <p>CO1:Know how to solve various problems on discrete mathematics</p> <p>CO2:Use approximation to solve problems</p> <p>CO3:Differentiation and integration concept are applied</p> <p>CO4:Apply , direct methods for solving linear systems</p> <p>CO5:Discrete solution of ordinary problems</p>			
Units	Contents		RequiredHours
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		15
II	Relations and functions-Definition-example- Relations on sets- Equivalence relations-Equivalence Class - Functions		15
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		15

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	15
V	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.	15

Text Book:

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

CourseCode: SEC-1	Office Automation		Credits: 2
LectureHours:(L) perweek: 2	TutorialHours: (T)perweek	Hours: (P)perweek	Total:(L+T+P) perweek: 2
CourseCategory: SEC-1	Year&Semester: I Year I Semester	AdmissionYear:	
Pre-requisite	Basic skills in Computer operations		
LearningObjectives:(forteachers:whatttheyhavetodointheclass/lab/field)			
<ul style="list-style-type: none"> • The major objective in introducing the Computer Skills course is to impart training for students in Microsoft Office which has different components like MS Word, MS Excel and Powerpoint. • The course is highly practice oriented rather than regular classroom teaching. • To acquire knowledge on editor, spreadsheet and presentation software. 			

<p>Course Outcomes:(for students: To know what they are going to learn)</p> <p>CO1:Understandthebasicsofcomputersystemsanditscomponents.</p> <p>CO2:Understand and apply the basic concepts of word processing package.</p> <p>CO3:Understandand apply the basic concepts of electronic spreadsheet software.</p> <p>CO4: Understand and apply the basic concepts of database management system.</p> <p>CO5: Understand and create a presentation using PowerPoint tool.</p>		
<p>Recap:(notforexamination)Motivation/previouslecture/relevantportionsrequiredforthe course)[Thisisdoneduring2Tutorialhours)</p>		
Units	Contents	RequiredHours
I	<p>Introductory concepts: Memory unit– CPU-Input Devices: Key board, Mouse and Scanner.Outputdevices:Monitor,Printer.Introductionto Operatingsystems&itsfeatures:DOS– UNIX–Windows. IntroductiontoProgrammingLanguages.</p>	17
II	<p>Word Processing: Open, Save and close word document; Editing text – tools, formatting, bullets;SpellChecker - Document formatting – Paragraph alignment, indentation, headers and footers,numbering;printing–Preview,options,merge.</p>	17
III	<p>Spreadsheets:Excel– opening,enteringtextanddata,formatting,navigating;Formulas–entering,handlingand copying;Charts– creating,formatting and printing,analysistables,preparationoffinancialstatements,introductiontodataanalytics.</p>	17
IV	<p>Database Concepts: The concept of data base management system; Data field, records, and</p>	17

	files,Sorting and indexing data; Searching records. Designing queries, and reports; Linking of datafiles; Understanding Programming environment in DBMS; Developing menu drive applicationsinquerylanguage(MS–Access).	
V	Power point: Introduction to Power point - Features – Understanding slide typecasting & viewingslides – creating slide shows. Applying special object – including objects & pictures – Slide transition– Animation effects ,audio inclusion, timers.	17
Extended Professional Component (isapartofinternal component only, Not to be included in the External Examination question paper)	Questionsrelatedtotheabovetopics,fromvariouscompetitiveexaminationsUPSC/TRB/NET/UGC– CSIR/GATE/TNPSC/otherstobesolved(TobediscussedduringtheTutorialhour)	
Skills acquired from the course	Knowledge,ProblemSolving,Analyticalability,Professional Competency,ProfessionalCommunicationandTransferrable Skill	
Learning Resources: <ul style="list-style-type: none"> • Recommended Texts <ol style="list-style-type: none"> 1.PeterNorton,“IntroductiontoComputers”–TataMcGraw-Hill. • Reference Books <ol style="list-style-type: none"> 1. JenniferAckermanKettel,GuyHat- 		

Davis, Curt Simmons, "Microsoft 2003", Tata McGraw-Hill.

- **Web resources :** Web content from NDL / SWAYAM or open source web resources

Subject Code	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	Marks		
									CIA	External	Total
FC	Problem Solving Techniques	FC	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	Familiarize with writing of algorithms, fundamentals of C and philosophy of problem solving.										
LO2	Implement different programming constructs and decomposition of problems into functions.										
LO3	Use data flow diagram, Pseudo code to implement solutions.										
LO4	Define and use of arrays with simple applications										
LO5	Understand about operating system and their uses										
UNIT	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. Programming Languages: Machine language, Assembly language, High-level language, 4GL and 5GL-Features of good programming language. Translators: Interpreters and Compilers.								6		
II	Data: Data types, Input, Processing of data, Arithmetic Operators, Hierarchy of operations and Output. Different phases in Program Development Cycle (PDC). 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. Pseudocode: Writing a pseudocode. Coding, documenting and testing a program: Comment lines and types of errors. Program design: Modular Programming.								6		

III	Selection Structures: Relational and Logical Operators - Selecting from Several Alternatives – Applications of Selection Structures. Repetition Structures: Counter Controlled Loops –Nested Loops– Applications of Repetition Structures.	6
IV	Data: Numeric Data and Character Based Data. Arrays: One Dimensional Array - Two Dimensional Arrays – Strings as Arrays of Characters.	6
V	Data Flow Diagrams: Definition, DFD symbols and types of DFDs. Program Modules: Subprograms-Value and Reference parameters- Scope of a variable - Functions – Recursion. Files: File Basics-Creating and reading a sequential file- Modifying Sequential Files.	6
TOTAL HOURS		30
Course Outcomes		Programme Outcomes
CO	On completion of this course, students will	
CO1	Study the basic knowledge of Computers. Analyze the programming languages.	PO1, PO2, PO3, PO4, PO5, PO6
CO2	Study the data types and arithmetic operations. Know about the algorithms. Develop program using flow chart and pseudocode.	PO1, PO2, PO3, PO4, PO5, PO6
CO3	Determine the various operators. Explain about the structures. Illustrate the concept of Loops	PO1, PO2, PO3, PO4, PO5, PO6
CO4	Study about Numeric data and character-based data. Analyze about Arrays.	PO1, PO2, PO3, PO4, PO5, PO6
CO5	Explain about DFD Illustrate program modules. Creating and reading Files	PO1, PO2, PO3, PO4, PO5, PO6
Textbooks		
1	Stewart Venit , “Introduction to Programming: Concepts and Design”, Fourth Edition, 2010, Dream Tech Publishers.	
Web Resources		
1.	https://www.codesansar.com/computer-basics/problem-solving-using-computer.htm	
2.	http://www.nptel.iitm.ac.in/video.php?subjectId=106102067	
3.	http://utubersity.com/?page_id=876	

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

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

Semester II

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
CC3	DATA STRUCTURE AND ALGORITHMS	Core	5	-	-	-	5	5	25	75	100
Learning Objectives											
LO1	To understand the concepts of ADTs										
LO2	To learn linear data structures-lists, stacks, queues										
LO3	To learn Tree structures and application of trees										
LO4	To learn graph structures and application of graphs										
LO5	To understand various sorting and searching										
UNIT	Contents										No. of Hours
I	Abstract Data Types (ADTs)- List ADT-array-based implementation-linked list implementation singly linked lists-circular linked lists-doubly-linked lists-applications of lists-Polynomial Manipulation- All operations-Insertion-Deletion-Merge-Traversal										15
II	Stack ADT-Operations- Applications- Evaluating arithmetic expressions										15

	– Conversion of infix to postfix expression-Queue ADT-Operations-Circular Queue- Priority Queue- deQueue applications of queues.	
III	Tree ADT-tree traversals-Binary Tree ADT-expression trees-applications of trees-binary search tree ADT- Threaded Binary Trees-AVL Trees- B-Tree- B+ Tree – Heap-Applications of heap.	15
IV	Definition- Representation of Graph- Types of graph-Breadth first traversal – Depth first traversal-Topological sort- Bi-connectivity – Cut vertex- Euler circuits-Applications of graphs.	15
V	Searching- Linear search-Binary search-Sorting-Bubble sort-Selection sort-Insertion sort-Shell sort-Radix sort-Hashing-Hash functions-Separate chaining- Open Addressing-Rehashing Extendible Hashing	15
Total		75
Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of Dynamic memory management, data types, algorithms, Big O notation	PO1,PO6
CO2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO2
CO3	Describe the hash function and concepts of collision and its resolution methods	PO2,PO4
CO4	Solve problem involving graphs, trees and heaps	PO4,PO6
CO5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO5,PO6
Text Book		
1	1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.	
2	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition	
Reference Books		
1.	Thomas H.Cormen, ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition.	
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003	
Web Resources		
1.	https://www.programiz.com/dsa	
2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/	

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	1	3	3	3
CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	13	15	14

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
CC4	DATA STRUCTURE AND ALGORITHMS [Note: Practicals may be offered through C / C++ / Python]	Core	-	-	3	-	3	-	25	75	100
Learning Objectives											
LO1	To understand the concepts of ADTs										
LO2	To learn linear data structures-lists, stacks, queues										
LO3	To learn Tree structures and application of trees										
LO4	To learn graph structures and application of graphs										
LO5	To understand various sorting and searching										
Sl. No	Contents									No. of Hours	

	<ol style="list-style-type: none"> 1. Search an element in a list using Binary Search. 2. Implementation of Stack- Push and Pop. 3. Implementation of Queue – Enqueue and Dequeue 4. Implementation of Binary Tree Traversals using recursion. <ol style="list-style-type: none"> a) Pre-order b) In-order c) Post-Order 5. Implementation of Breadth First Search algorithm. 6. Implementation of Depth First Search algorithm. 7. Implementation of Merge Sort 8. Implementation of Quick Sort 	60
		60
		Programm Outcome
CO		
1		PO1,PO4,PO5
2	Understand basic data structures such as arrays, linked lists, stacks and queues	PO1, PO4,PO6
3	Describe the hash function and concepts of collision and its resolution methods	PO1,PO3,PO6
4	Solve problem involving graphs, trees and heaps	PO3,PO4
5	Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data	PO1,PO5,PO6
Text Book		
1	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Pearson Education 2014, 4th Edition.	
2	Reema Thareja, “Data Structures Using C”, Oxford Universities Press 2014, 2nd Edition	
Reference Books		
1	Thomas H.Cormen,ChalesE.Leiserson,RonaldL.Rivest, Clifford Stein, “Introduction to Algorithms”, McGraw Hill 2009, 3rd Edition	
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education 2003	
Web Resources		
1.	https://www.programiz.com/dsa	

2.	https://www.geeksforgeeks.org/learn-data-structures-and-algorithms-dsa-tutorial/
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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	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	15

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
CC4	Web Design	Core	2	-	-	-	2	2	25	75	100
LO1	To understand the concepts of links										
LO2	To learn tags, lists										
LO3	To learn frames and its applications										
LO4	To apply forms and to create pages										
LO5	To apply sound effect										
Sl. No	Contents										No. of Hours
	<ol style="list-style-type: none"> 1. Create a website using internal links and images. 2. Design a calendar using table tag. 3. Create a HTML document to display a list of five flowers and link each one to another document displaying brief description of the flower, Add pictures wherever possible. 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 										

	<p>should display the list and the right frame should display the paragraph about the frame.</p> <ol style="list-style-type: none"> 5. Create a simple HTML Form covering major form elements. 6. Embed Audio and Video in an HTML page. 7. Rotate an element using CSS. 8. Build a simple quiz. 	60
		60

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	1	3	2	3
CO 3	3	3	3	3	2	3
CO 4	3	3	3	3	2	3
CO 5	3	2	3	3	3	3
Weightage of course contributed to each PSO	15	15	13	15	13	15

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
	Digital Logic Fundamentals	Elective course-2	4	-	-	-	3	4	25	75	100
Learning Objectives											
LO1	To understand the concepts of number systems										
LO2	To learn conversions										
LO3	To construct truth tables										
LO4	To learn SOP and POS										
LO5	To understand various simplifications										
UNIT	Contents										No. of Hours
I	<p>Number Systems :Codes and Digital Logic 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. Digital Logic:The Basic gates NOT, OR , AND –Universal Logic Gates NOR,NAND – AND-OR Invert Gates.</p>										15
II	<p>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.</p>										15
III	<p>Data Processing and Arithmetic circuits :Multiplexers –Demultiplexers –1-of-16-Decoders –BCD- to-Decimal Decoders – Seven-Segment decoders –Encoders –Exclusive-OR gates. Arithmetic Circuits:Binary Addition –Binary Subtraction –Unsigned Binary Numbers –Sign-Magnitude Numbers – 2's Complement Representation –2's Complement Arithmetic.</p>										15

IV	Flip-Flops: RS Flip Flops –Edge Triggered RS Flip Flops -Edge Triggered D Flip Flops -Edge Triggered JK Flip Flops –JK Master Slave Flip Flops	15
V	Registers :Types of Registers –Serial in serial out –serial in parallel out –parallel in serial out –parallel in parallel out–Universal Shift Register.	15
	Total	75

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of various number systems	PO1,PO6
CO2	Understand basic concepts of digital systems	PO2
CO3	Describe the storage structures	PO2,PO4
CO4	Solve problems using SOP and PoS	PO4,PO6
CO5	Apply concepts for simplifications	PO5,PO6

Text Book

Text Book:

Digital Principles and Applications, by Albert Paul Malvino & Donald P. Leach, Seventh Edition, McGraw Hill Education Private Limited

Reference Books:

1. Fundamentals of Digital Circuits, A. Anand Kumar, Second Edition, PHI Learning Private Limited
2. Digital design, M. Morris Mano, Third Edition, Pearson Education

Course code and title : Digital Logic Fundamentals

Mapping with Programme Outcomes:

CO/PO	PSO					% of co's
	1	2	3	4	5	
CO1	3	3	2	2	2	2.5
CO2	3	3	3	3	2	2.7

CO3	2	3	3	3	2	2.5
CO4	2	2	3	3	3	2.6
CO5	2	2	3	3	3	2.7

Average of CO's = 2.6(high)

Strongly correlated -3 Moderately correlated -2 weakly correlated-1

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
	Introduction to HTML	Skill Enhancement Course - 2	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	To understand the concepts Tags										
LO2	To learn linear data structures-lists and links										
LO3	To learn formatted images										
LO4	To learn frames and its structures										
LO5	To create various style sheets										
UNIT	Contents										No. of Hours
I	Introduction to HTML: Designing a Home page – History of HTML – HTML generations- HTML Documents-Anchor tag –Hyper links –Sample HTML documents.										15
II	Head and Body section: Header Section –Title-Prologue-Links-Colorful web page –Comments lines Designing the body: Heading printing –Aligning the headings-Horizontal rule- paragraph-Tab settings-Image and pictures- Embedding PNG format Images										15
III	Ordered and unordered lists: List-Unordered lists- headings in a list – ordered lists- Nested lists. Table handling: Tables- table creation in HTML- Width of the Tables and cells-Cells spanning multiple rows/Columns- Coloring cells – Column specification										15
IV	Frames: Frame set - Definition – Frame definition –Nested Frames Web Page Design Project : Frameset Definition – Animals – Birds – Fish Forms: Action										15

	attributes –Method attributes –Enctype attribute – Drop down list- sample forms	
V	DHTML and Style sheets: Defining styles –Elements of styles- Linking a style sheet to an HTML document –Inline styles –Internal & External style sheets – Multiple styles	15
	Total	75

Course Outcomes		Programme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of various tags	PO1,PO6
CO2	Understand basic designing	PO2
CO3	Describe the hash function and concepts of tables,designing etc	PO2,PO4
CO4	Solve problem involving style sheets	PO4,PO6
CO5	Apply the attributes in designing web pages	PO5,PO6

Text Book:

World Wide Web Design with HTML, C. Xavier, TMH, 2001

Reference Book:

1. Internet & World Wide Web, H.M.Deital, P.J.Deital & A.B.Goldberg, Pearson Education
2. Fundamentals of information technology, Mathew's lenon and Alxis leon, Vijay Nicole privatelimited, Chennai.

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
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CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
Weightage of course contributed to each PSO	15	14	13	13	15	14

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

Title of the Course/ Paper	Subject Name	Category	L	T	P	S	Credits	Inst. Hours	M a r k s		
									CIA	External	Total
	Understanding Internet	Skill enhancement	2	-	-	-	2	2	25	75	100
Learning Objectives											
LO1	To understand the concepts network										
LO2	To learn various links in internet										
LO3	To learn formatted images										
LO4	To learn frames and its structures										
LO5	To create various style sheets										
UNIT	Contents										No. of Hours
I	Man and Machines - Human Capability of five senses to see, hear, smell, speak and act - Basic Structure of a Computer - Data - Characteristics of a Computer-History of Computers - - Classification of Computers										15
II	Application Software and Programming Languages - Application Software - Packaged Software Products (Off-the-Shelf Products) - Office Automation - Core Banking System - Enterprise Software Products – SAP - Sales Force – Oracle - CRM and ERP - Early High Level Programming Languages - Translators (Compilers and Interpreters) – FORTRAN – BASIC – COBOL – PASCAL - C Language - Web Programming Languages – HTML - Java Script - Objected Oriented Programming with C++ - C++ Language - C# Language - Java Programming - Modern Programming Language – Python - GO Language - Swift Language - Kotlin Language - R Language - Artificial Intelligence Languages - Database Management Software										15
III	Digital Transformation - Data (High Value Commodity) - Digital Transformation in Business - Features of Digital Transformation -										15

	Banking and Financial Services Industry (BFSI) - Human Resource Management – Healthcare - Big Data Analytics in Healthcare - Virtual Reality Wearable medical devices	
IV	Cyber Security - IT Assets - Risk and Vulnerabilities - Computer Security Types - Fundamental Principles of Security - Physical Safety and Security - Access Control - Biometric Access Control - Network Security - AAA Server – Firewall – Malware – Spyware – Adware – Spamware – Virus – Ransomware – Worms - Trojan Horse -	15
V	<p>– Computer Virus - Types of Computer Viruses - Antivirus Protection - Digital Signature - Cyber Crime – Hacking – Phishing - Spam e-mails -</p> <p>Attack using Malware - ATM Skimming – Ransomware - Fake News - Deep fake – Cyberbullying –</p> <p>Textbook</p> <p>Fundamentals of Internet and Emerging Technologies (2021) , C. Xavier, New Age International Publishers Ltd., New Delhi., Chapters 1, 2, 3 and 9 to 16 only.</p> <p>Reference Book</p> <ol style="list-style-type: none"> 1. Introduction to Computer Science, Second Edition, ITL Education Solutions Ltd, Pearson Education 2. Introduction to Computers, Peter Norton, 7th Edition, McGraw Hill Education 3. Fundamentals of Computers, V.Rajaram, 5th Edition, PHI <p>–</p>	15
	Total	75
Course Outcomes		Programmeme Outcome
CO	On completion of this course, students will	
CO1	Understand the concept of network	PO1,PO6

CO2	Understand basic languages	PO2
CO3	Describe the securityhash function and concepts of security methods	PO2,PO4
CO4	Solve problem involving malware	PO4,PO6
CO5	Apply Algorithm for secure network	PO5,PO6

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CO 3	3	3	3	2	3	2
CO 4	3	2	3	2	3	3
CO 5	3	3	3	3	3	3
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S-Strong-3 M-Medium-2 L-Low-1