

**MOTHER TERESA WOMEN'S UNIVERSITY
KODAIKANAL
&
TAMIL NADU STATE COUNCIL FOR HIGHER EDUCATION
(TANSICHE)**



**B. Sc. Computer Science
(2023-2024 Onwards)
(As per TANSICHE Framework)**

May, 2023

B.Sc. Computer Science

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 realtime 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 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.

- PO6: 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.
- PO7: Equip with Computer science technical ability, problem solving skills, creative talent and power of communication necessary for various forms of employment.
- PO8: Develop a range of generic skills helpful in employment, internships& societal activities. Get adequate exposure to global and local concerns that provides
- PO9: platform for further exploration into multi-dimensional aspects of Computing sciences.

4. 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)

	POs						...	PSOs		
	1	2	3	4	5	6		1	2	...
CLO1										
CLO2										
CLO3										
CLO4										
CLO5										
CLO6										
...										

5. 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 survey 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..

6. Value additions in the Revamped Curriculum:

Semester	Newly introduced Components	Outcome / Benefits
I	<p>Foundation Course</p> <p>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"> • Instill 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

		<ul style="list-style-type: none"> • 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
Skills acquired from the Courses		<ul style="list-style-type: none"> Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

9. Consolidated Semester wise and Component wise Credit distribution

Parts	Sem. I	Sem. II	Sem. III	Sem. IV	Sem. V	Sem. VI	Total Credits
Part I	3	3	3	3	-	-	12
Part II	3	3	3	3	-	-	12
Part III	12	12	12	11	19	21	87
Part IV & Part V	4	4	5	6	7	3	29
Total	22	22	23	23	26	24	140

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

10. Illustration for B. Sc. Computer Science Curriculum Design

FIRST YEAR

(Academic Year 2023-2024 Onwards)

Semester-I						
Course Code	Course Title	Credits	Hours	CIA	ESE	Total
U23TAL11	Language – 1: Tamil/Hindi/Others	3	6	25	75	100
U23ENL21	Language - 2 – English	3	6	25	75	100
U23CST11	Core1 – OOPS using C++	5	5	25	75	100
U23CSP11	Core2 – OOPS using C++ Lab	5	5	25	75	100
U23CSE11	Elective 1 – Discrete Mathematics	3	4	25	75	100
U23CSS11	SEC1 – Problem Solving Techniques	2	2	25	75	100
U23CSF11	Foundation Course – Fundamentals of Information Technology	2	2	25	75	100
Total		23	30	-	-	700

Semester-II						
Course Code	Course Title	Credits	Hours	CIA	ESE	Total
U23TAL12	Language-1: Tamil/Hindi/Others	3	6	25	75	100
U23ENL22	Language-2: English	3	6	25	75	100
U23CST22	Core-3: Data Structures and Algorithms	5	5	25	75	100
U23CSP22	Core-4: Data Structures and Algorithms Lab	5	5	25	75	100
U23CSE22	Elective-2: Digital Computer Fundamentals	3	4	25	75	100
U23CSS22	SEC-2: Generic Course(Soft Skills)	2	2	25	75	100
U23CSS23	SEC-3: Web Designing Lab	2	2	25	75	100
Total		23	30	-	700	

SYLLABUS**First Year (Semester – I)**

Course Code U23CST11	Core 1 – OOPS USING C++		Credits 5
Lecture Hours:4 (L) Per week	Tutorial Hours: 5(T) per week	Lab Practice Hours: 0(P) per week	Total:(L+T+P) Per week: 5
Course Category: Core	Year & Semester: I Year I Semester		Admission Year: 2023-2024
Pre-requisite	Basic Knowledge of Programming concept		
Learning Objectives: (for teachers: what they have to doing the class /lab /field) <ul style="list-style-type: none"> To gain knowledge in C++ language. To inculcate fundamental programming skills. 			
Course Outcomes: (for students: To know what they are going to learn) <p>CO1: Remember the program of C++ with its syntax and semantics</p> <p>CO2: Understand the programming principles in C++ (data types, operators, branching and looping, arrays, functions, structures, pointers and files)</p> <p>CO3: Apply the programming principles learnt in real-time problems</p> <p>CO4:Analyze the various methods of solving a problem and choose the best method</p> <p>CO5: Code, debug and test the programs with appropriate test cases</p>			
Recap: (not for examination) Motivation/previous lecture/relevant portions required for the course)(This is done during 2 Tutorial hours)			
Units	Contents		Required Hours
I	Principles of object Oriented Programming: Software evolution – Basic concepts ofobjectOrientedProgramming–BenefitsofOOPS–ObjectOrientedLanguage–ApplicationofOOPS–BeginningwithC++.		15
II	Token, Expressions and Control Structure Functions : Token – Keyword – Identifier and constant– Basic Data Types– User defined data type-Derived data type – Operators in C++ -Scope Resolution Operator–Member dereferencing Operator –Manipulators–Typecast Operators–Expression and their types – Implicit conversion– Control		15

	structures.	
III	Classes and Objects – Constructor and Destructors – Operator overloading and Type conversions.	15
IV	Inheritance: Extending Classes– Pointers, Virtual Function and Polymorphism– Managing consoles I/O operations.	15
V	Working with Files–Templates–Exception Handling.	15
Total (Hrs.)		75
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC– CSIR/GATE/TNPSC/others to be solved (To be discussed during the Tutorial hour)
Skills acquired from the course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Learning Resources:		
Text Book:		
1. ObjectorientedProgrammingwithC++byE.BalagurusamyTataMcGrawHillPublishingCompanyLimited1998Chapter:1to11.		
Reference Book:		
1. C++, The Complete Reference Herbert Schlitz, 1997.		
Course Code U23CSP11	Core 2 - OOPS using C++ Lab	Credits 5
Lecture Hours:0 (L) Per week	Tutorial Hours: 0 (T) per week	Lab Practice Hours:5 (P) per week
		Total:(L+T+P) Per week: 5
Course Category: Core	Year & Semester: I Year I Semester	Admission Year:

		2023-2024
Pre-requisite	Basic Knowledge of Programming concept	
Learning Objectives:		
<ul style="list-style-type: none"> • To implement programming skills using C++. • To impart knowledge and provide efficient solutions for real time problems using C++ language 		
Course Outcomes: (for students: To know what they are going to learn)		
CO1: Remember and understand how to write programs using the basic syntax and semantics in C++		
CO2: Apply the concepts of functions, arrays, pointers and files in programs to solve problems		
CO3: Analyze and understand programs written in C++ language		
CO4: Evaluate the program execution flow with test cases and apply debugging		
CO5: Design algorithms and write programs in C++ language for the given problems		
Recap: (not for examination) Motivation/previous lecture/relevant portions required for the course)(This is done during 2 Tutorial hours)		
S.No.	Contents	Required Hours

1.	Simple Programs	75
2.	Arrays	
3.	Strings	
4.	Functions	
5.	Recursion	
6.	Structures	
7.	Pointers	
8.	Arrays with Structures	
9.	Arrays with Pointers	
10.	Files	
11.	Call by value & call by reference method	
12.	Inline function in C++	
13.	Function overloading	
14.	Default Arguments	
15.	Operator overloading	
16.	Program using Inheritance	
17.	Program using polymorphism and virtual functions	
18.	File concepts	
Total(Hrs.)		75
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC/CSIR/GATE/TNPSC/others to be solved (To be discussed during the Tutorial hour)
Skills acquired from the course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Learning Resources:

Recommended Texts

1. ObjectorientedProgrammingwithC++byE.BalagurusamyTataMcGrawHillPublishingCompanyLimited1998Chapter:1to11.

Reference Book:

1. C++,the Complete Reference Herbert Schlitz,1997.

Course Code U23CSE11	SBE 1 - DISCRETE MATHEMATICS		Credits 3
Lecture Hours: 4(L) Per week	Tutorial Hours: 4(T) per week	Lab Practice Hours:0(P) per week	Total:(L+T+P) Per week: 4
Course Category: SBE	Year & Semester: I Year I Semester		Admission Year: 2023-2024
Pre-requisite	Basic Knowledge of Mathematics		
Learning Objectives: <ul style="list-style-type: none"> To understand problem solving method. To understand about Boolean algebra. To describe Relations. Students completing this course will be able to evaluate Boolean functions and simplify expressions using the properties of Boolean algebra.. 			
Course Outcomes: (for students: To know what they are going to learn) CO1: Know how to solve set and logic problems CO2: Use of Relations, and Functions CO3: Use Groups and Lagrange’s theorem CO4: Apply the methods for solving Matrix problems CO5: Use of posets, Hasse diagram , lattice and its properties.			
Recap: (not for examination) Motivation/previous lecture/relevant portions required for the course)(This is done during 2 Tutorial hours)			
Units	Contents		Required Hours
I	Review of theory of sets – Relations – Equivalence Relations – partial Order – Function –Binary Operations.		15
II	Logic–Introduction–connectives–TruthTable–Tautology–Implications–Equivalences.		15
III	Groups–Definitions&Examples–Elementary–Properties–SubGroups–Cyclegroups – Cosets and Lagrange’s Theorem– Normal Subgroups.		15

IV	Matrices – Special type of Matrices – operations – Inverse of a Matrices – Elementary Transformation – Rank of Matrix – Simultaneous Linear Equation – Eigen values and Eigenvectors– Cayley Hamilton theorem.	15
V	Partial Ordering – Posets – Hasse Diagram-Lattices–Properties – Sub Lattices–Special lattices–Boolean Alegbra.	15
Total (Hrs.)		75
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC/CSIR/GATE/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	
<p>Learning Resources:</p> <p>Recommended Texts</p> <ol style="list-style-type: none"> 1. Modern algebra & S.Arumugam & Thangapandi Issac, New Gamma Publishing House, Palamkottai. 2. Discrete mathematics by M.K.Venkataraman anand N.Chandrasekaran, nation publishing CO., Chennai. 		

Course Code U23CSS11	SEC 1 – PROBLEM SOLVING TECHNIQUES		Credits 2
Lecture Hours: 2(L) Per week	Tutorial Hours: 2(T) per week	Lab Practice Hours:0(P) per week	Total:(L+T+P) Per week: 2
Course Category: SEC	Year & Semester: I Year I Semester		Admission Year: 2023-2024
Pre-requisite	Basic of Problem-solving skills		
Learning Objectives: <ul style="list-style-type: none"> To understand the importance of algorithms and programs, and to know of the basic problem solving strategies. To learn efficient strategies and algorithms to solve standard problems, thus laying a firm foundation for designing algorithmic solutions to problems. 			
Course Outcomes: (for students: To know what they are going to learn) CO1: Understand the systematic approach to problem solving. CO2: Know the approach and algorithms to solve specific fundamental problems. CO3: Understand the efficient approach to solve specific factoring-related problems. CO4: Understand the efficient array-related techniques to solve specific problems. CO5: Understand the efficient methods to solve specific problems related to text processing. Understand how recursion works.			
Recap: (not for examination) Motivation/previous lecture/relevant portions required for the course) (This is done during 2 Tutorial hours)			
Units	Contents		Required Hours
I	Introduction: Notion of algorithms and programs – Requirements for solving problems by computer – The problem-solving aspect: Problem definition phase, Getting started on a problem, The use of specific examples, Similarities among problems, Working backwards from the solution – General problem-solving strategies - Problem solving using top-down design – Implementation of algorithms – The concept of Recursion.		6
II	Fundamental Algorithms: Exchanging the values of two variables		6

	– Counting - Summation of a set of numbers - Factorial computation - Sine function computation - Fibonacci Series generation - Reversing the digits of an integer – Base Conversion.	
III	Factoring Methods: Finding the square root of a number – The smallest divisor of an integer – Greatest common divisor of two integers - Generating prime numbers – Computing the prime factors of an integer – Generation of pseudo-random numbers - Raising a number to a large power – Computing the n th Fibonacci number.	6
IV	Array Techniques: Array order reversal – Array counting or histogramming – Finding the maximum number in a set - Removal of duplicates from an ordered array - Partitioning an array – Finding the k^{th} smallest element – Longest monotone subsequence.	6
V	Text Processing and Pattern Searching: Text line length adjustment – Left and right justification of text – Keyword searching in text – Text line editing – Linear pattern search. Recursive algorithms: Towers of Hanoi – Permutation generation.	6
Total (Hrs.)		30
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC / CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	
Learning Resources: Recommended Texts 1. R. G. Dromey, How to Solve it by Computer, Pearson India, 2007. Reference Books 1. George Polya, Jeremy Kilpatrick, The Stanford Mathematics Problem Book: With Hints and Solutions, Dover Publications, 2009 (Kindle Edition 2013).		

2. Greg W. Scragg, Problem Solving with Computers, Jones & Bartlett 1st edition, 1996.

Web Resources

- https://onlinecourses.nptel.ac.in/noc22_cs101/preview
- https://onlinecourses.nptel.ac.in/noc19_cs43/preview

Course Code U23CSF11	AEC 1 – FUNDAMENTALS OF INFORMATION TECHNOLOGY		Credits 2
Lecture Hours: 2(L) Per week	Tutorial Hours: 2(T) per week	Lab Practice Hours:0(P) per week	Total:(L+T+P) Per week: 2
Course Category: AEC1	Year & Semester: I Year I Semester		Admission Year: 2023-2024
Pre-requisite	Basics of Computer		
Learning Objectives: <ul style="list-style-type: none"> To understand the importance of Information Technology. To learn about software and Operation System. 			
Course Outcomes: (for students: To know what they are going to learn) CO1: Understand basic concepts and terminology of information technology. CO2: Have a basic understanding of personal computers and their operation. CO3: Be able to identify data storage and its usage. CO4: Get great knowledge of software and its functionalities. CO5: Understand about operating system and their uses.			
Recap: (not for examination) Motivation/previous lecture/relevant portions required for the course)(This is done during 2 Tutorial hours)			
Units	Contents		Required Hours
I	Introduction to Computers: Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer		6
II	Basic Computer Organization: Role of I/O devices in a computer system. Input Units: Keyboard, Terminals and its types. Pointing Devices, Scanners and its types, Voice Recognition Systems, Vision Input System, Touch Screen, Output Units: Monitors and		6

	its types. Printers: Impact Printers and its types. Non Impact Printers and its types, Plotters, types of plotters, Sound cards, Speakers.	
III	Storage Fundamentals: Primary Vs Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives	6
IV	Software: Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w	6
V	Operating System: Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	6
Total (Hrs.)		30
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC/CSIR/GATE/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)	
Skills acquired from the course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill	

Learning Resources:

Recommended Texts

1. Anoop Mathew, S. Kavitha Murugesan (2009), “ Fundamental of Information Technology”, Majestic Books.
2. Alexis Leon, Mathews Leon,” Fundamental of Information Technology”, 2nd Edition.
3. S. K Bansal, “Fundamental of Information Technology”.

Reference Books

1. Bhardwaj Sushil Puneet Kumar, “Fundamental of Information Technology”
2. GG WILKINSON, “Fundamentals of Information Technology”, Wiley-Blackwell
3. A Ravichandran , “Fundamentals of Information Technology”, Khanna Book Publishing

Web Resources

1. <https://testbook.com/learn/computer-fundamentals>
2. <https://www.tutorialsmate.com/2020/04/computer-fundamentals-tutorial.html>
3. <https://www.javatpoint.com/computer-fundamentals-tutorial>
4. https://www.tutorialspoint.com/computer_fundamentals/index.htm
5. <https://www.nios.ac.in/media/documents/sec229new/Lesson1.pdf>

First Year (Semester – II)

Course Code U23CST22	Core 3 – Data Structures and Algorithms		Credits 5
Lecture Hours: 5(L) Per week	Tutorial Hours: 5(T) per week	Lab Practice Hours:0(P) per week	Total:(L+T+P) Per week: 5
Course Category: Core	Year & Semester: I Year II Semester		Admission Year: 2023-2024
Pre-requisite	Basic knowledge in data storage and representations		
<p>Learning Objectives:(for teachers: what they have to doing the class/lab/field)</p> <ul style="list-style-type: none"> To impart the basic concepts of data structures and algorithms. To acquaint the student with the basics of the various data structures and make the students knowledgeable in the area of data structures. This course also gives insight into the various algorithm design techniques 			
<p>Course Outcomes:(for students: To know what they are going to learn)</p> <p>CO1: To introduce the concepts of Data structures and to understand simple linear data structures.</p> <p>CO2: Learn the basics of stack data structure, its implementation and application</p> <p>CO3: Use the appropriate data structure in context of solution of given problem and demonstrate a familiarity with major data structures.</p> <p>CO4: To introduce the basic concepts of algorithms</p> <p>CO5: To give clear idea on algorithmic design paradigms like Dynamic Programming, Backtracking, Branch and Bound</p>			
<p>Recap: (not for examination) Motivation/previous lecture/relevant portions required for the course)(This is done during 2 Tutorial hours)</p>			
Units	Contents		Required Hours
I	<p>INTRODUCTION TO DATA STRUCTURES:</p> <p>Data Structures: Definition- Time & Space Complexity, Arrays: Representation of arrays, Applications of arrays, sparse matrix and its representation,</p> <p>Linear list: Singly linked list implementation, insertion, deletion and</p>		15

	searching operations on linear list, Circular linked list: implementation, Double linked list implementation, insertion, deletion and searching operations. Applications of linked lists- Dynamic Storage management.	
II	STACKS: Operations, array and linked representations of stack, stack applications, infix to postfix conversion, postfix expression evaluation, recursion implementation	15
III	QUEUES, TREES & GRAPHS: Queues: operations on queues, array and linked representations. Circular Queue: operations, applications of queues. Trees: Definitions and Concepts- Representation of binary tree, Binary tree traversals (Inorder, Postorder , Preorder), Binary search trees Graphs: Representation of Graphs- Types of graphs - Breadth first traversal – Depth first traversal - Applications of graphs.	15
IV	INTRODUCTION TO ALGORITHMS: INTRODUCTION: Definition of Algorithms- Overview and importance of algorithms- pseudocode conventions, Asymptotic notations, practical complexities. Divide-and-Conquer: General Method – Binary Search- Quick Sort- Merge Sort. Greedy Method: General method- Knapsack problem- Tree vertex splitting- Job sequencing with deadlines	15
V	DYNAMIC PROGRAMMING, BACKTRACKING & BRANCH & BOUND Dynamic programming: General method, Multistage Graphs, All pairs shortest path, Single source shortest path. Backtracking: General method, 8 Queens, Graph coloring, Hamiltonian cycle. Branch & Bound: General method, Travelling salesperson problem.	15
Total (Hrs.)		75

<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC/CSIR/GATE/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)</p>
<p>Skills acquired from the course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>

Learning Resources:

Recommended Texts

1. Ellis Horowitz , Sartaj Sahni, Susan Anderson Freed, Second Edition , “Fundamentals of Data in C”, Universities Press
2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,“Fundamentals of Computer Algorithms “ Universities Press

Reference Books

1. Seymour Lipschutz ,”Data Structures with C”, First Edition, Schaum’s outline series in computers, Tata McGraw Hill.
2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008.
3. A.K.Sharma, Data Structures using C , Pearson Education India,2011.
4. G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997.
5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, “The design and analysis of Computer Algorithms”, Addison Wesley, Boston, 1974
6. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009
7. SanjoyDasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

Web Resources:

- <https://archive.nptel.ac.in/courses/106/102/106102064/>
- <https://nptel.ac.in/courses/106102064>

Course Code U23CSP22	Core 4 – Data Structures and Algorithms Lab		Credits 5
Lecture Hours:0(L) Per week	Tutorial Hours:0 (T) per week	Lab Practice Hours:5(P) per week	Total:(L+T+P) Per week: 5
Course Category: Core	Year & Semester: I Year II Semester		Admission Year: 2023-2024
Pre-requisite	Basic skills in problem solving and		
Learning Objectives: (for teachers: what they have to doing the class/lab/field) <ul style="list-style-type: none"> • To understand and implement basic data structures using C • To apply linear and non-linear data structures in problem solving. • To learn to implement functions and recursive functions by means of data structures • To implement searching and sorting algorithms 			
Course Outcomes: (for students: To know what they are going to learn) <p>CO1: Implement data structures using C</p> <p>CO2: Implement various types of linked lists and their applications</p> <p>CO3: Implement Tree Traversals</p> <p>CO4: Implement various algorithms in C</p> <p>CO5: Implement different sorting and searching algorithms</p>			
Recap: (not for examination) Motivation/previous lecture/relevant portions required for the course) (This is done during 2 Tutorial hours)			
	List of Exercises:		Required Hours
	Implement the following exercises using C Programming language: <ol style="list-style-type: none"> 1. Array implementation of stacks 2. Array implementation of Queues 3. Linked list implementation of stacks 4. Linked list implementation of Queues 5. Binary Tree Traversals (Inorder, Preorder, Postorder) 6. Implementation of Linear search and binary search 7. Implementation Insertion sort, Quick sort and Merge Sort 		75

	<p>8. Implementation of Depth-First Search & Breadth-First Search of Graphs.</p> <p>9. Finding all pairs of Shortest Path of a Graph.</p> <p>10. Finding single source shortest path of a Graph.</p>	
Total (Hrs.)		75
<p>Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)</p>	<p>Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC/ CSIR/GATE/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)</p>	
<p>Skills acquired from the course</p>	<p>Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill</p>	
<p>Learning Resources:</p> <p>Recommended Texts</p> <ol style="list-style-type: none"> 1. Ellis Horowitz , SartajSahni, Susan Anderson Freed, Second Edition , “Fundamentals of Data in C”, Universities Press 2. E. Horowitz, S. Sahni and S. Rajasekaran, Second Edition ,“Fundamentals of Computer Algorithms “ Universities Press <p>Reference Books</p> <ol style="list-style-type: none"> 1. Seymour Lipschutz ,”Data Structures with C”, First Edition, Schaum’s outline series in computers, Tata McGraw Hill. 2. R.Krishnamoorthy and G.Indirani Kumaravel, Data Structures using C, Tata McGrawHill – 2008. 3. A.K.Sharma, Data Structures using C , Pearson Education India,2011. 4. G. Brassard and P. Bratley, “Fundamentals of Algorithms”, PHI, New Delhi, 1997. 5. A.V. Aho, J.E. Hopcroft, J.D. Ullmann,, “The design and analysis of Computer Algorithms”, Addison Wesley, Boston, 1974 		

6. Thomas H. Cormen, C.E. Leiserson, R L.Rivest and C. Stein, Introduction to Algorithms, Third edition, MIT Press, 2009
7. SanjoyDasgupta, C.Papadimitriou and U.Vazirani , Algorithms , Tata McGraw-Hill, 2008.

Web Resources:

- <https://archive.nptel.ac.in/noc/courses/noc18/SEM1/noc18-cs25/>
- <https://archive.nptel.ac.in/courses/106/106/106106127/>

Course Code U23CSE22	SBE 2 – DIGITAL COMPUTER FUNDAMENTALS		Credits 3
Lecture Hours: 4(L) Per week	Tutorial Hours: 4(T) per week	Lab Practice Hours:0(P) per week	Total:(L+T+P) Per week: 4
Course Category: SBE	Year & Semester: I Year II Semester		Admission Year: 2023-2024
Pre-requisite	Basic knowledge in Mathematics (numbers, algebra, Gates)		
Learning Objectives: (for teachers: what they have to doing the class/lab/field) <ul style="list-style-type: none"> • It aims to train the student of the basic concepts of Digital Computer Fundamentals • To impart the in-depth knowledge of logic gates, Boolean algebra, combinational circuits and sequential circuits. 			
Course Outcomes: (for students: To know what they are going to learn) <p>CO1: Identify the logic gates and their functionality.</p> <p>CO2: Perform number conversions from one system to another system</p> <p>CO3: Understand the functions of combinational circuits</p> <p>CO4: Perform number conversions.</p> <p>CO5: Perform Counter design and learn its operations.</p>			
Recap: (not for examination) Motivation/previous lecture/relevant portions required for the course)(This is done during 2 Tutorial hours)			
Units	Contents		Required Hours
I	Number System sand Codes: Number System–Base Conversion – Binary Codes – Code Conversion. Digital Logic: Logic Gates – Truth Tables – Universal Gates.		12
II	Boolean Algebra: Laws and Theorems – SOP, POS Methods – Simplification of Boolean Functions– Using Theorems, K-Map, Prime – Implicant Method–Binary Arithmetic: Binary Addition – Subtraction – Various Representations of Binary Numbers– Arithmetic Building Blocks – Adder – Subtractor.		12

III	Combinational Logic: Multiplexers – Demultiplexers – Decoders – Encoders – Code Converters – Parity Generator and Checkers.	12
IV	Sequential Logic: RS, JK, D, and T Flip-Flops – Master-Slave Flip-Flops. Registers: Shift Registers – Types of Shift Registers.	12
V	Counters: Asynchronous and Synchronous Counters - Ripple, Mod, Up- Down Counters – Ring Counters. Memory: Basic Terms and Ideas – Types of ROMs – Types of RAMs.	12
Total (Hrs.)		60
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)		Questions related to the above topics, from various competitive examinations UPSC/TRB/NET/UGC/CSIR/GATE/ TNPSC/ others to be solved (To be discussed during the Tutorial hour)
Skills acquired from the course		Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Learning Resources:		
Recommended Texts		
<ol style="list-style-type: none"> 1. V. Rajaraman and T. Radhakrishnan, Digital Computer Design, Prentice Hall of India, 2001 2. D. P. Leach and A. P. Malvino, Digital Principles and Applications – TMH – Fifth Edition – 2002. 3. M. Morris Mano, Digital Logic and Computer Design, PHI, 2001. 		
Reference Books		
<ol style="list-style-type: none"> 1. T. C. Bartee, Digital Computer Fundamentals, 6th Edition, Tata McGraw Hill, 1991. 		
Web Resources		
<ul style="list-style-type: none"> • https://onlinecourses.swayam2.ac.in/cec19_cs06/preview • https://onlinecourses.swayam2.ac.in/cec21_cs17/preview 		