P	PART- A: Introduction				
	ogram: Bachelor in Co ertificate / Diploma / Deg		Semester -	II Session: 2024-2025	
1	Course Code	CASC-04			
2	Course Title	Digital Electronics			
3	Course Type DSC (Discipline Specific Course)				
4	Prerequisite	As per program			
5	Course Learning Outcomes (CLO)	 At the end of this course, the students will be able: To understand the fundamental concepts and techniques used in digital electronics. Understand how the computer system identifies the data inside. To understand and examine the structure of various number systems and its application in digital design. To Perform basic arithmetic calculations in binary, decimal and hexadecimal; The ability to understand, analyze and design various combinational and sequential circuits. To identify the basic requirements according to the specification for a newly customized digital circuit and design it in a cost effective manner. 			
6	Credit Value	4 Credits	Credit = 15 Hours - I	Learning & Observation	
7	Total Marks	Max. Marks:	100	Min Passing Marks: 40	

PART -B:	Content	of the	Course
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	Total No. of Teaching-learning Periods (01 Hr. per period) - 60 Periods (60 Hours)
Unit	Topics (Course contents)	No. of Period
I	NUMBER SYSTEM AND DATA REPRESENTATION: Introduction of number system (binary, decimal, octal, hexadecimal etc.), inter-conversion between the number systems, arithmetic operations, complements in the number system, representation of numeric data(binary representation of integers, fixed point and floating point data representation), codes and its classification(weighted code and its types like NBCD etc., non-weighted code like (Excess-3 code Gray code etc.), alphanumeric code like (ASCII, UNICODE, EBCDIC etc.), Error detecting code like (parity bit coding technique, etc.), Error correcting codes like (hamming code etc.))	15
II	BOOLEAN ALGEBRA: Boolean algebra and basic operations, sum of product, product of sum, simplification of Boolean expression using simplification techniques: Boolean laws and K-Map. FUNDAMENTALS OF DIGITAL CIRCUIT DESIGN: Digital logic families and its properties, Logic gate and its types, Construction of basic digital circuits using fundamental gates as well as Universal gates, simplification of digital circuit. Types of digital circuits (combinational circuit, sequential circuits).	15
IV	COMBINATIONAL CIRCUIT: Adder (half adder, full adder, N bit adder), Subtractor (half subtractor, full subtractor, N bit subtractor), Decoder, Encoder, Multiplexer, De-multiplexer, Comparator, Code Convertor SEQUENTIAL CIRCUIT: Multivibrators/Latch, Flip- flop and its types (S R flip flop, D Flip Flop, J K Flip Flop, T Flip Flop, Master Slave Flip Flop), Register and its types, Counters and its types. MICROPROCESSORS: Introduction of microprocessor, evolution of microprocessor, basic	15
~	components in microprocessor, basic microprocessor instruction, addressing modes, designing of eight-bit microprocessor (8085 microprocessor), designing of 16-bit microprocessor (8086 microprocessor).	15

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Number System, Logic gates, Combinational circuits, Sequential circuits, flip-flop, Registers, Counters, Keywords Microprocessor. Name and Signature of Convener & Members of CBoS: Dr. H.S. Mata Cherman (Dr.k. & Dabey) PART-C: Learning Resources Text Books, Reference Books and Others Text Books Recommended: D. Nasib, S. Gill, J.B. Dixit, Digital Design and Computer Organization, Laxmi Publications Pvt K.K Neniwal, Digital Electronics (Hindi), Paperback Publication. Reference Books Recommended: M. Morris Mano, Digital logic and Computer Design, Prentice-hall of India private ltd. A. K. Maini, Digital Electronics Principles, Devices and Applications, John Wiley & Sons, Ltd. Online Resources: • Digital Circuits by Prof. Santanu Chattopadhyay (NPTEL) https://youtube.com/playlist?list=PLbRMhDVUMngePP5JcezxImF-FzOC9wstz&si=6YjQgG1tFGtYmEZv • Digital Electronics by Prof Gautam Saha (NPTEL) https://youtube.com/playlist?list=PLbRMhDVUMnge4gDT0vBWjCb3Lz0HnYKkX&si=L6PMoGGO Switching Circuits and Logic Design by Prof. Indranil Sengupta, IIT Kharagpur https://youtube.com/playlist?list=PLbRMhDVUMngfV8C6ElNAUaQQz06wEhFM5&si=e8goIfyf V YBAzp0 Online Simulator's for Digital Electronics Practices: CircuitVerse - Digital Circuit Simulator online Digital Electronics reference: Digital Electronics Tutorial - Javatpoint PART -D: Assessment and Evaluation **Suggested Continuous Evaluation Methods:** Maximum Marks: 100 Marks Continuous Internal Assessment (CIA): 30 Marks End Semester Exam (ESE): 70 Marks Internal Test / Quiz-(2): 20 & 20 Better marks out of the two Test / Quiz Continuous Internal Assignment / Seminar -10 + obtained marks in Assignment shall be Assessment (CIA): Total Marks -30 considered against 30 Marks (By Course Teacher) Two section - A & B **End Semester** Section A: Q1. Objective – $10 \times 1 = 10 \text{ Mark}$; Q2. Short answer type- 5x4 = 20 MarksExam (ESE): Section B: Descriptive answer type qts..lout of 2 from each unit-4x10=40 Marks Name and Signature of Convener & Members of CBoS: Charmer CDr. k. B. Dubey 1 Kuway

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Pro	ART- A: Introduce ogram: Bachelor in Contrigue (Contrigue) Department (Contrigue) Departmen	omputer Application	S	emester - II	Session: 2024-202	5
1	Course Code	CASC-05T	and the second s			
2	Course Title Programming in C-					
3	Course Type	urse Type DSC (Discipline Specific Course)				
4						
5 Course Learning. Outcomes (CLO)		Write progrDefine fundWrite progr	the fundamen rams related to ctions, class an rams for file ha	tals of object of concept of ob id to create ow andling.	oriented programming. ject oriented program	
6	Credit Value	3 Credits			earning & Observation	
7	Total Marks	Max. Marks:	100		Min Passing Marks: 4	0
PAF	RT -B: Conte	nt of the Co	urse			
	Total No. of Tea	ching-Learning	Periods (01)	Hr. per peri	od) - 45 Periods (45 Hou	ns) No. o
Uni	it	Top	Topics (Course contents)			
I	file, Executable file Testing, Debugging Structure of C prog Data Types, Contrand Associativity, defined functions,	Introduction and Programming Concepts: Definition of Program, Source file, Object file, Executable file, Header file, Language Translator- Assembler, Interpreter, Compiler, Testing, Debugging, Linker and Loader, Algorithms, Flow Charts, History of C language, Structure of C program, C Tokens: Identifiers, Keywords, Constants, Variables, Operators, Data Types, Control structure: Conditional and looping statements, Operator Precedence and Associativity, Array and its types, Pointer, Functions: Standard Library and User defined functions, function prototype, Call by value and Call by reference, recursive				
functions, String functions. II Introduction to Object Oriented Programming: Concept of object oriented programming, Features of C++, Structure of C++ program, Data types, structure, class and objects, Access Specifiers: Private, Public, Protected, inline functions, static data and static functions. Constructor: Default constructor, Copy constructor, Parameterized constructor,				11		
III Inheritance and Polymorphism: Definition, Concept of base and derived class, Types of Inheritance: Single, Multilevel, Multiple, Hierarchical and Hybrid Inheritance. Polymorphism: Definition, Compile time polymorphism: Function overloading, Operator overloading, constructor overloading, Runtime polymorphism: Virtual Function, pure virtual function. Inline function, friend function, friend class.				11		
IV Input-Output and File Handling: I/O classes, File and Stream classes, Char I/O, String I/O, Object I/O, File Pointer, Opening and Closing file. Exception Handling and Standard Template Library: Definition, Exception basics, try, catch and throws keywords, Template.						
	catch and throws k	eywords, Template.		rary: Definit	ion, Exception basics, try, rphism, Inheritance, Constru	11

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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Peter Juliff, Program Design, PHI Publications.
- Yashwant Kanetkar, Let us C: BPB Publications.
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw Hill

Reference Books Recommended:

- Y. Kanetkar, Let us C++, B.P.B Publication.
- E. Balaguruswamy, Programming in C++, Tata McGraw Hill.
- R. Kumar, Object Oriented Programming with C++, Prakhar Publication(Hindi)
- Dhupiya, Lakhyani, C++ Programming Alka Publications, Ajmer (Paperback, Dhupiya, Lakhyani)(Hindi)

Online Resources:

- Introduction to C and C++ from SWAYAM/NPTEL
 https://onlinecourses.nptel.ac.in/noc22_cs103/preview
 https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2
- Constant and Inline Function through NPTEL: https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10
- Pointer and Reference NPTEL https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12
- Function Overloading NPTEL https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=13
- Operator Overloading NPTEL https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17
- Dynamic Memory Management NPTEL https://www.youtube.com/watch?v=lkFK2X6qIc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18
- Class and Object NPTEL https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24
- Access Specifiers NPTEL https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=22
- Constructor and Destructor NPTEL https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24
- C++ different topics from W3School https://www.w3schools.com/CPP/default.asp
- C++ different topics from Javatpoint https://www.javatpoint.com/cpp-tutorial

	PART -D: Assess	ment and Evaluation	
	Suggested Continuous E	valuation Methods:	
	Maximum Marks:	100 Marks	
	Continuous Internal Ass	sessment (CIA): 30 Marks	
	End Semester Exam (ES	SE): 70 Marks	Devision of the two Test / Oniz +
	Continuous Internal	Internal Test / Quiz-(2): 20 +20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be
	Assessment (CIA):	Assignment / Seminar - 10	considered against 30 Marks
	(By Course Teacher)	Total Marks - 30	Considered against 50 Marks
	End Semester Exam	Two section – A & B	1-1-02 Short anguar type 5v4 = 20 Marks
9	(ESE):	Section A: O1 Objective $= 10 \text{ XI} = 10 \text{ N}$	Mark; Q2. Short answer type- 5x4 = 20 Marks 1 out of 2 from each unit-4x10=40 Marks
-		Section B: Descriptive answer type qts.,	and so some and all
	Name and Signature of Co	onvener & Members of CBoS:	Shall My
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		: Bachelor in Comp			20212	
	C	/ Diploma / Degr	0.0	Semester - II	Session: 2024-20	125
1 Course Code CASC-05P						
2	Cot	ırse Title	Lab 3: Programmin	ng in C++		
3	Cor	ırse Type	Practical			
4	Pre	erequisite	As per program			
At the end of this course, the students will be able to: • Understand the fundamental programming concepts and methodology which are essential to create good C++ programs. • Code, test, and implement a well-structured, robust computer programing the C++ programming language. • Write reusable modules (collections of functions). • Understand design/implementation issues involved with variable allocation and binding, control flow, types, subroutines, paraming passing. • Develop an in-depth understanding of functional, logic, and objoriented programming paradigms.					variable	
6 Credit Value			1 Credits Credit = 30 Hours Laboratory or Field Learning/Training			
7	То	tal Marks	Max. Marks:	50 Min	n Passing Marks:	20
PAF	RT -E		of the Course			
	National College Colle	Total No. of	learning-Training/per	rformance Periods:	30 Periods (30 Hour	
Mo	dule		Topics (Course contents)		No. of Period
Pra Expe	st of ctical riment s.	 Write a progration Write a progratio	am in C++ for various am in C++ for Multiplic am in C++ to store five am in C++ to store six of am in C++ to calculate ace method. am in C++ to find the acts. am in C++ to multiply	iggest number betwee factorial value of a arithmetic operation cation of two 3X3 marks books of information employee information is simple interest using sum and average of two numbers using ructure like this using	en two numbers. ny entered number s using switch case atrices. n using structure. n using union. g call by value and five numbers using	30

- 13. Write a program in C++ for multiple inheritance.
- 14. Write a program in C++ for operator overloading.
- 15. Write a program in C++ for friend class and friend function.
- 16. Write a program in C++ for virtual function and virtual class.
- 17. Write a program in C++ for Exception Handling.
- 18. Write a program in C++ to open and close a file using file Handling.
- 19. Given two ordered arrays of integers, write a program to merge the two-arrays to get an ordered array.
- 20. WAP to display Fibonacci series (i) using recursion, (ii) using iteration
- 21. WAP to calculate Factorial of a number (i) using recursion, (ii) using iteration
- 22. WAP to calculate GCD of two numbers (i) with recursion (ii) without recursion.
- 23. Create a Matrix class using templates. Write a menu-driven program to perform following Matrix Operations (2-D array implementation): a) Sum b) Difference c) Product d) Transpose 22. Create the Person class. Create some objects of this class (by taking information from the user). Inherit the class Person to create two classes Teacher and Student class. Maintain the respective information in the classes and create, display and delete objects of these two classes (Use Runtime Polymorphism).

24. Create a class Triangle. Include overloaded functions for calculating area. Overload assignment operator and equality operator.

- 25. Create a class Box containing length, breadth and height. Include following methods in it: a) Calculate surface Area b) Calculate Volume c) Increment, Overload ++ operator (both prefix & postfix) d) Decrement, Overload -operator (both prefix & postfix) e) Overload operator == (to check equality of two boxes), as a friend function f) Overload Assignment operator g) Check if it is a Cube or cuboid
- 26. Create a structure Student containing fields for Roll No., Name, Class, Year and Total Marks. Create 10 students and store them in a file.
- 27. Write a program to retrieve the student information from the file created in the previous question and print it in the following format: Roll No. Name
- 28. Copy the contents of one text file to another file, after removing all whitespaces.
- 29. Write a program for exception handling.
- 30. Write a program to insert data into file and to display it.

Note: Concerned teacher can add additional experiment as per requirement.

Keywords

Array, Function, Structure, union, matrix, constructor, destructor, inheritance.

Name and Signature of Convener & Members of CBoS; OzeH.S. Hotel Cheurman (DokiB. Dubey PART-C: Learning Resources Text Books, Reference Books and Others Text Books Recommended:

- Peter Juliff, Program Design, PHI Publications.
- Yashwant Kanetkar, Let us C: BPB Publications.
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw Hill

Reference Books Recommended:

- Y. Kanetkar, Let us C++, B.P.B Publication.
- E. Balaguruswamy, Programming in C++, Tata McGraw Hill.

- R. Kumar, Object Oriented Programming with C++, Prakhar Publication(Hindi)
- Dhupiya, Lakhyani, C++ Programming Alka Publications, Ajmer (Paperback, Dhupiya, Lakhyani)(Hindi)

Online Resources:

- Introduction to C and C++ from SWAYAM/NPTEL https://onlinecourses.nptel.ac.in/noc22_cs103/preview https://www.youtube.com/watch?v=KG4hjVDw-p8&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=2
- Constant and Inline Function through NPTEL: https://www.youtube.com/watch?v=pX6LufLso2M&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=10
- Pointer and Reference NPTEL https://www.youtube.com/watch?v=GtsBZ5e1-cE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=12
- Function Overloading NPTEL https://www.youtube.com/watch?v=uJGmGAShHeU&list=PLmp4ylk-B4KrM9uOEdvPlVFUkU3jNc6D2&index=13
- Operator Overloading NPTEL https://www.youtube.com/watch?v=0jpOwe4d-FE&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=17
- Dynamic Memory Management NPTEL https://www.youtube.com/watch?v=lkFK2X6qIc0&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=18
- Class and Object NPTEL https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24
- Access Specifiers NPTEL https://www.youtube.com/watch?v=6ki_W7cXdM0&list=PLmp4ylk-B4KrM9uOEdvPlVFUkU3jNc6D2&index=22
- Constructor and Destructor NPTEL https://www.youtube.com/watch?v=wtuks_f3vP4&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2&index=24
- C++ different topics from W3School https://www.w3schools.com/CPP/default.asp
- C++ different topics from Javatpoint https://www.javatpoint.com/cpp-tutorial

		4.		
PART -D: Assess	ment and Eval	uation		
Suggested Continuous F	Evaluation Methods:			
Maximum Marks:	50	Marks		
Continuous Internal Ass	000000000000000000000000000000000000000	Marks		
End Semester Exam (ES		Marks	Part Cal	Last / Oniz
Continuous Internal	Internal Test / Quiz-(2		Better marks out of the	
Assessment (CIA):	Assignment/Seminar +A		+ obtained marks in As	
(By Course Teacher)	Total Marks -	15.	considered agains	Managed by
End Semester Exam	Laboratory / Field Sl	till Performan	ce: On spot Assessment o. work - 20 Marks	Course teacher
(ESE):	A. Performed the 1:	isk based on fac), WOLK - 20 Marks	as per lab.
(C. Viva-voce (based	on drinciple/ted	ology (written) – 10 Marks chnology) – 05 Marks	status
			Mag	u N
Name and Signature of C	onvener & Members o	CBOS.	Dri	siJain)
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Program: Bachelor in Computer Application Semester - II Session: 2021-202	PAR	RT- A: Intro	duction	URRICULUM			
2 Course Title 3 Course Type 4 Prerequisite (if, any) 5 Course Learning Outcomes (CLO) 6 Credit Value 7 Total Marks 6 Content of the Course Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours) Introduction and Basic Concepts: Introduction, Fundamentals of Algorithms, Data types: Primitive, Non-Primitive Absent Data Type (ADT), Classification of Data Structure: Linear and Nonlinear Data Structure. Array: Arrays and its types, Memory allocation and address calculations of Array, Sparse Array. Linked List: Types of Linked List and various double. Postfix expression evaluation using Stack, Postfix expression evaluation using Stack, Postfix expression evaluation suggested. Postfix poperations of Queue. Pictinition, Spanning Tree, Kruskal's and Prim's Algorithms, Depth first Traversal, Connectivity of Graphs, Graph Traversal - Breadth first Traversal, Depth first Traversal, Connectivity of Graphs, Weighted Graphs, Shortest Path Algorithms, Spanning Tree, Kruskal's and Prim's Algorithms. Spanning Tree, Kruskal's and Prim's Algorithms.	Prog	ram: Bachelor in Co	omputer Application	Semester – Il	Session: 202	4-2025	
Scourse Type DSC (Discipline Specific Course)	1 C	Course Code	CASC -06T				
At the end of this course, the students will be able to: Understand the fundamentals and applications of data structure. Understanding about data management in computer memory. Apply stack, Queue, Lists, Trees and Graphs for real world applications. Understanding about data management in computer memory. Apply stack, Queue, Lists, Trees and Graphs for real world application. Understand how various data structures can be used to implement through programming language. Credit Value 3 Credits Credit = 15 Hours - Learning & Observation Max Marks: 100 Min Passing Marks: 40 PART -B: Content of the Course Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours) Unit Topics (Course contents) Introduction and Basic Concepts: Introduction, Fundamentals of Algorithms, Data types: Primitive, Non-Primitive Absent Data Type (ADT), Classification of Data Structure: Linear and Nonlinear Data Structure. Array: Arrays and its types, Memory allocation and address calculations of Array, Sparse Array. Linked List: Types of Linked List and various Operations Like INSERT, DELETE, TRAVERSE. Introduction and Application of Stack and Queue. Stack: Definition, Operations PUSH, POP, Implementations using Array and Linked list, Applications of Stack: Infix, Prefix, Postfix representation and conversion using Stack, Postfix expression evaluation using Stack, Recursion using Stack. Queue: Definition, Types of Queues: Priority Queue, Circular queue, Double Ended Queue, operations of Queue Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal, Binary Search Trees, Implementations, AVL Trees. Graph: Definition of Graphs and their types, Adjacency and Incident (matrix & linked list) Representation of graphs, Graph Traversal – Breadth first Traversal, Depth first Traversal, Connectivity of Graphs; Weighted Graphs, Shortest Path Algorithm, Spanning Tree, Minimum Spanning Tree, Kruskal's and Prim's Algorithms.	2 C	Course Title	Data Structure	ta Structure			
At the end of this course, the students will be able to: Understand the fundamentals and applications of data structure. Understanding about data management in computer memory. Apply stack, Queue, Lists, Trees and Graphs for real world application. Understand how various data structures can be used to implement through programming language. Credit Value 3 Credits Credits Total Marks Max. Marks: 100 Min Passing Marks: Max. Marks: Total No. of Teaching—Learning Periods (01 Hr. per period) - 45 Periods (45 Hours) Introduction and Basic Concepts: Introduction, Fundamentals of Algorithms, Data types: Primitive, Non-Primitive Absent Data Type (ADT), Classification of Data Structure: Linear and Nonlinear Data Structure. Array: Arrays and its types, Memory allocation and address calculations of Array, Sparse Array. Linked List: Types of Linked List and various Operations Like INSERT, DELETE, TRAVERSE. Introduction and Application of Stack and Queue. II Stack: Definition, Operations PUSH, POP, Implementations using Array and Linked list, Applications of Stack: Infix, Prefix, Postfix representation and conversion using Stack, Postfix expression evaluation using Stack, Recursion using Stack. Queue: Definition, Types of Queues: Priority Queue, Circular queue, Double Ended Queue, operations of Queue Insertions of Queue. III Tree: Definition of Trees and their types, Binary trees, Properties of Binary trees and operations Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal, Binary Search Trees, Implementations, AVL Trees. Graph: Definition of Graph and their types, Adjacency and Incident (matrix & linked list) Representation of graphs, Graph Traversal – Breadth first Traversal, Depth first Traversal, Connectivity of Graphs; Weighted Graphs, Shortest Path Algorithm, Spanning Tree, Minimum Spanning Tree, Kruskal's and Prim's Algorithms.	3 C	Course Type	DSC (Discipline Specific				
At the end of this course, the students will be able to: Understand the fundamentals and applications of data structure. Utilize various algorithms for real world problem solving. Understanding about data management in computer memory. Apply stack, Queue, Lists, Trees and Graphs for real world application. Understand how various data structures can be used to implement through programming language. Total Marks Max. Marks: 100 Min Passing Marks: 40 WART -B: Content of the Course Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours) Unit Topics (Course contents) Introduction and Basic Concepts: Introduction, Fundamentals of Algorithms, Data types: Primitive, Non-Primitive Absent Data Type (ADT), Classification of Data Structure: Linear and Nonlinear Data Structure. Array: Arrays and its types, Memory allocation and address calculations of Array, Sparse Array. Linked List: Types of Linked List and various Operations Like INSERT, DELETE, TRAVERSE. Introduction and Application of Stack and Queue. II Stack: Definition, Operations PUSH, POP, Implementations using Array and Linked list, Applications of Stack: Infix, Prefix, Postfix representation and conversion using Stack, Postfix expression evaluation using Stack, Recursion using Stack. Queue: Definition, Types of Queues: Priority Queue, Circular queue, Double Ended Queue, operations of Queue INSERT, DELETE, TRAVERSE, Implementation Queue using Array and Linked list, Applications of Queue. Tree: Definition of Trees and their types, Binary trees, Properties of Binary trees and operations Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal, Binary Search Trees, Implementations, AVL Trees. Graph: Definition of Graph and their types, Adjacency and Incident (matrix & linked list) Representation of graphs, Graph Traversal – Breadth first Traversal, Depth first Traversal, Connectivity of Graphs; Weighted Graphs, Shortest Path Algorithms.			As per program	<u> </u>			
Total Marks Max. Marks: 100 Min Passing Marks: 40 PART -B: Content of the Course Total No. of Teaching-Learning Periods (01 Hr. per period) - 45 Periods (45 Hours) Unit Topics (Course contents) Introduction and Basic Concepts: Introduction, Fundamentals of Algorithms, Data types: Primitive, Non-Primitive Absent Data Type (ADT), Classification of Data Structure: Linear and Nonlinear Data Structure. Array: Arrays and its types, Memory allocation and address calculations of Array, Sparse Array. Linked List: Types of Linked List and various Operations Like INSERT, DELETE, TRAVERSE. Introduction and Application of Stack and Queue. II Stack: Definition, Operations PUSH, POP, Implementations using Array and Linked list, Applications of Stack: Infix, Prefix, Postfix representation and conversion using Stack, Postfix expression evaluation using Stack, Recursion using Stack. Queue: Definition, Types of Queues: Priority Queue, Circular queue, Double Ended Queue, operations of Queue INSERT, DELETE, TRAVERSE, Implementation Queue using Array and Linked list, Applications of Queue. Tree: Definition of Trees and their types, Binary trees, Properties of Binary trees and operations Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal, Binary Search Trees, Implementations, AVL Trees. Graph: Definition of Graph and their types, Adjacency and Incident (matrix & linked list) Representation of graphs, Graph Traversal – Breadth first Traversal, Depth first Traversal, Connectivity of Graphs; Weighted Graphs, Shortest Path Algorithm, Spanning Tree, Minimum Spanning Tree, Kruskal's and Prim's Algorithms.	At the end of this course, the students will be able to: Understand the fundamentals and applications of data structure. Utilize various algorithms for real world problem solving. Understanding about data management in computer memory. Apply stack, Queue, Lists, Trees and Graphs for real world application. Understand how various data structures can be used to implement through						
Total Marks	6 C	redit Value		Tanana and a same a sa	ng & Observation		
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IV Sorting Methods: Types of Sorting Selection Sort, Insertion Sort, Bubble Sort, Quick Sort,	Tree: Definition of Trees and their types, Binary trees, Properties of Binary trees and operations Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal, Binary Search Trees, Implementations, AVL Trees. Graph: Definition of Graph and their types, Adjacency and Incident (matrix & linked list) Representation of graphs, Graph Traversal – Breadth first Traversal, Depth first Traversal, Connectivity of Graphs; Weighted Graphs, Shortest Path Algorithm, Spanning Tree,					11	
Merge Sort, Radix Sort. Searching: Linear search, Binary search.	IV	_			le Sort, Quick Sort,	11	
eywords Data, ADT, Array, Linked List, Stack, Queue, Tree, Graph, Searching, Sorting. Some and Signature of Convener & Members of CBoS:					orting.		

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PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Michael T. Goodrich, Data Structures and Algorithms in C++, Wiley
- Horowitz and Sahani, Fundamentals of Data Structures, Computer Science Press

Reference Books Recommended:

- Alfred V. Aho, Data structures and Algorithms, Jhon E. Hopcroft and J.E. Ullman.
- Jean Paul Trembley and Paul Sorenson, An Introduction to Data Structures with Applications, TMH, International Student Edition
- R. Kruse, Leung &Tondo, Data Structures and Program Design in C, PHI publication, 2nd Edition

Online Resources:

- NPTEL YouTube Channel: Data Structure Complete course
- https://youtube.com/playlist?list=PLc2MoXNv7E4mtsPlnn9BnTOENXsGyoDgR&si=aAYaVZvWfeuhFEO
- NPTEL YouTube Channel: Introduction to Data Structure
- https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F&index=1
- NPTEL YouTube Channel: Stacks
- NPTEL YouTube Channel: Queues and linked list
- https://www.youtube.com/watch?v=PGWZUgzDMYI&list=PLBF3763AF2E1C572F&index=3
- NPTEL YouTube Channel: Trees
- https://www.youtube.com/watch?v=tORLeHHtazM&list=PLBF3763AF2E1C572F&index=6
- NPTEL YouTube Channel: Graphs
- https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=24
- W3schools Data Structure Reference: DSA Tutorial (w3schools.com)

PART -D: Assess	sment and Evaluat	ion		
Suggested Continuous	Evaluation Methods:			
Maximum Marks:	100 Mar	ks		
Continuous Internal As	ssessment (CIA): 30 Mar	KS		
End Semester Exam (E				
Continuous Internal	Internal Test / Quiz-(2): 20	& 20		out of the two Test / Quiz +
Assessment (CIA):	Assignment / Seminar -	10		arks in Assignment shall be
(By Course Teacher)	Total Marks -	30	consid	ered against 30 Marks
End Semester	Two section – A & B			* 4
Exam (ESE):	Section A: Q1. Objective – 10	x1 = 10	Mark; Q2 . Short	answer type- $5x4 = 20$ Marks
Extens (ESE).	Section B: Descriptive answer	type qts	.,lout of 2 from	each unit-4x10=40 Marks
Name And Signature of C	Convener & Members of CBo	S:\	0	Qual

Chairman (Dr.k.B. Duhey) Do Sweet Thaker) (Sushil kumar Jaha)

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PROPERTY SERVICES	ART			luction		T		
			chelor in (loma / De	Computer A gree)	pplication	Semester - II	Session: 2024-2	2025
1	Cour	se Cod	e	CASC-06P				
2	Cour	se Title	9	Lab 4: Dat	a Structure	Using C++		
3	Cour	se Typ	e	Practical				
4								
At the end of this course, the students will be able to: • Understand how the concept of data structure can be implement programmatically. • Implement the fundamentals data structure through C and C++ • Understand the functioning of Array and linked list programmatically. • Understand the applications of array, linked list stack, queue, tree and programmatic. • Write programs for various data structures for real world application.						y. nd graph		
6	Cred	lit Val	ue	1 Credits	1		or Field Learning/Train	
7	Tota	l Marl	ζS	Max. Mai	rks: 5	0	Min Passing Marks:	20
PA	RT -	B:	Conte	nt of the	Course			
		THE REPLY OF STREET	Total No.	of learning-	Training/pe	erformance Period	ls: 30 Periods (30 Hours)	
M	odule				Topics (Course content	s)	No. of Period
	nining/ eriment	2. 3. 4. 5. 6. 7. 8.	Write a pr Write a pr linked list Write a p singly linl Write a p circular do Write a p should be Write a p should be Write a p write a p write a p	rogram to per rogram to per rogram to per ced list. rogram to per ced list. rogram to per created using program to per created linker rogram to per created linker rogram to per ced linker rogram to per ced linker rogram to per ced linker rogram to per linker ro	form multiple form insertion erform insert erform insert list. erform push g array. erform push ed list. culate factor erform inser- mented by userform inser-	ion and deletion o ion and deletion o and pop operation and pop operation ial of given numbertion and deletion sing a linked list.	rices. es from the end in singly f nodes from the end in f nodes from the end in as in stack, where stack in in stack, where stack	30

traversing using priority queue.

- 17. Write a program to implement the concept of priority-based element traversing using priority queue.
- 18. Write a program to create binary search tree using the concept of linked list and array, suppose data set will be given at the run time.
- 19. Write a program to create a binary tree with any data set and traverse the data items in pre-order, in-order and post-order manner using recursion.
- 20. Write a program to perform deletion of any data item from the binary search
- 21. Write a program to find the height of any tree.
- 22. Write a program to create any given undirected graph using the adjacency matrix, and print each node/element with list of its adjacent elements.
- 23. Write a program to find the height of any given tree.
- 24. Write a program to traverse the element of given graph according BFS and DFS.
- 25. Write a program to find the minimum spanning tree of any given graph.
- 26. Write a program to search any run time given element from the array of 10 elements in the array are unsorted.
- 27. Write a program to demonstrate the binary search.
- 28. Write a program to find the smallest and largest element in any array.
- 29. Write a program to arrange the data items of any array in ascending order.
- 30. Write a program to arrange the data items of any array in descending order using quick sort.

Note: Concerned teacher can add additional practical exercises as per requirement.

Array, Linked List, Stack, Queue, traversing, Tree, Graph, Searching, Sorting, Hashing. Name and Signature of Convener & Members of CBoS:

PART-C: Learning Resources

Text Books, Reference Books and Others

Text Books Recommended:

- Michael T. Goodrich, Data Structures and Algorithms in C++, Wiley
- Horowitz and Sahani, Fundamentals of Data Structures, Computer Science Press

Reference Books Recommended:

- Alfred V. Aho, Data structures and Algorithms, Jhon E. Hopcroft and J.E. Ullman.
- Jean Paul Trembley and Paul Sorenson, An Introduction to Data Structures with Applications, TMH, International Student Edition
- R. Kruse, Leung &Tondo, Data Structures and Program Design in C, PHI publication, 2nd Edition

Online Resources:

- NPTEL YouTube Channel: Data Structure Complete course https://youtube.com/playlist?list=PLc2MoXNv7E4mtsPlnn9BnTOENXsGyoDgR&si=aAYaVZvWfeuhFEO
- NPTEL YouTube Channel: Introduction to Data Structure https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F&index=1
- NPTEL YouTube Channel: Stacks https://www.youtube.com/watch?v=g1USSZVWDsY&list=PLBF3763AF2E1C572F&index=2

- NPTEL YouTube Channel: Queues and linked list https://www.youtube.com/watch?v=PGWZUgzDMYI&list=PLBF3763AF2E1C572F&index=3
- NPTEL YouTube Channel: Trees https://www.youtube.com/watch?v=tORLeHHtazM&list=PLBF3763AF2E1C572F&index=6
- NPTEL YouTube Channel: Graphs https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=24
- W3schools Data Structure Reference: DSA Tutorial (w3schools.com)

PART -D: Asses	sment and Evaluation	
Suggested Continuous	Evaluation Methods:	
Maximum Marks:	50 Marks	
Continuous Internal A	ssessment (CIA): 15 Marks	
End Semester Exam (F	CSE): 35 Marks	NI T 1/0:
Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar +Attendance - 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performan A. Performed the Task based on lal B. Spotting based on tools & technology C. Viva-voce (based on principle/te	b. work - 20 Marks Course teacher as plogy (written) - 10 Marks per lab. status
On Hostora tro	Convener & Members of CBoS:	ANDEETA KUTUR COS. A. S. Suest