KIT - Kalaignarkarunanidhi Institute of Technology

An Autonomous Institution

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' GRADE & NBA (AERO, CSE, ECE, EEE, MECH & MBA)

An ISO 9001 : 2015 Certified Institution, Coimbatore - 641 402.

Regulations, Curriculum & Syllabus - 2023

(For Students admitted from the Academic Year 2023-24 and onwards)

BACHELOR OF TECHNOLOGY DEGREE

IN

COMPUTER SCIENCE AND BUSINESS SYSTEMS

Department of Computer Science and Business Systems

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Department of Computer Science and Business Systems

	Conceptual Frame work (For Students admitted from the Academic Year 2023-24 and onwards)	

Semester	Level of Course	Hours / Week	No of Courses	Range of Credits / Courses	Total Credits
PART - I					
A - Foundation Courses					
I to VII	Humanities and Social Sciences (HS)	1-5	7	1-4	14
I to IV	Basic Sciences (BS)	4-5	7	4	26
I to II	Engineering Sciences (ES)	3-5	7	2-4	14
B - Professional Core Courses					
III to VII	Professional Core (PC)	3 – 4	24	2 - 4	71
C - Elective Courses					
V to VIII	Professional Elective (PE)	3	6	3	18
V to VIII	Open Elective (OE)	3	4	3	12
D - Project Work					
VI, VII & VIII	Project Work (PW)	4 -16	3	2 - 8	12
E - Mandatory Courses Prescribed by AICTE/UGC (Not to be Included for CGPA)					
V & VI	**Mandatory Course (MC)**	3	2	NC	NC
Total Credit					**167**
PART - II					
F- Career Enhancement Courses (CEC)					
II	Soft Skills	2	1	-	NC
IV	Professional Certificate course	-	1	1	1
V	Summer Internship	-	1	1	1
Total Credit					**02**
Total Credit to be Earned					**169**

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Curriculum and Scheme of Assessment	
	(For Students admitted from the Academic Year 2023-24 and onwards)	

Semester - I

Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
B23IPT101	Induction Programme	HS	-	-	-	-	0	-	-	-
Theory / Theory with Practical										
B23ENT102	Business Communication & Value Science – I	HS	3	3	0	0	3	40	60	100
B23HST101	தமிழர்மரபு / Heritage of Tamils	HS	1	1	0	0	1	40	60	100
B23MAT101	Matrices and Differential Calculus	BS	4	3	1	0	4	40	60	100
B23MET101	Engineering Graphics	ES	4	2	2	0	4	40	60	100
B23PHI101	Engineering Physics	BS	5	3	0	2	4	50	50	100
B23CBI101	Fundamentals of Computer Programming I	ES	5	3	0	2	4	50	50	100
Practical										
B23MEP101	Engineering Practices Laboratory	ES	4	0	0	4	2	60	40	100
Total credits to be earned							**22**			

Semester - II

Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
Theory / Theory with Practical										
B23ENT202	Business Communication &Value Science – II	HS	3	3	0	0	3	40	60	100
B23HST201	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HS	1	1	0	0	1	40	60	100
B23MAT201	Integral Calculus and Complex Analysis	BS	4	3	1	0	4	40	60	100
B23CHI101	Engineering Chemistry	BS	5	3	0	2	4	50	50	100
B23CBI202	Fundamentals of Computer Programming II	ES	5	3	0	2	4	50	50	100
B23CBI201	Programming for DataStructures	PC	5	3	0	2	4	50	50	100
B23CET201	Soft Skills	CEC	2	2	0	0	NC	100	-	100
Total credits to be earned							**20**			

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semester - III

Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
Theory / Theory with Practical										
B23MAT302	Discrete Mathematics	BS	4	3	1	0	**4**	40	60	100
B23CBT301	Fundamentals of Management	PC	3	3	0	0	**3**	40	60	100
B23CBT302	Object Oriented Programming with Java	PC	3	3	0	0	**3**	40	60	100
B23CBT303	Design Thinking	PC	3	3	0	0	**3**	40	60	100
B23CBT304	Web Application Development	PC	3	3	0	0	**3**	40	60	100
B23CBT305	Operating System Internals	PC	3	3	0	0	**3**	40	60	100
Practical										
B23CBP302	Object Oriented Programming with Java Laboratory	PC	4	0	0	4	**2**	60	40	100
B23CBP304	Web Application Development Laboratory	PC	4	0	0	4	**2**	60	40	100
Total credits to be earned							**23**			

Semester - IV

Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
Theory / Theory with Practical										
B23MAT305	Linear Algebra	BS	3	3	0	0	**3**	40	60	100
B23CBT401	Agile software engineering	PC	3	3	0	0	**3**	40	60	100
B23CBT402	Fundamentals of Economics	PC	3	3	0	0	**3**	40	60	100
B23CBT403	Computer Networks Essentials	PC	3	3	0	0	**3**	40	60	100
B23CST401	Database Management Systems	PC	3	3	0	0	**3**	40	60	100
B23CBT405	Advanced Data Structures and Algorithms	PC	3	3	0	0	**3**	40	60	100
B23CEP401	Professional Certificate Course	CEC	-	-	-	-	**1**	-	-	-
Practical										
B23ENP401	Business Communication & Value Science – III	HS	4	0	0	4	**2**	60	40	100
B23CSP401	Database Management Systems Laboratory	PC	4	0	0	4	**2**	60	40	100
B23CBP402	Advanced Data Structures and Algorithms Laboratory	PC	4	0	0	4	**2**	60	40	100
Total credits to be earned							**25**			

Summer Internship – Three Weeks (Review will be conducted in first week of Semester V and its credit will be included in Semester V) / NPTEL / Product Development / Mini Project / Model Development

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Semester - V											
Course Code	**Course Name**	**CT**	**Instructional Hours**					**Assessment**			
			CP	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**Total**	
Theory / Theory with Practical											
B23MAT502	Business Statistics	BS	3	3	0	0	**3**	40	60	100	
B23CBT502	Software Test Automation	PC	3	3	0	0	**3**	40	60	100	
B23CBT503	Full Stack Development	PC	3	3	0	0	**3**	40	60	100	
B23CBT603	Financial and Cost Accounting	PC	3	3	0	0	**3**	40	60	100	
	Professional Elective I	PE	3	3	0	0	**3**	40	60	100	
	Open Elective-I	OE	3	3	0	0	**3**	40	60	100	
B23MCT501	Environmental Sciences	MC	3	3	0	0	**NC**	100	-	100	
Practical											
B23CBP502	Software Test Automation Laboratory	PC	4	0	0	4	**2**	60	40	100	
B23CBP503	Full Stack Development Laboratory	PC	4	0	0	4	**2**	60	40	100	
B23CEP501	Summer Internship	CEC	-	-	-	-	**1**	100	-	100	
Total credits to be earned							**23**				

Semester - VI											
Course Code	**Course Name**	**CT**	**Instructional Hours**					**Assessment**			
			CP	**L**	**T**	**P**	**C**	**CIA**	**ESE**	**Total**	
Theory / Theory with Practical											
B23CBT601	Operations Research	PC	4	3	1	0	**4**	40	60	100	
B23CBT602	DevOps -Cloud Computing	PC	3	3	0	0	**3**	40	60	100	
	Professional Elective–II	PE	3	3	0	0	**3**	40	60	100	
	Professional Elective-III	PE	3	3	0	0	**3**	40	60	100	
	Open Elective-II	OE	3	3	0	0	**3**	40	60	100	
B23MCT502	Indian Constitution	MC	3	3	0	0	**NC**	100	-	100	
Practical											
B23ENP601	Business Communication & Value Science – IV	HS	4	0	0	4	**2**	60	40	100	
B23CBP603	Mini Project	PW	4	0	0	4	**2**	40	60	100	
B23CBP602	DevOps -Cloud Computing laboratory	PC	4	0	0	4	**2**	60	40	100	
Total credits to be earned							**22**				

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Semester - VII										
Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
Theory / Theory with Practical										
B23HST701	Universal Human values	HS	3	3	0	0	**2**	40	60	100
B23CBI701	IT Project Management	PC	5	3	0	2	**4**	50	50	100
B23CBT702	Business Strategywith DSS	PC	3	3	0	0	**3**	40	60	100
	Professional Elective-IV	PE	3	3	0	0	**3**	40	60	100
	Professional Elective-V	PE	3	3	0	0	**3**	40	60	100
	Open Elective-III	OE	3	3	0	0	**3**	40	60	100
Practical										
B23CBP701	Project work Phase-I	PW	4	0	0	4	**2**	40	60	100
Total credits to be earned							**20**			

Semester - VIII										
Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
Theory / Theory with Practical										
	Professional Elective - VI	PE	3	3	0	0	**3**	40	60	100
	Open Elective - IV	OE	3	3	0	0	**3**	40	60	100
Practical										
B23CBP801	Project Work Phase - II	PW	16	0	0	16	**8**	40	60	100
Total credits to be earned							**14**			

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HUMANITIES AND SOCIAL SCIENCES (HS)

Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
B23IPT101	Induction Programme	HS	-	-	-	-	0	-	-	-
B23ENT102	Business Communication &Value Science – I	HS	3	3	0	0	3	40	60	100
B23HST101	தமிழர்மரபு / Heritage of Tamils	HS	1	1	0	0	1	40	60	100
B23HST201	தமிழரும்தொழில்நுட்பமும்/ Tamils and Technology	HS	1	1	0	0	1	40	60	100
B23ENT202	Business Communication &Value Science – II	HS	3	3	0	0	3	40	60	100
B23ENP401	Business Communication &Value Science –III	HS	4	0	0	4	2	60	40	100
B23ENP601	Business Communication &Value Science –IV	HS	4	0	0	4	2	60	40	100
B23MGT701	Universal Human Values	HS	3	3	0	0	2	40	60	100

BASIC SCIENCES (BS)

Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
B23MAT101	Matrices and Differential Calculus	BS	4	3	1	0	4	40	60	100
B23PHI101	Engineering Physics	BS	5	3	0	2	4	50	50	100
B23MAT201	Integral Calculus and Complex Analysis	BS	4	3	1	0	4	40	60	100
B23CHI101	Engineering Chemistry	BS	5	3	0	2	4	50	50	100
B23MAT302	Discrete Mathematics	BS	4	3	1	0	4	40	60	100
B23MAT305	Linear Algebra	BS	3	3	0	0	3	40	60	100
B23MAT502	Business Statistics	BS	3	0	0	0	3	40	60	100

ENGINEERING SCIENCES (ES)

Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
B23CBI101	Fundamentals of Computer Programming I	ES	5	3	0	2	4	50	50	100
B23MET101	Engineering Graphics	ES	4	2	2	0	4	40	60	100
B23MEP101	Engineering Practices Laboratory	ES	4	0	0	4	2	60	40	100
B23CBI202	Fundamentals of Computer Programming II	ES	5	3	0	2	4	50	50	100

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	PROFESSIONAL CORE (PC)									

Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
B23CBI201	Programming for Data Structures	PC	5	3	0	2	4	50	50	100
B23CBT301	Fundamentals of Management	PC	3	3	0	0	3	40	60	100
B23CBT302	Object Oriented Programming with Java	PC	3	3	0	0	3	60	40	100
B23CBT303	Design Thinking	PC	4	3	1	0	3	40	60	100
B23CBT304	Web Application Development	PC	3	3	0	0	3	40	60	100
B23CBT305	Operating Systems Internals	PC	3	3	0	0	3	40	60	100
B23CBP302	Object Oriented Programming with Java Laboratory	PC	4	0	0	4	2	60	40	100
B23CBP304	Web Application Development Laboratory	PC	4	0	0	4	2	60	40	100
B23CBT401	Agile Software Engineering	PC	3	3	0	0	3	40	60	100
B23CBT402	Fundamentals of Economics	PC	3	3	0	0	3	40	60	100
B23CBT403	Essentials of Computer Networks	PC	3	3	0	0	3	40	60	100
B23CST401	Database Management Systems	PC	3	3	0	0	3	40	60	100
B23CBT405	Advanced Data Structures and Algorithms	PC	3	3	0	0	3	40	60	100
B23CBI201	Programming for Data Structures	PC	5	3	0	2	2	60	40	100
B23CBP402	Advanced Data Structures and Algorithms Laboratory	PC	4	0	0	4	2	60	40	100
B23CSP401	Database Management and Systems Laboratory	PC	4	0	0	4	3	40	60	100
B23CBT502	Software Test Automation	PC	3	3	0	0	3	40	60	100
B23CBT503	Full Stack Development	PC	3	3	0	0	2	40	60	100
B23CBP502	Software Test Automation Laboratory	PC	4	0	0	4	2	60	40	100
B23CBP503	Full Stack Development Laboratory	PC	4	0	0	4	4	40	60	100
B23CBT601	Operations Research	PC	4	3	1	0	3	40	60	100
B23CBT602	DevOps -Cloud Computing	PC	4	3	0	0	2	60	40	100
B23CBP602	DevOps -Cloud Computing laboratory	PC	4	0	0	4	3	40	60	100

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B23CBT603	Financial and Cost Accounting	PC	3	3	0	0	4	50	50	100
B23CBI701	IT Project Management	PC	5	3	0	2	3	40	60	100
B23CBT702	Business Strategy with DSS	PC	3	3	0	0	4	50	50	100

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PROJECT WORK (PW)										
Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
B23CBP603	Mini Project	PW	4	0	0	4	**2**	40	60	100
B23CBP702	Project work Phase-I	PW	6	0	0	6	**2**	40	60	100
B23CBP801	Project Work Phase-II	PW	16	0	0	16	**8**	40	60	100

MANDATORY COURSE (MC)										
Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
B23MCT501	Environmental Sciences	MC	3	3	0	0	**NC**	100	-	100
B23MCT601	Indian Constitution	MC	3	3	0	0	**NC**	100	-	100

CAREER ENHANCEMENT COURSE (CEC)										
Course Code	Course Name	CT	Instructional Hours					Assessment		
			CP	L	T	P	C	CIA	ESE	Total
B19CET201	Soft Skills	CEC	2	2	0	0	**NC**	100	-	100
B23CEP401	Professional Certificate Course	CEC	-	-	-	-	**1**	100	-	100
B23CEP501	Summer Internship	CEC	-	-	-	-	**1**	100	-	100

Approved by BoS Chairman

Semester - I

B.E / B.Tech	B23CBI101 – Fundamentals of Computer Programming I	L	T	P	C
		3	0	2	4

Course Objectives	
1.	To know the basics of computer and working of computer programming.
2.	To provide exposure to problem-solving through C programming.
3.	To develop C programming language with conditional statements and loops.
4.	To develop modular applications in C using functions.
5.	To develop applications involving direct memory access in C using pointers.

UNIT - I	INTRODUCTION	9

Basic Computing Concepts - Number Systems - Compilation and Execution Phase of a Program - Low Level vs High Level Programming Languages - Programming Paradigms / Styles of Programming - Operating System - Introduction to C Programming.

UNIT - II	INTRODUCTION TO C PROGRAMMING	9

Writing C Programs - Variables and Data Types - Operators in C programming - Blocks and Compound statements.

UNIT - III	CONDITIONAL STATEMENTS AND FUNCTIONS	9

Control Flow - Conditional Statements and Loops: Control Conditions - If Statement - Switch Statements – Loop Statements - Storage classes - Control Flow - Functions in C.

UNIT - IV	ARRAYS	9

Introduction to Arrays: Types of indexing in Arrays- Array Representation- Array Declarations - Application on Arrays - Input and Output : Standard Input and Output - Formatted Input - Command Line Input.

UNIT - V	POINTERS AND MEMORY ADDRESS	9

Pointers and Addresses - Physical and Virtual Memory - Addressing Variables - Dereferencing Pointers - Casting Pointers - Arrays and Pointers - The sizeof() Operator - Pointer Arithmetic – Strings: Strings as arrays - String Utility functions.

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Expt. No.	Description of the Experiments
1	Write a program to read an integer and display its square and cube.
2	Write a program to read the radius of a circle and calculate its area and circumference.
3	Write a program to read two integers and swap their values using a third variable.
4	Write a program to read three integers and find the maximum and minimum of them.
5	Write a program to check whether a given number is even or odd.
6	Write a program to find the sum of all natural numbers from 1 to n.
7	Write a program to print a pattern of asterisks in a right triangle shape.
8	Write a program to read an array of integer to find the sum and average of its elements.
9	Write a program to read a matrix and display its transpose.
10	Write a program to implement linear search in an array of integers.
	Total Instructional hours : (45+30) = 75

Course Outcomes : Students will be able to	
CO1	Demonstrate and explain the internal working of computer.
CO2	Demonstrate knowledge on C programming constructs.
CO3	Construct C programs using decision making and control statements.
CO4	Experiment with programs in C using an array.
CO5	Build programs in C using strings, pointers, functions.

Requirements for a Batch of 30 Students		
Sl. No.	Description of the Equipment	Quantity required (Nos.)
1.	HP Make, Core i5, 11th Generation, 16GB RAM PCs, Operating systems: Windows* 10 or later, macOS, and Linux. Turbo C/C++ 4.5	30

Approved by BoS Chairman

	Text Books
1.	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling
2.	Yashavant P. Kanetkar. "Let Us C", 16th Edition, BPB Publications, 2016.

	Reference Books
1.	Byron S Gottfried, "Programming with C", Schaum"s Outlines, Fourth Edition, Tata
2.	Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2016.
3.	Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First
4.	Dromey R.G., "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.

Approved by BoS Chairman

SEMESTER II

Approved by BoS Chairman

B.E / B.Tech	B23CBI201 - PROGRAMMING FOR DATA STRUCTURES	L	T	P	C
		3	0	2	4

Course Objectives	
1.	To understand the concepts of ADTs.
2.	To design and implement stacks, queues and linked lists.
3.	To understand the complex data structures such as trees.
4.	To understand various hashing Techniques.
5.	To understand sorting and searching algorithms.

UNIT - I	ARRAYS AND LISTS	9

Abstract Data Types (ADTs), List ADT, array-based implementation – linked list implementation — singly linked lists- circularly linked lists - doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT - II	STACKS AND QUEUES	9

Stack ADT - Operations - Applications: Evaluating arithmetic expressions, Conversion of Infix to postfix expression - Queue ADT - Types of Queue: Simple Queue, Circular Queue, Priority Queue, deQueue - Operations on each types of Queues (Insertion, Deletion, and Traversal) – applications of queues.

UNIT - III	TREES	9

Basic Tree Terminologies-Tree Traversals-Different types of Trees: Binary Tree, Expression tree, Threaded Binary Tree, Binary Search Tree: Basics – Insertion and Deletion, AVL Tree - Tree operations on each of the trees (Insertion, Deletion, and Searching) and their algorithms

UNIT - IV	HASHING TECHNIQUES	9

Hashing-Address calculation techniques-Common hashing functions- Collision resolution - Separate Chaining – Open Addressing: Linear probing, Quadratic, Double hashing – Rehashing – Extendible Hashing.

UNIT - V	SEARCHING, SORTING	9

Searching: Linear Search - Binary Search. Sorting: Bubble sort - Selection sort - Insertion sort - Quick Sort-Merge Sort -Heap Sort- shell sort-radix sort- comparison of sorting and searching methods.

9

Approved by BoS Chairman	

Expt. No.	Description of the Experiments
1	Implementation of Singly, Doubly and Circular Linked list.
2	Array implementation of Stack and Queue ADTs.
3	Linked list implementation of Stack and Queue ADTs.
4	Applications of Stack and Queue ADTs.
5	Implementation of Tree traversal algorithms.
6	Implementation of Binary Search Trees.
7	Implementation of AVL Trees.
8	Hashing – collision resolution techniques.
9	Implementation of searching algorithms.
10	Implementation of sorting algorithms.
	Total Instructional hours : (45+30) = 75

Course Outcomes : Students will be able to	
CO1	Build programs to implement linear data structures such as list
CO2	Apply the linear data structures such as stacks and queues to problem solutions
CO3	Apply the concept of tree data structure in real world scenarios
CO4	Analyze the various hashing algorithms
CO5	Analyze the various searching and sorting techniques

CO/PO & PSO		PO1 (K3)	PO2 (K4)	PO3 (K5)	PO4 (K5)	PO5 (K6)	PO6 (K3) (A3)	PO7 (K2) (A3)	PO8 (K3) (A3)	PO9 (A3)	PO10 (A3)	PO11 (K3) (A3)	PO12 (A3)	PSO1 (K4) (A3)	PSO 2 (K3) (A3)
CO1	K3	3	2	3	3	2	2	3	2	1	1	2	1	2	2
CO2	K3	3	2	3	3	2	2	3	3	2	1	2	2	2	2
CO3	K3	3	2	3	3	2	2	3	2	2	1	2	2	2	2
CO4	K4	3	2	3	3	2	2	3	2	2	1	2	2	2	2
CO5	K4	3	2	3	3	2	1	3	2	2	1	3	2	2	2
Weighted Average		3	2	3	3	2	2	3	2	2	1	2	2	2	2

3 – Strong   **2- Moderate**   **1- Weak**

Approved by BoS Chairman

Text Books
1.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2010

Reference Books
1.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures in C", Second
2.	Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press, 2011.
3.	M. Tenenbaum and Augestien, "Data Structures using C", Third Edition, Pearson Education 2007.
4.	J. P. Tremblay and P. G. Sorenson, "An Introduction to Data Structures with applications", Second Edition,
5.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education,1983

Requirements for a Batch of 30 Students		
SI. No.	**Description of the Equipment**	**Quantity required (Nos.)**
1.	HP Make, Core i5, 11th Generation, 16GB RAM PCs, Operating systems: Windows* 10 or later, macOS, and Linux. Turbo C/C++ 4.5	30

Approved by BoS Chairman

B.Tech CSBS	B23ENT202– BUSINESS COMMUNICATION & VALUE SCIENCE II	L	T	P	C
		3	0	0	3

Course Objectives	
1.	To develop effective writing, reading and group discussion skills.
2.	To Understand and use the tools of structured written communication
3.	To motivate students to understand basics of business communication.
4.	To help students to identify personality traits and evolve as a better team player.
5.	To introduce key concepts of values, diversity and business ethics.

UNIT – I LANGUAGE DEVELOPMENT	9

Listening to social issues, Speaking – Group Discussion on Social Cause, Writing Good And Bad Writing, Techniques- Editing, Punctuation Rules - Use of technical Words, Definitions, Compound Words, Jumbled Sentences. Creating an E Magazine: To Share Concepts and Ideas, – contributing article to the magazine

UNIT – II TECHNICAL WRITING	9

Listening to Group Discussion and meetings, Reading - Vision - Mission - Value Statements & Taglines, Reading user manuals of different products for specific information – Speaking: participating in discussions on organizing events, team discussions, Role Play, business letters, Inquiry letters, complaint letters, Sales Letters etc. One Word Substitutes, Sentences Expressing Purpose.

UNIT – III CREATION OF COMMUNICATION	9

Listening: Short Film on Diversity – Discussion on The Concept Empathy – Group Activity: Create a Story of a Person's Life Affected by Social Issues - Narrate The Story in First Person – Group Feedback – Write a Review in a Blog – Covering the Topics Discussed in Class – Verbal Analogies – Cause & Effect Expressions.

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UNIT – IV PERSONALITY TRAITS	9

Brain Storming - Class Discussion on Social Issue – Activity: Create – Design a Skit on Social Issue/NGO – Readout the Skit – Role Play – Individual Feedback -Team Work: Intro to Dr. Meredith Belbin and his Research on Team Work – Belbin's Personality Traits – Writing: Framing Questions – Report Writing.

UNIT – V DEVERSITY AND INCLUSION	9

Listening: "The Fish and I" by Babak Habibifar - Intro on Diversity & Inclusion - Different forms of Diversity in our society – Debate on the topic: diversity, morality and respect for individual – Group discussion: TCS Values – respect for individual and integrity – Writing: Job Application – resume preparation.

	Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Develop writing, reading and group discussion skills.
CO2	Utilize tools of structured written communication
CO3	Develop materials to create an identity for an organization dedicated to a social cause.
CO4	Identify individual personality types and role in a team.
CO5	Build the basic concepts of Morality and Diversity

Text Books	
1.	Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016.
2.	Richards, C. Jack. Interchange Students' Book – 2 New Delhi: CUP, 2015.

Reference Books	
1.	Sudharshana.N.P and Saveetha.C. English for Technical Communication. Cambridge University Press: New Delhi, 2016.
2.	Raman, Meenakshi and Sharma, Sangeetha "Technical Communication Principles and Practice" Oxford University Press: New Delhi, 2014.
3.	Butterfield, Jeff "Soft Skills for Everyone" Cengage Learning, New Delhi, 2015

Approved by BoS Chairman

B.E / B.Tech	B23CBI202 – Fundamentals of Computer Programming II	L	T	P	C
		3	0	2	4

Course Objectives	
1.	To know the basics of creating user defined datatypes.
2.	To provide exposure to advanced problem-solving on array in C.
3.	To develop C programming language for handling multidimensional data.
4.	To develop applications using C libraries.
5.	To develop applications involving reading and writing to and from files

UNIT - I	USER DEFINED DATA TYPES AND ADVANCED POINTERS	9

User Defined Data Types : Structure - Structure Pointers - Arrays of Structures – Unions - Dynamic Memory Allocations - Advanced Concepts on Pointers: Pointers to Pointers – String Arrays - Function Pointers - Array of Function Pointers.

UNIT - II	ADVANCED CONCEPTS ON ARRAYS	9

Multi-dimensional arrays - Dynamic memory allocation - malloc(), calloc(), and realloc() - Pointers and arrays - using pointers to manipulate arrays - Array of pointers: Creating arrays that hold pointers to other variables or arrays - Function pointers and arrays: Understanding function pointers and using them in combination with arrays - - Array libraries and data structures: Exploring array libraries and data structures, such as dynamic arrays and sparse arrays.

UNIT - III	MARTICES / 2 – DIMENSIONAL ARRAYS	9

Introduction: 2D Arrays - Advanced array operations: Using advanced array operations such as matrix multiplication, transposition, and rotation 3D Arrays - Diagonal Matrix - Symmetric Matrix - Tri-Diagonal and Tri-Band Matrix - Toeplitz Matrix.

UNIT - IV	C STANDARD LIBRARIES	9

<stdio.h> - Opening, Closing Files - File Operations- Temporary Files - Raw I/O - File Position - File errors,<ctype.h> - Testing Characters,<string.h> - Memory Functions,<stdlib.h> - Utility – Exiting - Searching and Sorting,<assert.h> - Diagnostics,<stdarg.h> - Variable Argument lists,<time.h>, <math.h> - Mathematical Functions.

UNIT - V	FILE HANDLING	9

File handling functions in C: fseek() vs rewind() - EOF, getc() and feof() - fopen() - fgets() and gets(). Basics of File Handling: fsetpos() - rename function in C - tmpfile() function - fgetc() and fputc() fseek() - ftell() - lseek() - remove function in C - Merge contents of two files into a third file - Print contents of file in C. - Project Phase.

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Expt. No.	Description of the Experiments
1.	Create a program to store and manage student records using structures. Each structure should contain the student's name, ID number, and grade point average. Implement functions to add, delete, and modify student records, as well as a search function that allows the user to search for a specific student by name or ID number.
2.	Develop a program that uses structures to manage a library of books. Each structure should contain the book's title, author, publication date, and ISBN number. Implement functions to add, delete, and modify book records, as well as a search function that allows the user to search for a specific book by title, author, or ISBN.
3.	Implement a program to manage a car dealership using structures. Each structure should contain the car's make, model, year, price, and availability status. Implement functions to add, delete, and modify car records, as well as a search function that allows the user to search for a specific car by make, model, year, or price range. You can also add features such as sorting by price, filtering by availability, and generating sales reports.
4.	Create a program to represent complex numbers using unions. A complex number consists of a real part and an imaginary part. Use a union to represent the complex number, with one member for the real part and one member for the imaginary part. Implement functions to add, subtract, multiply, and divide complex numbers, and to print the result in the form a + bi.
5.	Develop a program that uses unions to represent different data types, such as integers, floats, and characters. Each union should contain one member for each data type, and a tag to indicate which member is currently active. Implement functions to set and get the value of the active member, and to convert between data types. You can also add features such as input validation and error handling.
6.	Implement a program that creates and manipulates a 2D matrix. Use a 2D array to represent the matrix, and implement functions to add, subtract, multiply, and divide matrices, as well as to find the transpose and determinant of a matrix. You can also add features such as input validation and error handling.

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7.	Develop a program that uses a 2D matrix to simulate a game of Tic Tac Toe. Use a 2D array to represent the game board, and implement functions to display the board, validate moves, and check for a win or draw condition.
8.	Implement a program that reads data from a text file, performs some operation on the data, and then writes the result to another text file. For example write a program that reads a list of numbers from a file, sorts them in ascending order, and then writes the sorted list to another file.
9.	Develop a program that creates a binary file containing student records. Each record should contain the student's name, ID number, and grade point average. Implement functions to add, delete, and modify student records, as well as a search function that allows the user to search for a specific student by name or ID number. You can also add features such as sorting by GPA or generating statistical reports.
10.	Implement a program that reads a CSV file containing sales data, performs some analysis on the data, and then writes the results to a text file. For example, write a program that reads a list of sales transactions, calculates the total revenue, and then writes the total revenue with features such as filtering by date range, calculating other metrics such as average revenue per transaction, or generating graphs and charts.

Total Instructional hours : (45+30) = 75

Course Outcomes : Students will be able to	
CO1	Solve real world problems using user defined datatype in c programming.
CO2	Build solutions for solving advanced problems in arrays.
CO3	Construct C programs for handling multidimensional data.
CO4	Experiment with programs in c using various C libraries.
CO5	Build programs in C using FILE handling techniques.

Requirements for a Batch of 30 Students		
SI. No.	Description of the Equipment	Quantity required (Nos.)
1.	HP Make, Core i5, 11th Generation, 16GB RAM PCs, Operating systems: Windows* 10 or later, macOS, and Linux. Turbo C/C++ 4.5	30

Approved by BoS Chairman

Text Books
1.	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2016.
2.	Yashavant P. Kanetkar. "Let Us C", 16th Edition, BPB Publications, 2016.

Reference Books
1.	Byron S Gottfried, "Programming with C", Schaum"s Outlines, Fourth Edition, Tata McGraw-Hill,2018
2.	Reema Thareja, "Programming in C", Second Edition, Oxford University Press, 2016.
3.	Pradip Dey, Manas Ghosh, "Fundamentals of Computing and Programming in C", First Edition, Oxford University Press, 2009.
4.	Dromey R.G., "How to Solve it by Computer", Pearson Education, Fourth Reprint, 2007.

Approved by BoS Chairman

SEMESTER III

Approved by BoS Chairman

B.Tech -CSBS	B23CBP302-OBJECT ORIENTED PROGRAMMING WITH JAVA LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives	
1.	To teach fundamentals of object oriented programming in Java.
2.	To familiarize Java environment to create, debug and run simple Java programs
3.	To demonstrate java compiler and eclipse platform and learn how to use Net Beans IDE to create Java Application

Expt. No.	Description of the Experiments
1	Create a program to implement basic concepts of java control structures.
2	Create a program to implement classes and objects.
3	Create a program to implement constructors with array of objects.
4	Construct a program to demonstrate Method overloading.
5	Develop a program to implement different types of inheritances.
6	Develop a program to demonstrate the use of abstract, final, static blocks and
7	Build a program to demonstrate File streams and functions.
8	Design a program to perform string operations using string builder and string
9	Build a program to demonstrate exception handling techniques.
10	Develop a Front end window application using swing concepts.

	Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Solve Object oriented features using Java
CO2	Apply the concept of polymorphism and inheritance.
CO3	Build solutions with exception handling
CO4	Solve problems involving strings using String Builder and String Buffer.
CO5	Build network and window application using swings

Approved by BoS Chairman

Requirements for a Batch of 30 Students		
Sl. No.	**Description of the Equipment**	**Quantity required (Nos.)**
1.	HP Make, Core i5, 11th Generation, 16GB RAM PCs, Operating systems: Windows* 10 or later , jdk 1.5 or higher Java ide :Netbeans or Eclipse.	30

Approved by BoS Chairman

B.Tech - CSBS	B23CBP304- WEB APPLICATION DEVELOPMENT LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives	
1.	To understand the basics of Web and Web Architecture.
2.	To learn about front end design with HTML Tags
3.	To design a dynamic webpage using CSS.
4.	To manage client side activities on a web site using JavaScript.
5.	To create a simple javascript project.

Expt. No.	Description of the Experiments
1	Create a Web page using HTML5- Formatting Tags
2	Create a Web page using HTML5 – List & Tables
3	Design a Web page to capture data using HTML forms
4	Create a web page with CSS Styles –Internal and external style sheet
5	Create a web page with navigation menu and hover effect using HTML and CSS
6	Perform a client side validation using JavaScript user defined functions and DOM objects.
7	Design a Web page to illustrate the concept of event handling through JavaScript.
8	Develop a Web page and perform login validation and Navigation using JavaScript.
9	Design a Java script project for a game – Sudoku solver , Tic-Tac toe
10	Design a java script project – Numeric converter , Basic calculator
	Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Understand the working of web sites and web servers
CO2	Able to design web pages of a website with HTML
CO3	Design and create dynamic styles using CSS
CO4	Handle client side activities with JavaScript
CO5	Design database integrated websites with python

Approved by BoS Chairman

Requirements for a Batch of 30 Students		
Sl. No.	**Description of the Equipment**	**Quantity required (Nos.)**
1.	HP Make, Core i5, 11th Generation, 16GB RAM PCs, Operating systems: Windows* 10 or later, macOS, and Linux. Chrome or Mozilla Firefox browser	30

Approved by BoS Chairman

B.Tech-CSBS	B23CBT301 – FUNDAMENTALS OF MANAGEMENT	L	T	P	C
		3	0	0	3

Course Objectives	
1.	To help the students gain understanding of the functions and responsibilities of managers.
2.	To study about the forms of Business organization.
3.	To understand the tools and techniques used in strategic management.
4.	To learn how organizing and staffing are done in an organization.
5.	To study the process of effective directing and controlling in the organization

UNIT I	INTRODUCTION TO MANAGEMENT	9

Definition of Management – Manager Vs Entrepreneur – Types of managers -managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches — Current trends and issues in Management – Business Ethics.

UNIT II	BUSINESS ORGANIZATION	9

Organization - Forms of Organizations: Sole Proprietorship, Partnership – Company - Statutory Bodies and Corporations - HUF and Family Business, Cooperatives, Societies and Trusts; Limited Liability Partnership - Organization culture and Environment.

UNIT-III	INTRODUCTION TO STRATEGIC MANAGEMENT	9

Nature and purpose of planning – planning process – Types of planning – objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT-IV	ORGANISING & STAFFING	9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design – Staffing – Staffing process

UNIT-V	DIRECTING & CONTROLLING	9

Controlling – Process – Forms and types of controlling - budgetary and non-budgetary control techniques – Productivity problems and management – control and performance – reporting.

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Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the unique concepts of management and the responsibilities of a manager.
CO2	Identify the different forms of business organization.
CO3	Apply strategic management concepts in order to have a smooth working progress.
CO4	Build the ability to organize and staff effectively.
CO5	Inspect on directing and controlling functions.

Text Books	
1.	Stephen P. Robbins & Mary Coulter, "Management", 14th Edition, Prentice Hall (India) Pvt. Ltd.,2018.
2.	JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", 6th Edition, Pearson Education, 2004.

Reference Books	
1.	Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" 10th Edition, Pearson Education, 2017.
2.	Robert Kreitner & MamataMohapatra, "Management", Biztantra, 2008.
3.	Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill, 1998.
4.	Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999.

Approved by BoS Chairman

B.Tech- CSBS	B23CBT302- OBJECT ORIENTED PROGRAMMING WITH JAVA	L	T	P	C
		3	0	0	3

Course Objectives	
1.	To interpret the basics of Web and Web Architecture.
2.	To device a front end design with HTML Tags
3.	To design a dynamic webpage using CSS.
4.	To articulate client side activities on a web site using Javascript.
5.	To design a simple web application with database integration using Python.

UNIT - I	INTRODUCTION	9

Java features –Java Platform –Java Fundamentals – OOP in java – Datatypes - Input and output statements – Expressions- Operators and Control Structures – Classes and Objects, Constructors —– Array classes and methods.

UNIT - II	BASIC OOPS CONCEPTS	9

Polymorphism - Inheritance –Input and Output Streams, Files and Buffer – Multithreading – Exception Handling - Packages and Interfaces-Abstract methods and classes - Static methods, variables and Classes-Final and this keyword.

UNIT - III	APPLETS AND SWINGS	9

GUI Components - AWT package - Layouts –Containers - Event Package - Event Model –Painting –Garbage Collection – Java Applets – Applet Application – Swing Fundamentals - Swing Classes.

UNIT - IV	COLLECTION FRAMEWORKS	9

Collection: Iterators, Enumerators and interface collections - Collection objects- Set, Hash Set, Linked HashSet. - List, Linked List, Array List and Stack - . String: String Methods-String buffer – string Builder.

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UNIT - V	DATABASE	9

Introduction to JDBC ,ODBC.- Driver Manager , Connection , Statement , PreparedStatement.- Connecting with oracle / Mysql - MetaData- ResultSetMetaData, Database, MetaData. Case Study: Mini project – Swings / Applets as Front end , MySQL as Backend.

Course Outcomes : Students will be able to	
CO1	Describe basic knowledge of Object Orientation using classes, objects.
CO2	Apply object oriented programming features to achieve the concepts of reusability for solving given problems using inheritance
CO3	Develop GUI Components in Java using Applet and AWT that takes user response through peripheral devices
CO4	Construct the Collection framework mechanisms and apply the ArrayList methods and String classes and methods.
CO5	Develop the simple java applications using data base connectivity (JDBC)

Text Books	
1.	Herbert Schildt, " The Complete reference Java" , Seventh Edition, McGraw Hill Education,2017.

Reference Books	
1.	E Balaguruswamy, "Programming with Java", Sixth Edition , McGraw Hill Education,2019.
2.	John Dean, Raymond Dean, " Introduction to Programming with JAVA –A Problem Solving Approach", Tata Mc Graw Hill,2012. Tata Mc Graw Hill,2013
3.	Ralph Bravaco, Shai Simonson, "Java Programming : From the Ground Up", Tata McGraw Hill Edition,2012

Approved by BoS Chairman

B.Tech-CSBS	B23CBT303 – DESIGN THNIKING	L	T	P	C
		3	0	0	3

Course Objectives	
1.	To learn design thinking concepts and principles.
2.	To use design thinking methods in every stage of the problem.
3.	To learn the different phases of design thinking.
4.	To apply various methods in design thinking to different problems.
5.	To apply design thinking on real world case studies

UNIT I	INTRODUCTION	9

. Why Design? - Four Questions, Ten Tools - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project.

UNIT II	UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM	9

Search field determination - Problem clarification - Understanding of the problem – Problem analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs.

UNIT-III	IDEATION AND PROTOTYPING	9

. Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.

UNIT-IV	TESTING AND IMPLEMENTATION	9

Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking.

UNIT-V	FUTURE	9

Design Thinking meets the corporation – The New Social Contract – Design Activism – Designing tomorrow.

Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Planning of design thinking process.
CO2	Define key concepts of design thinking.
CO3	Prototyping of design thinking process.
CO4	Practice design thinking in all stages of problem solving.
CO5	Apply design thinking approach to real world problems

Text Books	
1.	Christian Mueller-Roterberg, Handbook of Design Thinking - Tips & Tools for how to design thinking, 2018
2.	Designing for Growth: a design thinking tool kit for managers By Jeanne Liedtka and Tim Ogilvie. 2018
3.	Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown. 2018

Reference Books	
1.	Johnny Schneider, "Understanding Design Thinking, Lean and Agile", O'Reilly Media, 2017.
2.	Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3.	Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011

Approved by BoS Chairman

B.Tech-CSBS	B23CBT304 -WEB APPLICATION DEVELOPMENT	L	T	P	C
		3	0	0	3

Course Objectives	
1.	To interpret the basics of Web and Web Architecture.
2.	To device a front end design with HTML Tags
3.	To design a dynamic webpage using CSS.
4.	To articulate client side activities on a web site using Javascript.
5.	To design a simple web application with database integration using Python

UNIT - I	INTRODUCTION TO WEB	8

Internet and World wide web , Protocols governing the Web - Web applications and Web Architecture - Issues in web development , Web servers , Web browsers - Internet addresses , TCP/IP suite , IP addresses and classes - MIME , HTTP & HTTPS - Web servers and clients , URL, URI,URN -HTTP message formate , Request and response message-Testing HTTP using telnet.

UNIT - II	HTML FOUNDATION	10

History of HTML and W3C , HTML basics - Elements , Attributes and Tags - Basic HTML tags ,HTML comments , paragraphs , Line breaks - Text styles, Font ,Bold ,Italic , Underline, Combining styles , Heading , Preformatted string, Strikethrough text - Lists and HTML symbols.- Table tags ,Border, Row, column header,- rowspan and column span, Cell spacing and Cell padding - Nested Tables.

UNIT - III	HTML FORMS & CSS	9

Form elements ,Text field, Text Area, Password field, Hidden field, Label - Checkbox, Radio Button, Selection List - Button , File Upload, Action Button, and Image Button- Frames and Layout , Iframes - Images , Meta tags , multimedia content - Cascading style sheets, , Embedded style sheet , Inline style sheet - External style sheet - Selectors and types of selectors , Pseudo classes and elements

Approved by BoS Chairman

UNIT - IV	CLIENT SIDE JAVA SCRIPTING	9

Introduction to java script - Inserting Javascript code , Adding comments - Browser Incompatibility - Placement of JavaScript Code - Javascript Keywords, Variables ,Literals, Operators - Control structure, if ,if else ,else if ladder , Switch case – Looping ,while ,for ,do while - Arrays ,Numeric array ,Associative array –JS Functions-Function Definitions, Function Parameters ,Function Invocation, Function Call

UNIT - V	JAVA SCRIPT OBJECTS & HTML DOM	9

JS Objects-Object Definitions, Object Properties & Methods, Object Display, Object Accessors, Object Constructors, Object Prototypes ,Object Iterables .Object Sets ,Object Map. JS HTML DOM - DOM Methods, DOM Document, DOM Elements ,DOM HTML, DOM Forms, DOM CSS, DOM Animations, DOM Events, DOM Event Listener, DOM Navigation, DOM Nodes, DOM Collections ,DOM Node Lists

	Total Instructional hours :45

Course Outcomes : Students will be able to	
CO1	Interpret the working of web sites and web servers
CO2	Design web pages of a website with HTML
CO3	Design and create dynamic styles using CSS
CO4	Articulate client side activities with Javascript
CO5	Develop and manage client side activities with DOM objects

Text Books	
1.	Uttam K.Roy ,"Web Technologies" by, Oxford University Press 2010, First edition, eight impression 2014

Reference Books	
1.	Web Technologies: HTML, JAVASCRIPT, PHP, JAVA, JSP, ASP.NET, XML and Ajax, Black Book: HTML, Javascript, PHP, Java, Jsp, XML and Ajax, Black Book Paperback – 1 January 2009 , by Kogent Learning Solutions Inc
2.	HTML & CSS: The Complete Reference, Fifth Edition Paperback – 1 July 2017 , by Thomas Powell, TataMcGrawHill.

Approved by BoS Chairman

B.Tech-CSBS	**B23CBT305- OPERATING SYSTEM INTERNALS**	L	T	P	C
		3	0	0	3

Course Objectives	
1.	To explain main components of OS and their working
2.	To familiarize the operations performed by OS as a resource Manager
3.	To impart various scheduling policies of OS
4.	To teach the different memory management techniques.
5.	To explain main components of OS and their working

UNIT - I	**OPERATING SYSTEMS OVERVIEW & STRUCTURE**	9

Introduction, operating system operations, process management, memory management, storage management, protection and security, distributed systems. Operating system services and systems calls, system programs, operating system structure, operating systems generations.

UNIT - II	**PROCESS MANAGEMENT**	9

Process concepts, process state, process control block, scheduling queues, process scheduling, multithreaded programming, threads in UNIX. Concurrency and synchronization**:** Process synchronization, critical section problem, Peterson's solution, synchronization hardware, semaphores, classic problems of synchronization, readers and writers problem, dining philosophers problem, monitors, synchronization examples(Solaris), atomic transactions. Comparison of UNIX and windows.

UNIT - III	**DEADLOCKS & MEMORY MANAGEMENT**	9

Deadlocks: System model, deadlock characterization, deadlock prevention, detection and Avoidance, recovery from deadlock banker's algorithm. **Memory management:** Swapping, contiguous memory allocation, paging, structure of the page Table, segmentation, virtual memory, demand paging, page-replacement algorithms, allocation of frames, thrashing, case study - UNIX.

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UNIT - IV	FILE SYSTEMS	9

File system**:** Concept of a file, access methods, directory structure, file system mounting, file Sharing, protection. File system implementation: file system structure, file system implementation, directory implementation, allocation methods, free-space management, efficiency and performance, comparison of UNIX and windows.
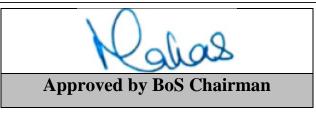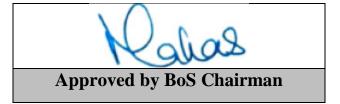
UNIT - V	I/O SYSTEM	9

I/O system **:** Mass storage structure - overview of mass storage structure, disk structure, disk attachment, disk scheduling algorithms, swap space management, stable storage implementation, and tertiary storage structure. **I/O:** Hardware, application I/O interface, kernel I/O subsystem, transforming I/O requests to hardware.

Course Outcomes : Students will be able to	
CO1	Outline various concepts and features of Operating systems
CO2	Compare various operating systems with respect to characteristics and features
CO3	Apply algorithm of CPU Scheduling, Memory Scheduling and disk scheduling.
CO4	Build solutions for effective file management on understanding the file system structure.
CO5	Develop solutions for managing I/O system and disk management.

Text Books	
1.	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne (2006), Operating System Principles, 7th edition, Wiley India Private Limited, New Delhi.

Reference Books	
1.	Stallings (2006), Operating Systems, Internals and Design Principles, 5th edition, Pearson Education, India.
2.	Andrew S. Tanenbaum (2007), Modern Operating Systems, 2nd edition, Prentice Hall of India,
3.	Deitel & Deitel (2008), Operating systems, 3rd edition, Pearson Education, India

Approved by BoS Chairman

SEMESTER - IV

B.E / B.Tech	B23CBP402-ADVANCED DATASTRUCTURE AND ALGORITHMS LABORATORY	L	T	P	C
		0	0	4	2

Course Objectives	
1.	To design and implement binary search trees & types of trees.
2.	To design and implement graph algorithms.
3.	To design and implement problems through backtracking algorithms.
4.	To develop solutions for real world problem using dynamic programming approach.
5.	To develop solution for sorting and searching using divide and conquer technique.

Expt. No.	Description of the Experiments
1	**Binary Tree Traversal**: Implement algorithms for inorder, preorder, and postorder traversal of a binary tree.
2	**Binary Tree Diameter**: Write a function to find the diameter of a binary tree (the longest path between any two nodes).
3	**Breadth-First Search (BFS)**: Implement BFS to traverse a graph and find the shortest path from a source node to all other nodes.
4	**Depth-First Search (DFS)**: Write a function to perform DFS on a graph and identify connected components.
5	**N-Queens Problem**: Implement a solution to place N queens on an NxN
6	**Sudoku Solver**: Write a program to solve a Sudoku puzzle using backtracking.
7	**Fibonacci Series**: Implement a function to find the nth Fibonacci number using dynamic programming to optimize recursive calls.
8	**Longest Common Subsequence (LCS)**: Write a function to find the length of the
9	Merge Sort: Implement the merge sort algorithm to sort an array of elements
10	**Binary Search**: Write a function to perform binary search on a sorted array to find a target element.
	Total Instructional hours : 45

Approved by BoS Chairman

Course Outcomes : Students will be able to	
CO1	Apply binary tree concepts for solving real world problems.
CO2	Build solutions for traversal problems using graph algorithms.
CO3	Develop solutions for applications through backtracking techniques
CO4	Model solutions using dynamic programming approach
CO5	Solve problems on searching and sorting using divide and conquer techniques.

Requirements for a Batch of 30 Students		
Sl. No.	Description of the Equipment	Quantity required (Nos.)
1.	HP Make, Core i5, 11th Generation, 16GB RAM PCs, Operating systems: Windows* 10 or later, macOS, and Linux. Turbo c/c++ or Higher.	30

Approved by BoS Chairman

B.Tech- CSBS	B23CBT401 – AGILE SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

Course Objectives	
1.	To understand the phases in a software project.
2.	To understand fundamental concepts of requirements engineering and Analysis Modelling.
3.	To understand the various software design methodologies.
4.	To learn various testing and maintenance measures.
5.	To learn various agile execution methodologies.

UNIT - I	SOFTWARE PROCESS AND AGILE DEVELOPMENT	9

Introduction to Software Engineering, Software Process, Introduction to Agility- Agile Software Engineering – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles

UNIT - II	REQUIREMENTS ANALYSIS AND AGILE PROCESS	9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management- Lean Production - SCRUM, Scrum roles : Product Owner, Scrum Master, Scrum Team, Adaptive Software Development.

UNIT - III	SOFTWARE DESIGN	9

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- Agile Design: Agile design practices, Agile design philosophies, Agile design methodology and process, Agile Documentations, Agile SDLC(Software Development Life Cycle).

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UNIT - IV	TEST DRIVEN DEVELOPMENT	9
	Software testing fundamentals-Internal and external views of Testing-white box testing -basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model.	
UNIT - V	TRANSITION AND APPLICATION OF AGILE	9
	Business Leadership Transition, Customer Relationship Transition, Project Management Transition, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline.	

Course Outcomes : Students will be able to	
CO1	Identify the key activities in managing a software project and compare different process
CO2	Concepts of requirements engineering and Analysis Modelling.
CO3	Apply systematic procedure for software design and deployment.
CO4	Compare the various testing and maintenance.
CO5	Explain the purpose and benefits of agile execution methodologies.

Text Books	
1.	Roger S. Pressman, "Software Engineering – A Practitioner"s Approach", 8th Edition, McGraw-Hill International Edition, 2019.
2.	David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Resultsǁ, Prentice Hall, 2003.

Reference Books	
1.	Ian Sommerville, "Software Engineering", 10th Edition, Pearson Education Asia, 2017.

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2.	Johnny Schneider, "Understanding Design Thinking, Lean and Agile", O'Reilly Media, 2017.
3.	Agile Software Development, Principles, Patterns and Practices by Robert C. Martin Publisher:

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B.TECH CSBS	B23CBT402 – FUNDAMENTALS OF ECONOMICS	L	T	P	C
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Course Objectives	
1.	To learn the principles of microeconomics relevant to managing an organization.
2.	To study about firms and their decisions about optimal production.
3.	To understand the market structure.
4.	To understand the fundamentals of macroeconomics.
5.	To familiarize the students about the money market.

UNIT - I	INTRODUCTION TO MICROECONOMICS	9

Economics – Definition - Types of Economic Analysis – Micro and Macro Economics, Demand - Types, Determinants; Supply - Determinants - Demand Curve - Supply Curve - Market Equilibrium -Elasticity of Demand and Supply.

UNIT - II	COST AND PRODUCTION FUNCTION	9

Production Function – Types, Return to scale and ISO-quants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs – Law of Production - Return to scale.

UNIT - III	MARKET STRUCTURE	9

Market Structure – Types of Market structure – Perfect Competition - Monopoly and Monopsony – Sources of monopoly power - Pricing with Market Power - Monopolistic Competition – Oligopoly

UNIT - IV	MACRO ECONOMICS	9

Macro vs. Micro Economics - Limitations of Macroeconomics - Stock and Flow variables - Equilibrium and Disequilibrium - Partial and General Equilibrium Statics – Comparative Statics and Dynamics - National Income Concepts – GDP, GNP, NDP and NNP at market price, factor cost, real and nominal - Disposable personal Income.

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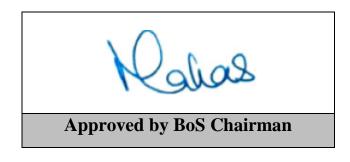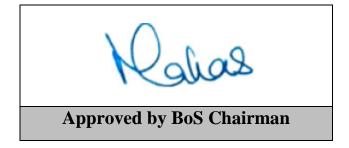| UNIT - V	**MONEY MARKET**	9
Demand for Money - Supply of Money - Integrating Money and Commodity Markets – Monetary Policy – Fiscal Policy - Central Bank and the Government; The Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment.		

Course Outcomes : Students will be able to	
CO1	Classify the basic principles and concepts of Microeconomics and use them to solve
CO2	Identify the fundamentals of national income and aggregate supply and aggregate demand consumption.
CO3	Explain the market structure for proper analysis of the market.
CO4	Analyse the basic macroeconomic principles.
CO5	Identify the concepts of money market.

Text Books	
1.	Robert S.Pindyck, and Daniel L. Rubinfeld, "Microeconomics", Pearson Publishing House 9th Edition.
2.	Dornbusch, Fischer and Startz, "Macroeconomics", McGraw-Hill, 12th Edition, 2018.
3.	D N Dwivedi, "Macroeconomics: Theory and Policy", McGraw-Hill, 5th Edition.

Reference Books	
1.	Hal R, Varian, "Intermediate Microeconomics: A Modern Approach", W W Norton & Co
2.	N. Gregory Mankiw, "Principles of Macroeconomics", Cengage Learning, Eight Edition,

Approved by BoS Chairman

3.	Paul Anthony Samuelson, William D. Nordhaus, "Economics", McGrawHill, 19th Edition, 2011

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B.TECH CSBS	B23CBT403 – COMPUTER NETWORK ESSENTIALS	L	T	P	C
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Course Objectives	
1.	To study the concepts of data communications and functions of different layers of ISO/OSI reference architecture
2.	To understand the error detection and correction methods and types of LAN
3.	To study the concepts of sub netting and routing mechanisms.
4.	To understand the different types of protocols and network components.
5.	To study and configure Switches and Routers.

UNIT - I	INTRODUCTION	9

Computer networks and distributed systems, Classifications of computer networks, Preliminaries of layered network structures. Data communication Components: Representation of data and its flow, Various Connection Topology, Protocols and Standards, OSI model, Transmission Media. LAN: Wired LAN, Wireless LAN, Virtual LAN. Techniques for Bandwidth utilization: Multiplexing - Frequency division, Time division and Wave division, Concepts on spread spectrum.

UNIT - II	DATA LINK LAYER AND MEDIUM ACCESS SUB LAYER	9

Fundamentals of Error Detection and Error Correction, Block coding, Hamming Distance, CRC; Flow Control and Error control protocols - Stop and Wait, Go-back–N ARQ, Selective Repeat ARQ, Sliding Window, Piggybacking, Random Access, Multiple access protocols - Pure ALOHA, Slotted ALOHA, CSMA/CD, CDMA/CA.

UNIT - III	NETWORK LAYER	9

Switching, Logical addressing – IPV4, IPV6; Address mapping – ARP, RARP, BOOTP and DHCP–Delivery, Forwarding and Unicast Routing protocols.

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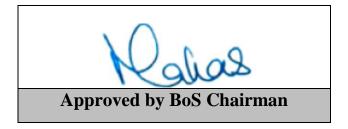| UNIT - IV	TRANSPORT LAYER	9
Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP Congestion Control; Quality of Service (QoS), QoS improving techniques - Leaky Bucket and Token Bucket algorithms.		
UNIT - V	APPLICATION LAYER AND SECURITY	9
Application Layer: DNS, DDNS, TELNET, EMAIL, FTP, WWW, HTTP, SNMP, Bluetooth, Firewalls. Network Security: Electronic mail, directory services and network management, Basic concepts of Cryptography.		

Course Outcomes : Students will be able to	
CO1	Understand the fundamentals of data communications and functions of layered architecture.
CO2	Practice the error detection and correction methods and understand the different network technologies in Data link layer and MAC.
CO3	Analyse the requirements for a given organizational structure and select the most
CO4	Configure Routers and Switches for efficient Data Transfer.
CO5	Understand the application layer protocols and also the use of cryptography and network

Text Books	
1.	James F.Kurose & Keith W.Ross, "Computer Networking", 8th Edition, Pearson Education, 2022.
2.	William Stallings, "Data and Computer Communications", 10th Edition, Pearson Education, 2021.

Reference Books	
1.	Charlie Kaufman, Radia Perlman, Mike Speciner & Ray Perlner, "Network Security: Private Communication in a Public World" 3rd Edition, Pearson Education, 2022.

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2.	W. Richard Stevens, "UNIX Network Programming, Vol. 1,2 & 3", Prentice-Hall of India, 2004.

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B.Tech - CSBS	B23CBT405- ADVANCED DATA STRUCTURES AND ALGORITHMS	L	T	P	C
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Course Objectives	
1.	To design and implement binary search trees & types of trees.
2.	To design and implement graph algorithms.
3.	To understand various network flows.
4.	To understand techniques used for designing algorithms.
5.	To understand the concepts of algorithms.

UNIT - I	HIERARCHICAL DATA STRUCTURES	9

Binary Search Trees: Basics – Insertion and Deletion- AVL –Insertion ,Deletion ,Segment Tree –Construction –Overlapping – Range sum query –Range minimum query – Binary Heap – Minimum binary heap – Maximum binary heap.

UNIT - II	PROPERTIES OF GRAPH	9

Elementary Graph Algorithms: Representations of Graphs – Breadth-First Search – Depth-First Search –Minimum Spanning Trees: Kruskal and Prim- Single Source Shortest Paths: Bellman-Ford algorithm – Single-Source Shortest paths in Directed Acyclic Graphs – Dijkstra's Algorithm; All-Pairs Shortest Paths: The Floyd Warshall Algorithm.

UNIT - III	ROLE OF ALGORITHMS IN COMPUTING	9

Algorithms – Algorithms as a Technology- Sum of first N natural numbers – Analysing Algorithms – Designing Algorithms- Growth of Functions: Asymptotic Notation – Standard Notations and Common Functions- Recurrences: The Substitution Method – The Recursion-Tree Method.

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UNIT - IV	ALGORITHM DESIGN TECHNIQUES	9
Dynamic Programming: Memorization, Tabulation- Longest palindrome subsequence, Longest common subsequence problem , Optimal sub structure property , Back tracking –Nqueens , Sub set sum , Divide and conquer – Merge sort , Binary searching ,String algorithm-KMP algorithm.		

UNIT - V	ADVANCED ALGORITHM DESIGN TECHNIQUES	9
Longest increasing subsequence –O / I knapsack problem. Greedy algorithms: An activity selection problem – Elements of Greedy Strategy – Fractional knapsack problem. Mathematical algorithm –Sieve of Eratosthenes –Binary exponentiation –Euclidian GCP-Extended Euclidean gcd		

Course Outcomes : Students will be able to	
CO1	Analyze the asymptotic performance of algorithms.
CO2	Apply suitable design strategy for problem solving
CO3	Apply suitable design strategy for advanced problem solving
CO4	Implement the concept of hierarchical data structures in real world scenarios.
CO5	Analyze important algorithmic design paradigms to implement graph data structure

Text Books	
1.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", 2nd Edition, Pearson Education, 2010

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Reference Books	
1.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, "Fundamentals of Data Structures
2.	Reema Thareja, "Data Structures Using C", Second Edition, Oxford University Press,
3.	M. Tenenbaum and Augestien, "Data Structures using C", Third Edition, Pearson
4.	J. P. Tremblay and P. G. Sorenson, "An Introduction to Data Structures with applications", Second Edition, Tata McGraw Hill, 2007
5.	Aho, Hopcroft and Ullman, "Data Structures and Algorithms", Pearson Education,1983

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