



TULSIRAMJI GAIKWAD-PATIL
College of Engineering & Technology

Mohgaon, Wardha Road, Nagpur - 441 108

An Autonomous Institute Affiliated to RTM Nagpur University



UG Programme
B-Tech
in
COMPUTER SCIENCE & ENGINEERING

Structure & Curriculum

From

Academic Year 2021-22

Vision of Institute

“To emerge as a learning Center of Excellence in the National Ethos in domains of Science, Technology and Management.”

Mission of Institute

- To strive for rearing standard and stature of the students by practicing high standards of professional ethics, transparency and accountability.
- To provide facilities and services to meet the challenges of Industry and Society.
- To facilitate socially responsive research, innovation and entrepreneurship.
- To ascertain holistic development of the students and staff members by inculcating knowledge and profession as work practices.

Program Outcomes (PO)

1. **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and software tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** understand the impact of the professional engineering solutions in societal and environmental contexts, demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics, responsibilities, and norms of the engineering practice.
9. **Individual and teamwork:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Program Specific Outcomes (PSO)

PSO 1- Basic Fundamental: To apply fundamental knowledge of computer science to analyze complex problem and design effective solution.

PSO 2 - Design and Implementation: Apply modern tool to solve engineering, societal problem and communicate effectively as team member in software project management.

PSO 3 – Higher Studies and Entrepreneur: The ability to use modern computer technologies to create career paths for higher studies and entrepreneurship, also inculcate moral values and ethics for lifelong learning.

Vision of the Department

"To become a centre of excellence for nurturing the quality Computer Science & Engineering professionals to cater the needs of industry and society."

Mission of the Department

- ◆ To achieve academic excellence by imparting in-depth knowledge to the students through effective pedagogies and hands on experience on latest tools and technologies.
- ◆ Inculcating professional behavior, strong ethical values, innovative research capabilities and leadership abilities in graduates.
- ◆ To trained the graduates with the knowledge and skills required to enable them to be industry ready.
- ◆ To strengthen the Industry-Institute Interaction for stakeholders to become successful entrepreneurs.

Program Education Objectives (PEO)

- PEO 1 - Apply mathematical knowledge and logical programming to develop engineering solutions in the computing domain.
- PEO 2 - Analyze the real life problems and apply latest tools for developing software solutions.
- PEO 3 - Apply emerging technology by communicating effectively as a team.
- PEO 4 - Enhance the quality, security, privacy, cost utility, etiquette and ethics by their computing abilities.
- PEO 5 - Adapt emerging technology and advance in careers for fulfilling the societal needs and protecting the environment for lifelong learning.

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SCHEME OF EXAMINATION & SYLLABI

Programme: Computer Science & Engineering

Scheme of Examination: Second Year B. Tech. in Computer Science & Engineering

Semester – III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME				
									CT-1	CT-2	TA/CA	ESE	TOTAL
1	BSC	BCS2301	Applied Mathematics- III	3	1	-	4	4	15	15	10	60	100
2	ESC	BCS2302	Fundamentals of Digital Circuits and Microprocessor	3	-	-	3	3	15	15	10	60	100
3	PCC	BCS2303	Object Oriented Programming with JAVA	2	1	-	3	3	15	15	10	60	100
4	PCC	BCS2304	Data Structure & Algorithms	2	1	-	3	3	15	15	10	60	100
5	PCC	BCS2305	Computer Architecture & Organization	2	1	-	3	3	15	15	10	60	100
6	PCC	BCS2306	Object Oriented Programming Lab	-	-	2	2	1	-	-	25	25	50
7	PCC	BCS2307	Data Structure & Algorithms Lab	-	-	2	2	1	-	-	25	25	50
8	ESC	BCS2308	Fundamentals of Digital Circuits and Microprocessor Lab	-	-	2	2	1	-	-	25	25	50
9	PCC	BCS2309	Programming Lab	-	-	2	2	1	-	-	25	25	50
10	HSM C	BSH2301	Human Values for Professional Society	3	-	-	3	3	15	15	10	60	100
11	MCC	BAU2303	Environmental Science	2	-	-	2	Audit	-	-	-	-	-
			Total	17	04	08	29	23	90	90	160	460	800

L- Lecture

T-Tutorial

P-Practical

CT1- Class Test 1

TA/CA- Teacher Assessment/Continuous Assessment

CT2- Class Test 2

ESE- End Semester Examination (For Laboratory End Semester performance)

Course Category	HSMC (Hum, Soc. Sc, Mgmt.)	BSC (Basic Sc.)	ESC (Engg. Sc.)	PCC (Programme Core Courses)	PEC (Programme Elective Courses)	OEC (Open Elective courses from other discipline)	Project / Seminar /Industrial Training	MCC (Mandatory Courses)
Credits	03	04	04	12	--	--	--	Yes
Cumulative Sum	06	22	18	12	--	--	--	--

PROGRESSIVE TOTAL CREDITS: 35+20=55

Vice Principal

Principal

Dept. Head
(CSE)
Tulsiramji Gaikwad-Patil College
of Engineering & Technology
Nagpur, Wardha Road, Nagpur

Academics
Tulsiramji Gaikwad-Patil
College Of Engineering
& Technology, Nagpur

Tulsiramji Gaikwad-Patil
College Of Engineering &
Technology, Nagpur.

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Program: B. Tech. Computer Science and Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2301	Applied Mathematics - III	3	1	-	4

Pre-Requisites: Mathematics – I, Mathematics – II

Course Contents

Unit I	Laplace Transform: Laplace transforms and their simple properties, Unit step function, inverse of Laplace transform, convolution theorem, Applications of Laplace transform to solve ordinary differential equations
Unit II	NUMERICAL METHODS: Error in numerical calculations, Errors in series approximation, Rounding of errors, Solution of Algebraic and Transcendental Equation: Bisection method, False position method, Newton –Raphson method and their convergence, Solution of system of simultaneous linear equations: Gauss elimination method, Gauss Jordan method. Gauss Seidel method, Crout's method,
Unit III	Linear Algebra: Vector Space, Subspaces, Linear Dependence/Independence, Basis, Dimension, Linear transformation, Null Space and Nullity, Matrix Representation of a linear transformation, Linear Operators on R_n and their representation as square matrices, Singular Value Decomposition.
Unit IV	Stochastic Process & Sampling Techniques- Introduction of Stochastic Process, Classification of Random Process, Stationary and Nonstationary Random Process, Stochastic Matrix. Markov Chain- Classification of States, Classification of Chains, Random walk and gambler Ruin. Testing a hypothesis, Null hypothesis, Alternative hypothesis, t-test, F-test and Chi square test.
Unit V	Probability, Probability Distributions & Mathematical Expectation: Random variables, discrete and continuous random variable, probability density function; probability distribution function for discrete and continuous random variable joint distributions. Definition of mathematical expectation, the variance and standard deviations, moment generating function Binomial, Geometric distribution, Poisson distribution,

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Text Books	
T.1	Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication
T.2	Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India
T.3	Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville.
Reference Books	
R.1	A Text Book of applied Mathematics, Volume II , by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan
R.2	Introductory methods of Numerical Analysis, by S.S. Sastry, PHI
Useful Links	
1	https://nptel.ac.in/courses/117/106/117106034/
2	https://nptel.ac.in/courses/108108076/
3	https://nptel.ac.in/courses/108105062/

	Course Outcomes	CL	Class Sessions
BCS2301.1	Apply the concept of Laplace Transform to solve Differential Equation	3	10
BCS2301.2	Analyze numerical techniques to find the roots of equations different types of equations.	4	9
BCS2301.3	Apply principles of matrix algebra to linear Transformation	3	9
BCS2301.4	Apply the most appropriate Stochastic and sampling techniques for a given applied problems	3	8
BCS2301.5	Use of a probability distribution for a random variable to evaluate probabilities	3	9

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Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2302	Fundamentals of Digital Circuits and Microprocessor	3	-	-	3

Pre-Requisites: A basic idea regarding the initial concepts of Digital Electronics

Course Contents

Unit I	Number System: Decimal, Binary, Octal, Hexadecimal and its conversions Types of Codes: Reflected (Gray), Self-Complementary (Excess-3), BCD and ASCII codes, Conversion of Codes, Logic Gates: Logic Gates and their truth tables. Boolean algebra: Axioms and laws of Boolean algebra.
Unit II	Reducing Boolean Expressions, Boolean functions and their representation: SOP, POS, Standard Sum of products form and Standard Product of Sums form, Truth Table Form, Karnaugh Map Expansion of Boolean Expression in SOP form to Standard SOP form. Expansion of Boolean expression in POS form to standard POS form. Boolean Expressions and Logic Diagrams. Karnaugh map: Simplification of functions using K- map (up to 5 variables) and their implementation using logic gates.
Unit III	Combinational Logic Design and Sequential Circuits: Design procedure, Adders, Subtractors, Ripple Carry adder, 4bit parallel subtractor, Look ahead carry adder, Multiplexers, Demultiplexer, Encoders, Decoders, Code Converters.
Unit IV	Sequential Circuits: Flip Flops: Latches and Flip-flops, S-R FF, J-K FF, D FF, T FF, Master Slave FF, Race around Condition (Racing) and Toggling. Characteristics Table and Excitation Table, Conversion of Flip- Flop. Counters, Modulus of Counter, Types-Synchronous Counter and Asynchronous (Ripple) counter. Memory: Random Access memory, types of ROM, Memory decoding, Sequential Memory, Cache Memory, Programmable Logic Arrays, Memory Hierarchy in terms of capacity and access time.
Unit V	8085 Microprocessor: Architecture of 8085 MP, Pin Diagram and instruction set of 8085 Programming of 8085, interrupt structure and timing diagrams of 8085 and Introduction to 8086 MP (Advanced Microprocessor).

Text Books

T.1	Modern Digital Electronic: 4th edition by R.P.Jain
T.2	Digital Logic Design: 2nd edition by M. Mano
T.3	Fundamental of Digital Electronics: A. Anand Kumar
T.4	8 bit microprocessor & controller: fifth edition – V.J.Vibhute

Reference Books

R.1	Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition.
R.2	Microprocessor: Architecture, Programming & applications with 8085; Ramesh S.Gaonkar; Penramth International, 5th Edition.

Useful Links

1	https://nptel.ac.in/courses/108/105/108105113/
2	https://nptel.ac.in/courses/117/106/117106086/

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	Course Outcomes	CL	Class Sessions
BCS2302.1	Evaluate numerical values in various number systems and perform its conversions.	5	9
BCS2302.2	Implement minimization of boolean expressions using Boolean Algebra and K-Map.	6	9
BCS2302.3	Analyze , design and implement combinational circuits and sequential circuits	4	9
BCS2302.4	Classify different memory and programmable logic design	4	9
BCS2302.5	Illustrate the microprocessor architecture and its programming.	2	9

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Program: B. Tech. Computer Science and Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2303	Object Oriented Programming with JAVA	2	1	-	3

Pre-Requisites: Programming for Problem Solving using C Language.

Course Contents

Unit I	Introduction to Java : Basics of Java programming, Data types, Variables, Operators, Control structures including selection, Looping, Java methods, Overloading, Math class, Arrays in java
Unit II	Objects and Classes : Basics of objects and classes in java, Constructors, Finalizer, Visibility modifiers, Methods and objects, Inbuilt classes like String, Character, StringBuffer, File, this reference.
Unit III	Inheritance and Polymorphism : Inheritance in java, Super and sub class, Overriding, Object class, Polymorphism, Dynamic binding, Generic programming, Casting objects, Instance of operator, Abstract class, Interface in java, Package in java, UTIL package.
Unit IV	I/O programming : Text and Binary I/O, Binary I/O classes, Object I/O, Random Access Files. Multithreading in java : Thread life cycle and methods, Runnable interface, Thread synchronization, Exception handling with try-catch-finally, Collections in java.
Unit V	Event and GUI programming : Event handling in java, Event types, Mouse and key events, GUI Basics, Panels, Frames, Layout Managers: Flow Layout, Border Layout, Grid Layout, GUI components like Buttons, Check Boxes, Radio Buttons, Labels, Text Fields, Text Areas, Combo Boxes, Lists, Scroll Bars, Sliders, Windows, Menus, Dialog Box, Applet and its life cycle, Introduction to swing.

Text Books

T1	The Complete Reference (8 th Edition) by Herbert Schildt, Tata McGrawHill Publications
T2	Head First Java, 2 nd Edition by Kathy Sierra, Bert Bates, O'Reilly Media
T3	Programming in Java (Fifth edition) by E Balguruswami, McGraw Hill Education

Reference Books

R1	Introduction to Java Programming, Daniel Liang, Seventh Edition, Pearson.
R2	Programming in Java, Sachin Malhotra & Saurabh Chaudhary, Oxford University Press.
R3	The Complete Reference, Java 2 (Fourth Edition), Herbert Schildt, TMH.

Useful Links

1	https://nptel.ac.in/courses/106/105/106105191/
2	https://www.nptelvideos.com/video.php?id=1472



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	Course Outcomes	CL	Class Sessions
BCS2303.1	Define the Principle of Object oriented approach to design software.	1	9
BCS2303.2	Identify Classes, objects and use of inheritance in programs.	3	9
BCS2303.3	Make Use of Package, exception handling, multithreading in real time situations.	3	9
BCS2303.4	Understand the concept of stream, Collection classes and its use for problem solving.	2	9
BCS2303.5	Develop GUI programs using java to construct desktop application.	6	9

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Program: B. Tech. Computer Science & Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2304	Data Structure and Algorithms	3	-	-	3

Pre-Requisites: Programming for Problem Solving.

Course Contents

Unit I	Introduction to data structure: General concepts of data structures, Types of Data Structure with its properties and Operations, Time and space analysis of algorithms, Big oh, theta, and omega notations, Average, best and worst case analysis, Abstract data structure ,Array as an ADT: Representation of One - Dimensional , Two-Dimensional array & its operations (Searching & Sorting techniques). Advanced data structures like Fibonacci heap, disjoint set representation
Unit II	Stack & Queue: Representation of Stack & queue using array, Application of stacks, Conversion from infix to postfix and prefix expressions, Evaluation of postfix expression using stacks, Linear Queues, Circular Queues, and Priority Queues. Applications of Queues: Job Scheduling, Josephus problem etc.
Unit III	Linked List: Definition and representation in memory, Types of linked list: linked list, circular linked list, Doubly linked list and circular doubly linked list, operations: insertion, deletion, searching, updation, traversing. Application of linked list such as polynomial expression, comparisons of linked lists.
Unit IV	Trees: Definition and basic terminology, Representation of tree. Basic operations of binary trees and binary search trees (traversals of trees, insertion and deletion of elements). Threaded Binary Trees, the concept of balancing, AVL Trees, B-Trees, B+ Trees and its operations. Introduction to Red-Black and Splay Trees(Elementary treatment-only Definitions and Examples),
Unit V	Graphs: Representation of Graph, Matrix Representation of Graph, List Representation of Graph, Directed Graphs(Digraphs), graph traversal (BFS and DFS) with complexity analysis, shortest path (Dijkstra's, Bellman ford& Floyd Warshall), Spanning trees(Kruskal & Prim's algorithm) Hashing: Hash tables, hash functions, hashing techniques, Collision resolution techniques.

Text Books

T1	Classical Data Structure, D. Samanta, Prentice Hall of India.
T2	Data Structure with C, Seymour Lipschutz, Tata Mcgraw Hill
T3	Data Structures using C, Aaron M. Tanenbaum, Pearson Education

Reference Books

R1	An Introduction to Data Structures and Applications, Jean-Paul Tremblay, Paul G. Sorenson, P. G. Sorenson, Tata McGraw Hill Publication
R2	Data Structures using C and C++, Y. Langsam, Pearson Education.
R3	Prof.P.S.Deshpande & Prof. O.G.Kakde,"C & Data structures",dreamtech

Useful Links

1	https://nptel.ac.in/courses/106/105/106105183/
2	https://nptel.ac.in/courses/106/106/106106091/

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	Course Outcomes	CL	Class Sessions
BCS2304.1	Analyze different ADTs and their operations and analyze their complexities.	4	9
BCS2304.2	Understand and Implement linear data structures like stack and queue.	2	9
BCS2304.3	Implement various types of Linked list.	6	9
BCS2304.4	Summarize different types of trees, their operations and applications.	2	9
BCS2304.5	Design traversal and path finding algorithms for Graphs.	6	9

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**Program: B. Tech. Computer Science and Engineering**

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2305	Computer Architecture & Organization	2	1	-	3

Pre-Requisites: Basic of Number System**Course Contents**

Unit I	BASIC STRUCTURE OF COMPUTERS: Functional units, Basic operational concepts, Bus architecture, Instruction formats: Three- address Instructions, Two-address instructions, One-address instructions, and Zero-address instructions. BASIC PROCESSING UNIT: Execution of a complete instruction, Hardwired control. Microprogrammed control, Addressing modes, Subroutines: parameter passing Execution of a complete instruction, sequencing of control signals.
Unit II	ARITHMETIC and Control: Addition and Subtraction with signed-magnitude, Design of Fast Adders, Array multiplier, Signed multiplication: Booth's Algorithm, Fast Multiplication, Bit-pair recoding, Integer Division, Floating-point Arithmetic operations, Guard bits and rounding.
Unit III	THE MEMORY SYSTEM: Basic concept, semiconductor RAM, memories static and dynamic RAMs, ROMs, Memory hierarchy, Main memory, Auxiliary memory, Virtual Memory, Cache memory, Address mapping, cache optimization techniques.
Unit IV	INPUT/OUTPUT ORGANIZATION: I/O mapped I/O and memory mapped I/O, Interrupts and Interrupts handling mechanisms, Synchronous vs. Asynchronous data transfer, Direct Memory Access, File Services. PIPELINING: Pipelining, basic concepts in pipelining, delayed branch, branch prediction, data dependency, influence of pipelining on instruction set design, multiple execution units
Unit V	INTRODUCTION TO MULTIPROCESSORS: Basic concepts in parallel processing, classification of parallel architectures. RISC Processor, SISC Processor, Loosely Coupled and Tightly Coupled System.

Text Books

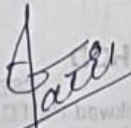
T.1	Carl Hamacher, Zvonko Vanadic and Safety Zaky Computer Organization, McGraw Hill 5 th Ed, 2002
T.2	Computer Architecture and organization III Ed- J. P. Hayes.
T.3	Computer Organization, Design and Architecture (IV Ed), Sajjan G. Shiva, CRC Press Computer Architecture & Organization III Ed- J. P. Hayes.

Reference Books

R.1	M Mano, "Computer System and Architecture", PHI, 1993
R.2	W. Stallings, "Computer Organization & Architecture", PHI, 2001

Useful Links

1	https://nptel.ac.in/courses/106/105/106105163/
2	https://nptel.ac.in/courses/106/102/106102062/


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	Course Outcomes	CL	Class Sessions
BCS2305.1	Examine the basics of organizational and architectural issues of a digital computer and Classify and compute the performance of machines, Machine Instructions.	4	9
BCS2305.2	Apply logic to perform binary operation and multiplication and Division Algorithms.	3	9
BCS2305.3	Analyze the performance of various classes of Memories, build large memories using small memories for better performance and analyze arithmetic for ALU implementation	4	9
BCS2305.4	Identify various data transfer techniques in digital computer and the I/O interfaces	3	9
BCS2305.5	Determine the concept of parallel processing and classification of parallel architectures	5	9

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Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2306	Object Oriented Programming with JAVA Lab	-	-	2	1

List of Practical

1	Demonstrate the installation of JAVA with necessary path settings & Execute simple java Program.
2	Execute a simple program using different operator and control statements.
3	Construct & Execute a Java Program to define a class, constructors, overload the constructors.
4	Implement inheritance by applying various access controls to its data members and methods. Demonstrate use of method overriding.
5	Demonstrate use of how a class implements two interfaces using departmental data of college.
6	Implement Package and Sub-Packages by taking suitable example.
7	Implement the concept Exception Handling using predefined exception by creating user defined exception.
8	Write an application program to implement the concept of threading by extending Thread class and by implementing Runnable Interface
9	Demonstrate database connectivity and add, delete, update and retrieve records from database using JDBC.
10	Design User registration application using Swing controls.

Text Books

T.1	The Complete Reference (8 th Edition) by Herbert Schildt, Tata McGrawHill Publications
T.2	Head First Java, 2 nd Edition by Kathy Sierra, Bert Bates, O'Reilly Media
T.3	Programming in Java (Fifth edition) by E Balguruswami, McGraw Hill Education

Reference Books

R.1	Sun Certified Java Programmer for Java 6 by Kathy Sierra
R.2	The JavaTM Programming Language (3rd Edition) by Arnold, Holmes, Gosling, Goteti
R.3	Core Java for Beginners by Rashmi Kanta Das (III Edition) Vikas Publication

Useful Links

1	https://nptel.ac.in/courses/106/105/106105191/
2	https://www.nptelvideos.com/video.php?id=1472

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	Course Outcomes	CL	Lab Sessions
BCS2306.1	Define the Principle of Object oriented approach to design software.	5	2
BCS2306.2	Identify Classes, objects and use of inheritance in programs.	6	4
BCS2306.3	Make Use of Package, exception handling, multithreading in real time situations.	5	4
BCS2306.4	Understand the concept of stream, Collection classes and its use for problem solving.	4	4
BCS2306.5	Develop GUI programs using java to construct desktop application.	6	4

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Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2307	Data Structure and Algorithms Lab	-	-	2	1

Pre-Requisites: Programming for Problem Solving.**List of Experiment**

1	Consider a student database of SEIT class (at least 15 records). Database contains different fields of every student like Roll No, Name and SGPA.(array of structure) a) Design a roll call list, arrange list of students according to roll numbers in ascending order (Use Bubble Sort) b) Arrange a list of students alphabetically. (Use Insertion sort) c) Arrange a list of students to find out first ten toppers from a class. (Use Quick sort)
2	Design, develop and execute a program in C to implement linear search and binary search.
3	Implement stack as an abstract data type using singly linked list and use this ADT for conversion of infix expression to postfix, prefix and evaluation of postfix and prefix expression
4	Implement Circular Queue using Array. Perform following operations on it. a) Insertion (Enqueue) b) Deletion (Dequeue) c) Display
5	Design, develop and execute a program in C to implement a singly linked list where each node consists of integers. The program should support the following functions. a. Create a singly linked list b. Insert a new node c. Delete a node if it is found, otherwise display appropriate message d. Display the nodes of singly linked list
6	Using array representation for a polynomial, design, develop and execute a program in C to add two polynomials and then print the resulting polynomial.
7	Implement binary search tree and perform following operations: a) Insert (Handle insertion of duplicate entry) b) Delete c) Search d) Display tree (Traversal) e) Display - Depth of tree f) Display - Mirror image g) Create a copy h) Display all parent nodes with their child nodes i) Display leaf nodes j) Display tree level wise
8	Implement In-order Threaded Binary Tree and traverse it in In-order and Pre-order
9	Represent a graph of your college campus using adjacency list/adjacency matrix. Nodes should represent the various departments/institutes and links should represent the distance between them. Find minimum spanning tree a) Using Kruskal's algorithm.

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	b) Using Prim's algorithm.
10	Represent a graph of the city using an adjacency matrix /adjacency list. Nodes should represent the various landmarks and links should represent the distance between them. Find the shortest path using Dijkstra's algorithm from single source to all destinations.
Text Books	
T1	Classical Data Structure, D. Samanta, Prentice Hall of India.
T2	Data Structure with C, Seymour Lipschutz, Tata McGraw Hill
T3	Data Structures using C, Aaron M. Tanenbaum, Pearson Education
Reference Books	
R1	An Introduction to Data Structures and Applications, Jean-Paul Tremblay, Paul G. Sorenson, P. G. Sorenson, Tata McGraw Hill Publication
R2	Data Structures using C and C++, Y. Langsam, Pearson Education.
R3	Prof.P.S.Deshpande & Prof. O.G.Kakde,"C & Data structures",dreamtech
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105183/
2	https://nptel.ac.in/courses/106/106/106106091/

	Course Outcomes	CL	Lab Sessions
BCS2307.1	Analyze different ADTs and their operations and analyze their complexities.	4	2
BCS2307.2	Implement linear data structures like stack and queue.	5	2
BCS2307.3	Implement various types of Linked list.	5	2
BCS2307.4	Construct different types of trees and their operations and applications.	6	2
BCS2307.5	Design traversal and path finding algorithms for Graphs.	6	2


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Program: B. Tech. Computer Science and Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2308	Fundamentals of Digital Circuits and Microprocessor Lab	-	-	2	1

List of Practical

1	Verify AND,OR and NOT Basic Gates.
2	Verify NAND and NOR Universal Gates. Also verify EX-OR, XNOR gates
3	Construct Half Adder circuit and verify its Truth Table.
4	Construct Full Adder circuit and verify its Truth Table.
5	Construct Half Subtractor circuit and verify its truth table.
6	Construct Full Subtractor circuit and verify its truth table.
7	Design and verify the truth table using 4:1 Multiplexer.
8	Design and verify the truth table of 1:4 DEMUX.
9	Perform addition of two 8-bit BCD numbers using 8085 microprocessor.
10	Write an assembly language program to display 'n' elements of the Fibonacci series using 8085 Microprocessor.

Text Books

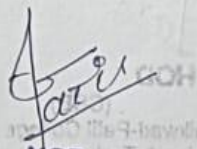
1	Modern Digital Electronic: 4th edition by R.P.Jain
2	Digital Logic Design: 2nd edition by M. Mano
3	Fundamental of Digital Electronics: A. Anand Kumar
4	8 bit microprocessor & controller: fifth edition – V.J.Vibhute

Reference Books

1	Digital Principles and Design – Donald D.Givone, Tata McGraw Hill, Edition.
2	Microprocessor: Architecture, Programming & applications with 8085; Ramesh S.Gaonkar; Penramth International, 5th Edition.

Useful Links

1	https://nptel.ac.in/courses/108/105/108105113/
2	https://nptel.ac.in/courses/117/106/117106086/


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	Course Outcomes	CL	Lab Sessions
BCS2308.1	Evaluate numerical values in various number systems and perform its conversions.	5	2
BCS2308.2	Implement minimization of boolean expressions using Boolean Algebra and K-Map.	5	1
BCS2308.3	Design combinational circuits and sequential circuits	6	4
BCS2308.4	Classify different memory and programmable logic design	4	1
BCS2308.5	Perform the microprocessor architecture and its programming.	5	2

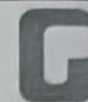
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Program: B.Tech. Computer Science and Engineering

Semester	Course Code	Name of Course	L	T	P	Credits
III	BCS2309	Programming Lab	-	-	2	1

Pre-Requisites: Basic of Python

Course Objectives:

List of Experiment

1	Perform following Python program using 1. Data type. 2. Declaration of variable. 3. Print "Hello world" 4. Arithmetic operators. 5. Conditional operators.
2	Implement Python program to demonstrate use of conditional statements: if statement, 'if ... else' statement, Nested 'if' statements.
3	Perform following Python program using 1. While loop 2. For loop 3. Break statement.
4	Implement Python program to perform following operations on Lists: Create list, Access list, Update list (Add item, Remove item), Delete list.
5	Implement Python Program using OOPS concept like: 1. Object 2. Classes 3. Inheritance 4. Polymorphism
6	Perform following Python Program like. 1. Constructor 2. Destructor
7	Execute Python Program using Exception handling
8	Execute Python program to perform following operations on Dictionaries: Create Dictionary, Access Dictionary elements, Update Dictionary, Delete Dictionary, Looping through Dictionary
9	Implement python Program using 1. File 2. Modules 3. Database connectivity
10	Implement simple Calculator by using python programming

Text Books

T1	Invent Your Own Computer Games with Python, 4th edition.
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T2	Learn Python 3 The Hard Way, by Zed A. Shaw.
T3	Fluent Python: Clear, Concise, and Effective Programming, by Luciano Ramalho
Reference Books	
R1	Python crash course by Eric Matthes
R2	Python for Data Analysis by Wes Mckinney
Useful Links	
1	https://nptel.ac.in/courses/106/105/106105178/
2	https://nptel.ac.in/courses/106/104/106104137/
3	https://onlinecourses.nptel.ac.in/noc22_cs32/preview



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