NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA, G.B. NAGAR

(AN AUTONOMOUS INSTITUTE)

Affiliated to

DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY, UTTAR PRADESH, LUCKNOW

Evaluation Scheme & Syllabus

For

Bachelor of Technology

Computer Science and Engineering (Mathematics & Computing)

Second Year

(Effective from the Session: 2025-26)

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA

(AN AUTONOMOUS INSTITUTE)

Bachelor of Technology

Computer Science

EVALUATION SCHEME

SEMESTER-III

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BCSCC0301	Employability Skill Development - I	Mandatory	2	0	0	60	40	100				100	2
2	BAS0303N	Statistics and Probability	Mandatory	3	1	0	30	20	50		100		150	4
3	BCSE0303A	Operating Systems	Mandatory	2	0	0	30	20	50		50		100	2
4	BCSE0301	Data Structures and Algorithms-I	Mandatory	3	0	0	30	20	50		100		150	3
5	BASMC0302	Numerical Methods and Optimization	Mandatory	2	0	0	30	20	50		50		100	2
6	BCSMC0301	Introduction to Quantum Computing	Mandatory	3	0	0	30	20	50		100		150	3
7	BCSE0353A	Operating Systems Lab	Mandatory	0	0	4				50		50	100	2
8	BCSE0351	Data Structures and Algorithms-I Lab	Mandatory	0	0	4				50		50	100	2
9	BASMC0352	Numerical Methods and Optimization Lab	Mandatory	0	0	2				25		25	50	1
10	BCSE0352	Object Oriented Techniques using Java	Mandatory	0	0	6				50		100	150	3
11	BCSE0359X	Social Internship	Mandatory	0	0	2				50			50	1
12	BNC0302/ BNC0301	Environmental Science / Artificial Intelligence and Cyber Ethics	Compulsory Audit	2	0	0	30	20	50				50	NA
		Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL		17	1	18	210	140	350	225	400	225	**1200**	**25**

*** List of MOOCs Based Recommended Courses for Second year (Semester-III) B. Tech Students**

Sr. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0008	Object Oriented Programming Using Python	Infosys Wingspan (Infosys Springboard)	46h 13m	3.5
2	BMC0009	Probability and Statistics using Python	Infosys Wingspan (Infosys Springboard)	16h	1

PLEASE NOTE: -

- **A 3–4-week Internship shall be conducted during summer break after semester-II and will be assessedduring semester-III.**
- **Compulsory Audit (CA) Courses (Non-Credit - BNC0301/BNC0302)**
  - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - The total and obtained marks are not added to the grand total.

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

NOIDA INSTITUTE OF ENGINEERING & TECHNOLOGY, GREATER NOIDA, GAUTAM BUDDH NAGAR
(AN AUTONOMOUS INSTITUTE)

Bachelor of Technology
Computer Science

Evaluation Scheme
SEMESTER-IV

Sl. No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	TOTAL	PS	TE	PE		
1	BASCC0401	Employability Skill Development - II	Mandatory	2	0	0	60	40	100				100	2
2	BCSE0402	Database Management Systems	Mandatory	3	0	0	30	20	50		100		150	3
3	BCSE0401	Data Structures and Algorithms-II	Mandatory	3	0	0	30	20	50		100		150	3
4	BASMC0401	Applied Linear Algebra and Quantum Mechanics	Mandatory	3	0	0	30	20	50		100		150	3
5		Department Elective - I	Departmental Elective	3	0	0	30	20	50		100		150	3
6	BASL0401N	Technical Communication	Mandatory	2	0	0	30	20	50		50		100	2
7	BCSE0452Z	Database Management Systems Lab	Mandatory	0	0	4				50		50	100	2
8	BCSE0451	Data Structures and Algorithms-II Lab	Mandatory	0	0	2				25		25	50	1
9	BCSE0455	Web Technologies	Mandatory	0	0	6				50		100	150	3
10	BCSE0459	Mini Project	Mandatory	0	0	2				50			50	1
11	BCSCC0452	Problem Solving Approaches	Mandatory	0	0	2				50			50	1
12	BNC0401/ BNC0402	Artificial Intelligence and Cyber Ethics/ Environmental Science	Compulsory Audit	2	0	0	30	20	50				50	NA
		Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL		**18**	**0**	**16**	**210**	**140**	**350**	**225**	**450**	**175**	**1200**	**24**

* List of MOOCs Based Recommended Courses for Second year (Semester-IV) B. Tech Students

S. No.	Subject Code	Course Name	University / Industry Partner Name	No of Hours	Credits
1	BMC0011	Building Machine Learning Systems with TensorFlow	Infosys Wingspan (Infosys Springboard)	27h 18m	2
2	BMC0010	Comprehensive Training on Unix and Linux OS Fundamentals	Infosys Wingspan (Infosys Springboard)	29h 53m	2

PLEASE NOTE: -

- **Compulsory Audit (CA) Courses (Non-Credit - BNC0401/BNC0402)**
  - ➢ All Compulsory Audit Courses (a qualifying exam) do not require any credit.
  - ➢ The total and obtained marks are not added to the grand total.

Abbreviation Used:

L: Lecture, T: Tutorial, P: Practical, CT: Class Test, TA: Teacher Assessment, PS: Practical Sessional, TE: Theory End Semester Exam., CE: Core Elective, OE: Open Elective, DE: Departmental Elective, PE: Practical End Semester Exam, CA: Compulsory Audit, MOOCs: Massive Open Online Courses.

DEPARTMENTAL ELECTIVES

Subject Code	Subject Name	Type	Sem	Branch	Bucket
BCSAI0411	Data Analytics	Department Elective-I	IV	MCT	AI Driven Analytics
BCS0411	Introduction to Cloud Computing	Department Elective-I	IV	MCT	Cloud Computing
BCSCY0411	Fundamentals of Cyber Security	Department Elective-I	IV	MCT	Cyber Security- I
BCSE0411	Python web development with Django	Department Elective-I	IV	MCT	Full stack Development

A student will be eligible to get Undergraduate degree with Honours only, if he/she completes the additional MOOCs courses such as Coursera certifications, or any other online courses recommended by the Institute (Equivalent to 20 credits). During Complete B.Tech. Program Guidelines for credit calculations are as follows.

1. For 6 to 12 Hours =0.5 Credit
2. For 13 to18 =1 Credit
3. For 19 to 24 =1.5 Credit
4. For 25 to 30 =2 Credit
5. For 31 to 35 =2.5 Credit
6. For 36 to 41 =3 Credit
7. For 42 to 47 =3.5 Credit
8. For 48 and above =4 Credit

For registration to MOOCs Courses, the students shall follow Coursera registration details as per the assigned login and password by the Institute these courses may be cleared during the B. Tech degree program (as per the list provided). After successful completion of these MOOCs courses, the students shall provide their successful completion status/certificates to the Controller of Examination (COE) of the Institute through their coordinators/Mentors only.

The students shall be awarded Honours Degree as per following criterion.

i. If he / she secures 7.50 as above CGPA.
ii. Passed each subject of that degree program in the single attempt without any grace.
iii. Successful completion of MOOCs based 20 credits.

Course Code: BCSCC0301	Course Name: : Employability Skill Development-I	L	T	P	C
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		2	0	0	2

Pre-requisite: Basic: Programming Language C

Course Objectives:- This course introduces computer system fundamentals, basic mathematics for computing, and software development principles. It emphasizes algorithm design and C++ programming skills. Through hands-on practice and project-based learning, students develop problem-solving abilities and teamwork while creating real-world applications, mini-games, and simulations, enhancing both technical and collaborative competencies.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply the principles of sets, relations, and functions to address computational problems and implement solutions by following the stages of the software development life cycle.	K3
CO2	Design and develop small-scale software projects or games using structured programming and project-based approaches.	K6
CO3	Collaborate in teams to plan, develop, and present a complete software project, demonstrating problem-solving and communication skills.	K6
CO4	Collaborate in teams to plan, develop, and present a complete software project, demonstrating problem-solving and communication skills.	K6

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	-	-	-	2	-	-	-	1	1
CO2	3	3	3	2	-	-	-	2	-	-	-	2	1
CO3	3	3	3	2	-	-	-	2	-	-	-	3	1
CO4	3	3	3	3	-	-	-	2	-	-	-	1	2

Course Contents / Syllabus

Module 1	Computer System Fundamentals:	04 hours

Introduction to Assembler, Compiler, Interpreter, Role of Loader and Linker in program execution.
Mathematical Foundations for Computing: Sets, Relations, and Functions: definitions and applications, Principle of Mathematical Induction and its use in proofs.

Module 2	Mathematical Foundations for Computing:	06 hours

Sets, Relations, and Functions: definitions and applications, Principle of Mathematical Induction and its use in proofs.
Introduction to Software Development Life Cycle, Step-by-step solution to simple problems, Developing logic/flowchart/pseudocode, simple games, puzzles, Step-wise refinement and Procedural Abstraction

Module 3	Introduction to the basics of C++	10 hours

Implementation of control structures through practical tasks such as creating a number guessing game using loops and conditions, Functions and scope demonstrated by developing a menu-driven applications using user-defined functions, implement simple logic-based games including puzzles, tic-tac-toe, Hangman etc., the concept of pointers and dynamic memory allocation is introduced by creating a dynamic leader board to store player scores. File handling in C++ to save high scores or game states to external files

Module 4	Project Planning & Development	10 hours

Teams, roles, idea pitching, develop C++ game or simulation), Mini Project, Project Demonstration and Review

	Total Lecture Hours	30 hours

Textbook:

S.No	Book Title	Author

1	Programming: Principles and Practice Using C++,	Bjarne Stroustrup
2	Effective Modern C++,	Scott Meyers

Course Code BAS0303N	Course Name: Statistics and Probability	L	T	P	C
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		3	1	0	4

Pre-requisite: Basic B.Tech. Ist Year Syllabus

Course Objectives

The objective of this course is to familiarize the students with concepts of Probability and statistical techniques. It aims to equip the students with adequate Knowledge of statistics that will enable them in formulating Problems and solving problems analytically..

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply the concept of moments, skewness and kurtosis in relevant field.	K3
CO2	Apply the concept of correlation, regression and curve fitting with real world problems.	K3
CO3	Apply the concept of probability and random variable.	K3
CO4	Apply the concept of Mathematical Expectations and Probability Distribution in real life problems.	K3
CO5	Apply the concept of hypothesis testing and statistical quality control to create control charts.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	3	1	1	-	1	2	2	2	-	-
CO2	3	2	2	3	1	1	-	1	2	2	2	1	-
CO3	3	2	1	2	-	-	-	-	1	2	2	2	1
CO4	3	2	2	3	1	1	-	1	2	2	2	1	1
CO5	3	2	2	3	1	1	-	1	2	2	2	1	1

Course Contents / Syllabus

Module 1	Statistical Techniques-I	6 hours

Introduction: Measures of central tendency: Mean, Median, Mode, Standard deviation, Quartile deviation, Moment, Skewness, Kurtosis.

Module 2	Statistical Techniques-II	10 hours

Curve Fitting, Method of least squares, fitting of straight lines, Fitting of second-degree parabola, Exponential curves, Correlation and Rank correlation, Linear regression, nonlinear regression and multiple linear regression.

Module 3	Probability and Random Variable	10 hours

Random Variable: Definition of a Random Variable, Discrete Random Variable, Continuous Random Variable, Probability mass function, Probability Density Function, Distribution functions.

Multiple Random Variables: Joint density and distribution Function, Properties of Joint Distribution function, Marginal density Functions, Conditional Distribution and Density, Statistical Independence, Central Limit Theorem (Proof not expected).

Module 4	Expectations and Probability Distribution	10 hours

Expectations of single Random Variable, Mean, Variance, Moment Generating Function, Binomial, Poisson, Normal, Exponential distribution

Module 5	Hypothesis Tests and Control Charts	12 hours

Testing a Hypothesis, Null hypothesis, Alternative hypothesis, Level of significance, Confidence limits, Test of significance of difference of means, Z-test, t-test and Chi-square test, F-test, One way ANOVA.

Statistical Quality Control (SQC), Control Charts, Control Charts for variables (Mean and Range Charts), Control Charts for Variables (p, np and C charts).

Total Lecture Hours	**48 hours**

Textbook:

S.No	**Book Title**	**Author**
1	Textbook of Engineering Mathematics- IV	Bali, N.P.
2	Advanced engineering mathematics	Jain, R.K.
3	Higher engineering mathematics	Grewal, B.S.
4	Statistical methods	Gupta, S.P.
5	Advanced engineering mathematics	ZILL, DENNIS G.

Reference Books:

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S.No	**Book Title**	**Author**
1	Introduction to Probability Models	Ross, Sheldon M
2	Probability, Random Variables and Stochastic Processes	Papoulis, Athanasios
3	Advanced engineering mathematics	Kreyszig, E.

NPTEL/ Youtube/ Faculty Video Link:

Module 1	**https://archive.nptel.ac.in/courses/110/107/110107114/**
Module 2	https://archive.nptel.ac.in/courses/111/105/111105042/
Module 3	**https://archive.nptel.ac.in/courses/117/105/117105085/** **https://archive.nptel.ac.in/courses/111/104/111104032/**
Module 4	http://www.digimat.in/nptel/courses/video/111106112/L19.html https://youtu.be/qvUT68tG_bo?si=40-T46aZ8TmQ-wsG
Module 5	**https://archive.nptel.ac.in/courses/103/106/103106120/**

NIET Greater Noida

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science in Emerging Technologies

Course Code BCSE0303A	Course Name: Operating Systems	L	T	P	C
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		2	0	0	2

Pre-requisite: Basic understanding of C/ C++ Programming, Data structures & algorithms, Computer Organization & architectures.

Course Objectives:-The objective of the course is to provide a foundational understanding of operating system concepts, including system architecture, process and thread management, concurrency, deadlock, resource management, memory and file systems, Linux shell scripting, and an introduction to virtualization and distributed systems.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO 1	Understand operating systems architecture and types, and use the Linux CLI for basic Operations.	K2
CO2	Implement the CPU scheduling algorithms along with uses of multithreading models.	K4
CO3	Implement concurrency control, process synchronization techniques, and deadlock handling methods.	K4
CO4	Implement memory management strategies and page replacement algorithms to optimize system performance.	K4
CO5	Analyze file systems and configure distributed systems and virtual machines in modern operating systems.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	CO1	3	2	2	2	3	2	-	1	2	2	2	3
CO2	CO2	3	3	3	2	2	1	-	1	2	2	1	3
CO3	CO3	3	3	3	2	2	2	-	1	2	2	1	3
CO4	CO4	3	2	2	3	2	1	-	1	2	2	1	3
CO5	CO 5	3	3	2	2	2	2	-	1	2	2	2	3

Course Contents / Syllabus

Module 1	Fundamentals & Shell scripting	10 hours

Fundamentals of Operating Systems, Overview of Operating Systems, Generations of OS, Operating system architecture, Interrupt handling, System call and kernel, Types of Operating System: Batch OS, Multiprogramming OS, Multitasking OS, Multiprocessor OS, Real time OS. Shell Scripting in Linux, Introduction to Linux Operating System & Architecture, Basic Command Line Interface (CLI) Operations in Linux, Shell Scripting Basics: Variables, Control Structures, Functions Case Study: Automating system administration tasks using shell scripts in Ubuntu/Linux (e.g., backup scheduling).

Module 2	Process & Thread Management	10 hours

Process Management: - Process, Transition Diagram, Process Control Block (PCB), Types of Schedulers: Long Term, Mid Term, Short Term Scheduler. CPU Scheduling- Pre-emptive and Non-Pre-emptive Algorithm (FCFS, SJF, SRTF, Non-Pre-emptive Priority, Pre-emptive Priority, Round Robin, Multilevel Queue Scheduling and Multilevel Feedback Queue Scheduling) Thread: - Processes vs Threads, Thread states, Benefits of threads, Types of threads, Multithread Model, Concept of Hyper-Threading Case Study: Analyse

Module 3	Concurrency and Deadlock Management	10 hours

Concurrency: Introduction of Concurrency, Types of Process, Race Condition, Critical Section, Inter Process Communication, Producer consumer problem. Process Synchronization: Lock variable, Peterson's Solution, Strict alternation, Lamport Bakery Solution, Test and set lock, Semaphore- counting, binary and monitor, Classical Problem of Synchronization: - Bound Buffer, Dinning Philosopher, Reader writer, Sleeping barber. Deadlock: Deadlock, Deadlock characterization, Deadlock Prevention, Deadlock Avoidance: Bankers Algorithms, Deadlock Detection, Recovery from Deadlock. Case Study: Deadlock avoidance in database transaction management systems like Oracle or MySQL

Module 4	Memory Management	10 hours

Memory Management: - Memory Management function, Loading and linking Address Binding, Memory management techniques, Contiguous technique- Fixed Partitions, variable partitions, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Non-contiguous, Paging, Segmentation, Segmented pagingVirtual Memory:- Virtual Memory Concepts, Demand Paging, Performance of Demand Paging, Page Replacement Algorithms: FIFO, LRU, Optimal and LFU, Belady’s Anomaly, Thrashing
Case Study: Virtual memory management in modern OS like Windows 10 and how paging impacts performance.

Module 5	**File Management & Modern Operating System**	**8 hours**

File Management: - Access Mechanism, File Allocation Method, Free Space Management: -Bit Vector, Linked List.DISK: Disk Architecture, HDD vs SSD, Disk Scheduling Algorithms Modern Operating System: -Overview of modern operating system, Modern OS features: Multitasking, virtualization, security, scalability, Shared Memory concepts, Distributed system, Parallel system & its architecture, Virtual machines – hypervisor, Introduction to GPU Case Study: Large File Storage in a Distributed Manner.

	Total Lecture Hours	**48 hours**

Textbook:

S.No	**Book Title**	**Author**
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne” Operating System Concepts Essentials”	Willey Publication,10th Edition,2018.
2	“A practical guide to Linux: Commands, Editors and Shell Programming”, CreateSpace Independent Publishing Platform, 4th Edition,2017.	Marks G. Sobell

Reference Books:

S.No	**Book Title**	**Author**
1	“Operating Systems: Internals and Design Principles”, Pearson Education , 9th Edition, 2019.	William Stallings
2	“Operating System: A Design-oriented Approach” , McGraw Hill Education ,2017.	Charles Patrick Crowley,
3	“Learning Linux Shell Scripting”, Packt Publishing ,2nd Edition 2018.	Ganesh Naik

NPTEL/ Youtube/ Faculty Video Link:

Module 1:	CS162 Lecture 1: What is an Operating System? (youtube.com) Operating System #01 Introduction to OS, its Roles & Types (youtube.com) Operating System #14 What is an Interrupt? Types of Interrupts - YouTube https://www.youtube.com/watch?v=akU1Ji8Vzdk&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ https://www.youtube.com/watch?v=rRGCGZ6OHw8&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ&index=2
Module 2:	Operating System #03 Programs & Processes, System Calls, OS Structure (youtube.com) Operating System #18 CPU Scheduling: FCFS, SJF, SRTF, Round Robin - YouTube Operating System #19 Priority Scheduling Algorithms, Multilevel Queues - YouTube Operating System #20 Multi Processor Scheduling (youtube.com) Operating System #33 Threads: Thread Model, Thread vs Process, pthread library (youtube.com) Operating System #34 Threads: User level & Kernel level thread, Threading issues (youtube.com)

	https://www.youtube.com/watch?v=3eG27YUbzyM&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ&index=3
Module 3:	CS162: Lecture 6: Synchronization 1: Concurrency and Mutual Exclusion (youtube.com) CS162: Lecture 6.5: Concurrency and Mutual Exclusion (Supplemental) (youtube.com) Operating System #04 CPU Sharing, Race Conditions, Synchronization, CPU Scheduling (youtube.com) Operating System #26 Bakery Algorithm - YouTube Operating System #27 Hardware Locks: Spinlock & its Usage (youtube.com) Operating System #31 Deadlocks: Deadlock Detection & Recovery (youtube.com)
Module 4:	Operating System #05 Memory Management: Process, Fragmentation, Deallocation, (youtube.com) Operating System #06 Virtual Memory & Demand Paging in Operating Systems (youtube.com) Operating System #07 MMU Mapping | How Virtual Memory Works? - YouTube
Module 5:	https://www.youtube.com/watch?v=qbQCQ0U6H0o https://www.youtube.com/watch?v=SnKgEuUfV4k https://www.youtube.com/watch?v=cVFyK1f5lDw https://www.youtube.com/watch?v=Z0Vkrn9faoM&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ&index=4 https://www.youtube.com/watch?v=_BtDcroOTSA CUDA Programming Course – High-Performance Computing with GPUs

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Code: BCSE0301	Course Name: Data Structures and Algorithms -1	L	T	P	C
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech. (Integrated)		**3**	**0**	**0**	**3**

Pre-requisite: Programming Language

Course Objectives: The objective of the course is to learn the basic concepts of algorithm analysis, along with the implementation of linear data structures.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the concept of algorithm analysis and its importance for computational problem solving.	K2
CO2	Implement arrays for searching, sorting, and hashing to foster critical thinking.	K3
CO3	Analyse the performance and structural differences of linked lists with arrays and the implementation of linked list with their applications.	K4
CO4	Apply the concept of Stacks and Queues to implement Linear Data Structures and solve real-world computational problems.	K2
CO5	Implement and analyse divide & conquer algorithm and greedy approaches for efficient problem-solving across diverse contexts.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	1	1	-	1	1	1	2	3	-
CO2	3	3	3	2	2	1	-	3	1	1	3	3	2
CO3	3	3	3	2	2	1	-	3	1	1	3	3	2
CO4	3	3	3	2	2	1	-	3	1	2	3	3	1
CO5	3	3	3	3	2	1	-	3	1	2	3	3	2

Course Contents / Syllabus

Module 1	**Introduction to Data Structure and Algorithms**	**10 hours**

Algorithms, Analysing Algorithms, Complexity of Algorithms, Amortized Analysis, Growth of Functions, Methods of solving Recurrences, Performance Measurements, Time and Space Complexity of an algorithm, Asymptotic notations (Big Oh, Big Theta and Big Omega), Abstract Data Types (ADT).

Data types: Primitive and non-primitive, Introduction to Data structure, Types of Data Structures- Linear & Non-Linear Data Structures.

Module 2	**Design and Analysis of Algorithms: Arrays, searching and sorting, Hashing**	**9 hours**

Arrays: Definition, Single and Multidimensional Arrays, Representation of Arrays: Row Major Order, and Column Major Order, Derivation of Index Formulae for 1-D,2-D,3-D and n-D Array Application of Arrays: Sparse Matrices and their Representations.

Searching algorithm with analysis: Linear search, Binary search. Sorting algorithm with analysis: Bubble sort, Insertion sort, Selection sort, Shell Sort, sorting in Linear Time- Counting Sort. Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques, Hashing for direct files

Module 3	**Design and Analysis of Algorithms: Linked lists Data Structure**	**10 hours**

Comparison of Array and Linked list, Types of linked list: Singly Linked List, Doubly Linked List, Circular Linked List Polynomial Representation and Addition of Polynomials.

Module 4	**Design and Analysis of Algorithms: Stacks Data Structure, Recursion and Queue Data Structure**	**10 hours**

Primitive Stack operations: Push & Pop, Array and Linked List Implementation of Stack, Application of stack: Infix, Prefix, Postfix Expressions and their mutual conversion, Evaluation of postfix expression. Principles of recursion, Tail recursion, Removal of recursion, Problem solving using iteration and recursion with examples such as binary search, Fibonacci series, and Tower of Hanoi, Trade-offs between iteration and recursion. Merge sort and Quick sort algorithms with analysis. Array and linked List implementation of queues, Operations on Queue: Create, Insert, Delete, Full and Empty, Circular queues, Dequeue and Priority Queue algorithms with analysis

Module 5	**Design and Analysis of Algorithms: Divide and Conquer Algorithm and Greedy Algorithms**	**9 hours**
Divide and Conquer concepts with Examples Such as Quick sort, Merge sort. Greedy Methods with Examples Such as Activity Selection, Task Scheduling, Fractional Knapsack Problem, Huffman Encoding.		
	Total Lecture Hours	**48 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**
1	“Data Structures and Algorithms in Python: An Indian Adaptation", 1st Edition, 2021.	Michael T. Goodrich, Roberto Tamassia
2	“Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd, 2nd Edition, 2017.	Lipschutz
3	“Fundamentals of Data Structures”, Computer Science Press, 1st Edition, 1993.	Horowitz and Sahani

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	Introduction to Algorithms, 4th ed. Cambridge, MA, USA: MIT Press, 2022.	T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein
2	Data Structures and Algorithms Made Easy: Data Structure and Algorithmic Puzzles, 5th ed. Noida, India: CareerMonk Publications, 2016.	N. Karumanchi
3	Grokking Algorithms: An Illustrated Guide for Programmers and Other Curious People, 2nd ed. Shelter Island, NY, USA: Manning Publications, 2024	A. Y. Bhargava
4	Algorithms, 4th ed. Boston, MA, USA: Addison-Wesley, 2011.	R. Sedgewick and K. Wayne
5	The Algorithm Design Manual, 2nd ed. London, U.K.: Springer, 2011.	S. S. Skiena

NPTEL/ Youtube/ Faculty Video Link:

Module 1:	https://youtu.be/u5AXxR4GnRY
Module 2:	https://www.youtube.com/watch?v=LQx9E2--p5c&pp=ygUMYXJyYXlzIG5wdGVs
Module 3:	https://www.youtube.com/watch?v=K7VIKlUdo20&pp=ygUPbGluayBsaXN0IG5wdGVs
Module 4:	https://www.youtube.com/watch?v=g1USSZVWDsY&list=PLB3CD0BBB95C1BF09&index=2&pp=iAQB https://www.youtube.com/watch?v=THMyk2_p530&pp=ygUccXVldWUgZGF0YSBzdHJ1Y3R1cmUgICBucHRlbA%3D%3D
Module 5:	https://www.youtube.com/watch?v=_VV9v41FIq0&pp=ygUZZGl2aWRlIGFuZCBjb25xdWVyICBucHRlbA%3D%3D https://www.youtube.com/watch?v=ARvQcqJ_-NY&list=PLfFeAJ-vQopt_S5XlayyvDFL_mi2pGJE3

Course Code: BASMC0302	**Course Name: Numerical Methods and Optimization**	**L**	**T**	**P**	**C**
Course Offered in: Department of Mathematics and Computing, B.Tech. 3rd Sem (2024-28)		**2**	**0**	**0**	**2**

Pre-requisite: Calculus, Linear Algebra, and Basic Programming Knowledge

Course Objectives:

This course aims to introduce the fundamental principles of optimization and numerical methods, enabling students to model and solve real-world engineering problems. It emphasizes the application of numerical techniques for approximate solutions, fosters understanding of stability, convergence, and error estimation, and develops computational thinking using relevant software tools.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Solve real world problems for Linear Programming problems.	K3
CO2	Solve real world problems for Non-Linear Programming problems.	K3
CO3	Apply numerical methods for solving algebraic and transcendental equations.	K3
CO4	Apply techniques of Interpolation. numerical differentiation and integration.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	3	-	-	-	1	-	2	3	3
CO2	3	3	3	2	3	-	-	-	1	-	2	3	3
CO3	3	2	3	3	3	-	-	-	1	-	2	3	3
CO4	3	3	2	3	3	-	-	-	1	-	2	3	3

Course Contents / Syllabus

Module 1	**Introduction and Linear Programming**	**10 hours**
Introduction to optimization and types of optimization problems; Formulation of Linear Programming Problems (LPP); Graphical Method and Simplex Method, Big-M method; Duality; Applications in engineering and decision science		
Module 2	**Non-Linear Programming Problem**	**8 hours**
Introduction to Convex and Concave Optimization; Unconstrained Optimization Techniques: Gradient Descent, Newton's Method; Constrained Optimization using Lagrange Multipliers; Kuhn Tucker Method; Numerical solutions using software tools		
Module 3	**Numerical Solution of Equations**	**8 hours**
Solving Algebraic and Transcendental Equations: Bisection, Regula-Falsi, Newton-Raphson; Rate of Convergence and Error Estimation; System of Linear Equations: Gauss Elimination, LU Decomposition; Iterative Methods: Gauss-Seidel		
Module 4	**Interpolation, Numerical Differentiation and Integration**	**8 hours**
Finite Differences, Forward and Backward Differences, Interpolation: Lagrange Interpolation; Spline Interpolation; Least Squares Method for Curve Fitting (Linear) Numerical Differentiation for ordinary differential equations: Euler's Modified Method, Runge-Kutta 4th order Methods, Numerical Integration: Trapezoidal Rule, Simpson's 1/3rd Rule.		

Total Lecture Hours	**34 hours**

Textbook:

S.No	**Book Title**	**Author**
1	Optimization: Theory and Applications, New Age International. 2nd edition,1984	S. S. Rao
2	Elementary Numerical Analysis, McGraw Hill. 3rd edition, 1980	S. D. Conte and Carl de Boor

Reference Books:

S.No	Book Title	Author
1	Operations Research, Sultan Chand & Sons. 20th edition, 2022	Kanti Swarup, P. K. Gupta, Man Mohan,
2	Numerical Methods, McGraw Hill. 5th edition, 2019	E. Balagurusamy,
3	Applied Numerical Methods with Python for Engineers and Scientists, McGraw Hill. 1st edition 2021	Steven C. Chapra,

NPTEL/ Youtube/ Faculty Video Link:

Module 1:	NPTEL – Optimization Techniques by Prof. S. S. Rao (https://nptel.ac.in)
Module 2:	YouTube – Convex Optimization Basics (https://www.youtube.com)
Module 3:	NPTEL – Numerical Methods for Engineers (https://nptel.ac.in), YouTube – Interpolation Techniques (https://www.youtube.com)
Module 4:	NPTEL – Numerical Integration and ODEs (https://nptel.ac.in)

Course Code: BCSMC0301	**Course Name: Introduction to Quantum Computing**	**L**	**T**	**P**	**C**
Course Offered in: Department of Mathematics and Computing, B.Tech. 3rd Sem (2024-28)		**3**	**0**	**0**	**3**

Pre- requisites: Basic Computer Knowledge and understanding of computation

Course Objectives

This course introduces the fundamentals of classical computing while exploring the evolution and motivation behind quantum computing, covering core concepts like superposition, entanglement, quantum gates, circuits, and algorithms, and bridging traditional and quantum paradigms through comparative analysis.

Pre-requisite: Basic Computer Knowledge and understanding of computation		Bloom's Knowledge Level (KL)
CO1	Differentiate between various computing paradigms.	K2, K4
CO2	Explain classical computer architecture and its limitations.	K2
CO3	Describe quantum mechanical principles relevant to quantum computing.	K2
CO4	Apply the basics of quantum gates and quantum circuits.	K3
CO5	Analyze simple quantum algorithms using available frameworks.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	3	-	2	2	-	-	-	1	-	-	2	2
CO2	3	3	-	2	2	-	-	-	1	-	-	2	2
CO3	3	2	2	3	3	-	-	-	1	-	-	2	3
CO4	3	3	2	2	3	-	-	-	1	-	-	2	3
CO5	3	3	3	3	3	-	-	-	1	-	-	2	3

Course Contents / Syllabus

Module 1	**Introduction to Traditional Computing**	**10 hours**

Evolution of Computing: From Mechanical to Electronic Computing; Basic Structure of Classical Computers: CPU; Memory, I/O Devices; Classical Bits vs. Information Representation; Von Neumann Architecture; Turing Machines and Computational Limits; Introduction to Algorithms and Complexity.

Module 2	**Limitations of Classical Computing**	**10 hours**

Moore's Law and its Physical Constraints; Energy Dissipation and Miniaturization; NP Problems and Intractability; Introduction to Randomized Algorithms; Motivation for New Computational Models;

Module 3	**Fundamentals of Quantum Mechanics**	**10 hours**

Postulates of Quantum Mechanics; Qubits and Quantum State Representation; Superposition and Measurement; Entanglement and Tensor Products; Quantum No-Cloning Theorem

Module 4	**Quantum Computing Basics**	**10 hours**

Quantum Gates and Circuits: X, Y, Z, H, S, T, CNOT; Bloch Sphere Visualization; Quantum Parallelism and Interference; Measurement and State Collapse; Introduction to Quantum Programming (e.g., Qiskit basics)

Module 5	**Applications and Future of Quantum Computing**	**8 hours**

Quantum Algorithms: Deutsch-Jozsa, Grover's Search (Introductory Overview); Potential Applications: Cryptography, Optimization, Simulation; Quantum Supremacy and Quantum Advantage; Challenges in Quantum Hardware; Future Directions and Industry Landscape

Total Lecture Hours	**48 hours**

Textbook:

S.No	Book Title	Author
1	Quantum Computation and Quantum Information, Cambridge University Press. 10th edition, 2010	Michael A. Nielsen and Isaac L. Chuang
2	Quantum Computer Science: An Introduction, Cambridge University Press. 1st edition, 2007	Mermin, N. David

Reference Books:

S.No	Book Title	Author
1	Quantum Computing for Computer Scientists, Cambridge University Press. 1st edition, 2008	Yanofsky & Mannucci
2	An Introduction to Quantum Computing, Oxford University Press, 1st edition 2007	P. Kaye, R. Laflamme, M. Mosca
3	Quantum Mechanics for Scientists and Engineers, Cambridge University Press. 1st edition 2008	William H. Press

NPTEL/ Youtube/ Faculty Video Link:

Module 1:	NPTEL – Introduction to Computing by Prof. D. Goswami (https://nptel.ac.in)
Module 2:	YouTube – Classical vs Quantum Computing (IBM Q) (https://www.youtube.com)
Module 3:	NPTEL – Quantum Mechanics and Quantum Computation (https://nptel.ac.in)
Module 4:	YouTube – Qiskit and Quantum Circuits (https://www.youtube.com)
Module 5:	YouTube – Quantum Applications in Industry (https://www.youtube.com)

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

LAB Course Code: BCSE0353A	**LAB Course Name: Operating System Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/ CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		**0**	**0**	**4**	**2**
Pre-requisite:- Basic knowledge of computer fundamentals, C programming, Data structure and Computer organization					

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Execute basic Linux commands and shell scripts to automate file management and system administration tasks.	K3
CO2	Implement and compare various CPU scheduling algorithms, process synchronization solutions using semaphores and deadlock handling algorithms.	K4
CO3	Simulate memory allocation techniques and page replacement algorithms, disk management strategies and explore modern OS features including virtualization and distributed computing.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	2	2	1	1	-	3	1	1	2	3	-	2	2
CO2	3	3	3	2	2	1	-	3	1	1	2	3	2	2	2
CO3	3	3	3	2	2	1	-	3	1	1	2	3	2	2	3

List of Practical		
Sr. No	**Program Title**	**CO Mapping**
1.	**Implementation of Linux Commands** Introduction of Unix/Linux Operating system and their architecture Display system information using uname, hostname, and date etc. File operations using cat, touch, cp, mv, rm, and chmod ,umask etc. Create, view, and navigate directories using mkdir, rmdir, cd, pwd, ls etc. Disk Commands df,du,mount,unmount,mkfs,fsck etc. Use redirection and piping in commands File compression and archiving using tar, gzip, zip, unzip etc. Process commands ps,kill, killall,nice, pgrep, top,htop etc. Network commands ifconfig, ping, netstat, host,ip route etc. Administrator Commands Adduser,Passwd, deluser, usermod, groupadd etc	**CO1**
2.	**Shell Scripting Programming**	**CO1**

	Write a shell script to ask your name, program name and enrollment number and print it on the screen.	
	Write a shell script to find the sum, the average and the product of the four integers entered.	
	write shell script to find average of numbers given at command line	
	Write a shell program to exchange the values of two variables	
	Write a shell program to Print Numbers 1 to 10 using while & do while loop.	
	Write a shell program to Print Numbers 1 to 10 using for loop.	
	Write a shell script to display the digits which are in odd position in a given 5-digit number**.**	
	Write a shell program to search for a given number from the list of numbers provided using binary search method.	
	Write a shell program to concatenate two strings and find the length of the resultant string	
	Write a shell script to find the smallest of three numbers	
	Write a shell program to count number of words, characters, white spaces and special symbols in a given text	
	Process & Thread Management	
3.	Introduction to C Programming (Statement, Conditional Statement, Loop, Array & Function)	**CO2**
4.	Implement FCFS CPU Scheduling algorithm.	**CO2**
5.	Implement the SJF CPU Scheduling algorithm (For both Pre-emptive and non-pre-emptive).	**CO2**
6.	Implement PRIORITY CPU Scheduling Algorithm (For both Pre-emptive and non-pre-emptive).	**CO2**
7.	Implement Round-Robin CPU Scheduling Algorithm	**CO2**
8.	Implement Multi-Level Queue CPU Scheduling algorithm.	**CO2**
9.	Implement Multilevel Queue CPU Scheduling Algorithm.	**CO2**
	Concurrency and Deadlock Management	
10.	Execute the RACE Condition of Process Synchronization.	**CO2**
11.	Implement the Producer–consumer problem using semaphores.	**CO2**
12.	Design a code and implement the Dinning Philosopher problem.	**CO2**
13.	Implement Banker’s algorithm of Deadlock Avoidance.	**CO2**

14.	Execute an algorithm for Deadlock Detection.	**CO2**
	Memory Management	
15.	Implement Contiguous memory variable size partition scheme.	**CO3**
16.	Simulate the First-Fit contiguous memory allocation technique.	**CO3**
17.	Simulate the Best-Fit contiguous memory allocation technique.	**CO3**
18.	Simulate the Worst-Fit contiguous memory allocation technique.	**CO3**
19.	Implement the Non-contiguous Memory Allocation by using Paging.	**CO3**
20.	Implement Contiguous memory variable size partition scheme.	**CO3**
	Page Replacement	
21.	Write a Program to simulate the FIFO page replacement algorithm.	**CO3**
22.	Write a Program to simulate the LRU page replacement Algorithm.	**CO3**
23.	Write a Program to simulate the Optimal page replacement Algorithm.	**CO3**
	Disk Scheduling	**CO3**
24.	Write a program to simulate FCFS Disk Scheduling Algorithm.	**CO3**
25.	Write a Program to simulate the SSTF Disk Scheduling Algorithm.	**CO3**
26.	Write a program to simulate SCAN Disk Scheduling Algorithm.	**CO3**
27.	Write a Program to simulate the C SCAN Disk Scheduling Algorithm.	**CO3**
28.	Write a Program to simulate the LOOK Disk Scheduling Algorithm.	**CO3**
	Modern Operating System	**CO3**
29.	Introduction of CUDA Programming.	**CO3**
30.	Write a program in CUDA print message “Welcome CUDA programming”	**CO3**
31.	Implement matrix multiplication using shared memory in CUDA.	**CO3**
32.	Connects to VMware vCenter and lists all virtual machines along with their power state.	**CO3**
33.	Create a new virtual machine in Azure with specified configurations.	**CO3**
34.	Deploy a simple HTTP-triggered distributed Azure Function.	**CO3**
Total Hours:		**48**

LAB Course Code: BCSE0351	**LAB Course Name: Data Structures and Algorithms Lab -1**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		**0**	**0**	**4**	**2**
Pre-requisite: Programming Language					
Course Objectives: Learn to implement linear data structures.					

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Implement array and matrix operations along with searching and sorting algorithms to solve computational problems.	K3
CO2	Implement Link list, Stack and Queues with their applications.	K2
CO3	Implement and analyse various operation like searching sorting and hashing.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	3	2	2	1	1	-	3	1	1	2	3	-
CO2	3	3	3	2	2	1	-	3	1	1	2	3	2
CO3	3	3	3	2	2	1	-	3	1	1	2	3	2

List Of Practical's (Indicative & Not Limited To)

1. Construct a program to compare the time complexities of selection, bubble and insertion sort by plotting the graph
2. Construct a program to compare the time complexities of various algorithms by varying size "n".
3. Construct a Code to find the maximum element in an array.
4. Construct a Code to calculate the sum of all elements in an array.
5. Construct a Code to reverse the elements of an array.
6. Construct a Code to check if an array is sorted in ascending order.
7. Construct a Code to count the occurrence of a specific element in an array.
8. Construct a Code creation and traversal of 2D Array in row major and column major order.
9. Construct a code to print the transpose of a given matrix using function
10. Program to find if a given matrix is Sparse or Not and print Sparse Matrix
11. Construct a code to represent a sparse matrix in triplet form.
12. Construct a code to Implement Linear Search
13. Construct a code to implement Binary Search
14. Construct a program to Implement Selection Sort
15. Construct a program to Implement Bubble Sort
16. Construct a program to Implement Insertion Sort
17. Construct a program to Implement Shell Sort
18. Construct a program to Implement Counting Sort
19. Create a single linked list and perform basic operations (insertion, deletion, traversal).

20. Create a double linked list and perform basic operations (insertion, deletion, traversal).
21. Create a circular linked list and perform basic operations (insertion, deletion, traversal).
22. Create a circular double linked list and perform basic operations (insertion, deletion, traversal).
23. Reverse a single linked list.
24. Check if a linked list is palindrome.
25. Reverse a double linked list.
26. Find the middle element of a single linked list.
27. Find the middle element of a double linked list.
28. Merge two sorted single linked lists.
29. Detect and remove a loop in a circular linked list.
30. Construct a code to add two polynomials using linked list
31. Construct a program to Implement stack using array
32. Construct a program to Implement stack using a linked list
33. Construct a code to Infix to postfix conversion using a stack
34. Construct a code for Balanced parentheses checker using a stack
35. Implement Reverse a string using a stack.
36. Implement Binary Search using Recursion.
37. Construct a program to print Fibonacci Series using Recursion.
38. Construct a code to implement Tower of Hanoi.
39. Construct a program to Implement queue using array.
40. Construct a code for Implementing a circular queue.
41. Construct a program to Implement queue using stack
42. Construct a program to Implement priority queue
43. Construct a program to Implement double ended queue
44. Construct a program to Implement Merge Sort with recursion
45. Construct a program to Implement Quick Sort with recursion
46. Construct a program to Implement Merge Sort using iteration
47. Construct a program to Implement Quick Sort using iteration
48. Construct a program to Implement fractional knapsack
49. Construct a program to Implement Activity selection problem
50. Construct a program to Implement Job scheduling problem
51. Construct a program to compare the time complexities of selection, bubble and insertion sort by plotting the graph
52. Construct a program to compare the time complexities of various algorithms by varying size “n”.
53. Construct a Code to find the maximum element in an array.
54. Construct a Code to calculate the sum of all elements in an array.
55. Construct a Code to reverse the elements of an array.
56. Construct a Code to check if an array is sorted in ascending order.

57. Construct a Code to count the occurrence of a specific element in an array.

58. Construct a Code creation and traversal of 2D Array in row major and column major order.

59. Construct a code to print the transpose of a given matrix using function

60. Program to find if a given matrix is Sparse or Not and print Sparse Matrix

61. Construct a code to represent a sparse matrix in triplet form.

62. Construct a code to Implement Linear Search

63. Construct a code to implement Binary Search

64. Construct a program to Implement Selection Sort

65. Construct a program to Implement Bubble Sort

66. Construct a program to Implement Insertion Sort

67. Construct a program to Implement Shell Sort

68. Construct a program to Implement Counting Sort

69. Create a single linked list and perform basic operations (insertion, deletion, traversal).

70. Create a double linked list and perform basic operations (insertion, deletion, traversal).

71. Create a circular linked list and perform basic operations (insertion, deletion, traversal).

72. Create a circular double linked list and perform basic operations (insertion, deletion, traversal).

73. Reverse a single linked list.

74. Check if a linked list is palindrome.

75. Reverse a double linked list.

76. Find the middle element of a single linked list.

77. Find the middle element of a double linked list.

78. Merge two sorted single linked lists.

79. Detect and remove a loop in a circular linked list.

80. Construct a code to add two polynomials using linked list

81. Construct a program to Implement stack using array

82. Construct a program to Implement stack using a linked list

83. Construct a code to Infix to postfix conversion using a stack

84. Construct a code for Balanced parentheses checker using a stack

85. Implement Reverse a string using a stack.

86. Implement Binary Search using Recursion.

87. Construct a program to print Fibonacci Series using Recursion.

88. Construct a code to implement Tower of Hanoi.

89. Construct a program to Implement queue using array.

90. Construct a code for Implementing a circular queue.

91. Construct a program to Implement queue using stack

92. Construct a program to Implement priority queue

93. Construct a program to Implement double ended queue

94. Construct a program to Implement Merge Sort with recursion

95. Construct a program to Implement Quick Sort with recursion

96. Construct a program to Implement Merge Sort using iteration

97. Construct a program to Implement Quick Sort using iteration

98. Construct a program to Implement fractional knapsack

99. Construct a program to Implement Activity selection problem

100. Construct a program to Implement Job scheduling problem

Total Hours: 48 hrs.

LAB Course Code: BASMC0352	**LAB Course Name: Numerical Methods and Optimization Lab**	**L**	**T**	**P**	**C**
Course Offered in: Department of Mathematics and Computing, B.Tech. 3rd Sem (2024-28)		**0**	**0**	**2**	**1**

Pre-requisite: Basic Python programming knowledge, numerical methods, and calculus

Course Objectives:
This course objective is to provide hands-on experience in implementing optimization and numerical techniques using Python, fostering skills in mathematical modeling, algorithmic thinking, and the use of Python libraries to solve real-world problems programmatically.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Implement classical optimization techniques using Python.	K2
CO2	Write programs to solve linear and non-linear equations numerically.	K4
CO3	Develop Python solutions for numerical integration and interpolation.	K2
CO4	Solve systems of linear equations using matrix-based numerical methods.	K4
CO5	Use libraries like NumPy, SciPy, and Matplotlib for mathematical computing.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	3	3	2	3	-	-	-	2	-	2	3	3
CO2	3	3	3	2	3	-	-	-	2	-	2	3	3
CO3	3	3	3	3	3	-	-	-	2	-	2	3	3
CO4	3	3	3	3	3	-	-	-	2	-	2	3	3
CO5	3	3	3	3	3	-	-	-	2	-	2	3	3

List Of Practical's (Indicative & Not Limited To)

Objective	**CO Mapping**
1. Solve linear programming problems using the Simplex method with the help of SciPy library.	CO1, CO5
2. Solve linear programming problems using the Big-M method with the help of SciPy library.	CO1, CO5
3. Perform unconstrained optimization using gradient descent method and visualize convergence.	CO2, CO5
4. Perform root finding using Bisection and Secant methods and compare results graphically.	CO3, CO5
5. Implement the Newton-Raphson method in Python to find roots of a non-linear equation.	CO3, CO5
6. Write a Python program to solve a system of linear equations using Gauss Elimination method.	CO3, CO5
7. Write a Python script to interpolate using Lagrange's method and plot the result.	CO4, CO5
8. Develop a program to fit a polynomial using Least Squares method and visualize the curve.	CO4, CO5
9. Implement Trapezoidal and Simpson's 1/3 Rule for numerical integration in Python.	CO4,CO5
10. Write a Python function to solve ODEs using Euler and Runge-Kutta (RK4) methods.	CO4, CO5

Total Hours: 48 hrs.

Course Code: BCSE0352	Course Name: Object Oriented Techniques using Java	L	T	P	C
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		0	0	6	2

Pre-requisite: 1. Student must know at least the basics of computer skills and should be able to start a command line shell.

2. Knowledge of basic programming concepts.

Course Objectives: The objective of this course is to understand the object-oriented methodology, and its techniques to design stand alone and GUI applications using hands-on engaging activities.

Course Outcome: After completion of the course, the student will be able to		Bloom’s Knowledge Level (KL)
CO 1	Understand the concepts of object-oriented programming and relationships among them needed in modeling.	K2
CO2	Demonstrate the Java programs using OOP principles and also implement the concepts of lambda expressions.	K3
CO3	Analyze packages with different protection level resolving namespace collision and implement the error handling concepts for uninterrupted execution of Java program.	K4
CO4	Implement Concurrency control, I/O Streams and Annotations concepts by using Java program.	K3
CO5	Design and develop the GUI based application, Generics and Collections in Java programming language to solve the real-world problem.	K6

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	2	2	1	-	1	-	2	2	2
CO2	3	3	3	3	2	2	1	-	1	1	2	2	2
CO3	3	3	3	3	3	2	2	-	2	1	2	2	3
CO4	3	3	3	3	3	2	2	1	2	1	2	3	3
CO5	3	3	3	3	3	2	2	1	2	1	2	3	3

Course Contents / Syllabus

Module 1	**Basics of Java Programming**	**5 hours**

Introduction and Pillars of OOP with real life example, jvm architecture and its componentsIntroduction, Class Diagram and Object Diagram, UML concepts: Association, Composition, aggregation, realization, and Generalization.Decision Making, Looping and Branching, Argument Passing Mechanism: Command Line Argument, Console Input.Object Reference, Constructor, Abstraction: Abstract Class,Interface and its uses, DefiningMethods, Use of “this” and “super”keyword, Garbage Collection and finalize () Method etc.

Module 2	**OOPs features, arrays and lambda expressions**	**5 hours**

Overview and Types of Inheritance in Java, Access Modifiers, Constructors and super constructor in Inheritance. Introduction and Types of Polymorphism, Overloading and Overriding. Introduction and Working with Lambda Variables. Introduction to Arrays and its Types.		
Module 3	**Packages, Exception Handling and String Handling**	**4 hours**
Introduction to Packages and its Types, Access Protection in Packages, Import and Execution of Packages. Exceptions vs. Errors, Handling of Exception. Finally, Throws and Throw keyword, Multiple Catch Block, Nested Try and Finally Block, Tokenizer. Assertions and Localizations Concepts and its working. String Types, Operations, Immutable String, Method of String class, String Buffer and String Builder class.		
Module 4	**Concurrency in Java and I/O Stream**	**4 hours**
Overview of Threads, Creating Threads, Thread Life-Cycle, Thread Priorities, Daemon Thread, Runnable Class, Synchronizing Threads etc. Common I/O Stream Operations, Interaction with I/O Streams Classes. Introduction, Custom Annotations and Applying Annotations.		
Module 5	**GUI Programming, Generics and Collections**	**5 hours**
Swing, AWT, Components and Containers, Layout Managers and User-Defined Layout and Event Handling. Introduction to Generic Classes, Initializing a Generic Object, Generic Cell Driver Class, Generic Methods, Use enumerated type. Introduction to Collections, Using Method References, Using Wrapper Class, Using Lists, Sets, Maps and Queues, Collection using Generics, Iterators		
Total Lecture Hours		**23 hours**

List of Practicals

Sr. No.	Program Title	CO Mapping
1	Understanding Text Editors to Write Programs, Compile and run first java file and Byte Code and class file	CO1
2	Sketch a class and object diagram by describing the sales order system of a restaurant.	CO1
3	Sketch a class diagram by describing the circle and rectangle class.	CO1
4	Sketch a class diagram for a college platform including, classroom, playground, chair, table, smart board, teaching staff etc.	CO1
5	Sketch a class diagram containing class called Employee, which models an employee with an ID, name and salary. Add method raisesalary(percent) that increases the salary by the given percentage.	CO1
6	Program to display the default value of all Primitive data types	CO1
7	Implement the code using main() method to calculate and print the **Total** and **Average Marks** scored by a student from the input given through the command line arguments and assume that four command line arguments **name, marks1, marks2, marks3** will be passed to the main() method in the below class with name **TotalAndAvgMarks**.	CO1
8	Write code which uses if-then-else statement to check if a given account balance is greater or lesser than the minimum balance. Write a class BalanceCheck with public method checkBalance that takes one parameter balance of type double. Use if-then-else statement and print Balance is low if balance is less than 1000. Otherwise, print Sufficient balance.	CO1

9	A class NumberPalindrome with a public method isNumberPalindrome that takes one parameter number of type int. Write a code to check whether the given number is palindrome or not. For example Cmd Args : 333 333 is a palindrome	CO1
10	Write a class FibonacciSeries with a main method. The method receives one command line argument. Write a program to display fibonacci series i.e. 0 1 1 2 3 5 8 13 21	CO1
11	Write a Java Program to find the Factorial of a given number.	CO1
12	Java Program to create a class, methods and invoke them inside main method.	CO1
13	• Write a Java program to illustrate the abstract class concept. Create an abstract class Shape, which contains an empty method numberofSides(). • Define three classes named Trapezoid, Triangle and Hexagon extends the class Shape, such that each one of the classes contains only the method numberofSides(), that contains the number of sides in the given geometrical figure. • Write a class AbstractExample with the main() method, declare an object to the class Shape, create instances of each class and call numberofSides() methods of each class.	CO1
14	Java program to illustrate the static field in the class.	CO1
15	Java Program to illustrate static class.	CO1
16	Write a java program to access the class members using super keyword	CO1
17	Java program to access the class members using this keyword	CO1
18	Implement an interface named MountainParts that has a constant named TERRAIN that will store the String value “off_road”. The interface will define two methods that accept a String argument name newValue and two that will return the current value of an instance field. The methods are to be named: getSuspension, setSuspension, getType , setType.	CO1
19	Java program to demonstrate nested interface inside a interface.	CO1
20	Java program to demonstrate nested interface inside a class.	CO1
21	Java program to explicit implementation of garbage collection by using finalize() method	CO1
22	JAVA program to implement Single Inheritance	CO2
23	JAVA program to implement multi-level Inheritance	CO2
24	JAVA program to implement constructor and constructor overloading.	CO2
25	JAVA program implement method overloading.	CO2
26	JAVA program to implement method overriding.	CO2
27	Java program to implement lambda expression without parameter.	CO2
28	Java program to implement lambda expression with single parameter.	CO2
29	Java program to implement lambda expression with multi parameter.	CO2
30	Java program to implement lambda expression that iterate list of objects	CO2
31	Java program to define lambda expressions as method parameters	CO2

32	Write a class CountofTwoNumbers with a public method compareCountof that takes three parameters one is arr of type int[] and other two are arg1 and arg2 are of type int and returns true if count of arg1 is greater than arg2 in arr. The return type of compareCountof should be boolean. Assummptions: • arr is never null • arg1 and arg2 may be same	CO2
33	JAVA program to show the multiplication of two matrices using arrays.	CO2
34	Java Program to search an element using Linear Search	CO2
35	Java program to search an element using Binary Search	CO2
36	Java Program to sort element using Insertion Sort	CO2
37	Java Program to sort element using Selection Sort – Largest element Method	CO2
38	java program to Sort elements using Bubble Sort	CO2
39	Java program to create user defined package.	CO3
40	Java Program to create a sub- classing of package	CO3
41	Implement the following: • Import package.*; • import package.classname; • Using fully qualified name.	CO3
42	Implement and demonstrate package names collision in java	CO3
43	Java program to handle and Arithmetic Exception Divided by zero	CO3
44	Java Program to implement User Defined Exception in Java	CO3
45	Java program to illustrate finally block	CO3
46	Java program to illustrate Multiple catch blocks	CO3
47	Java program for creation of illustrating throw in exception handling.	CO3
48	Implement the concept of Assertion in Java Programming Language	CO3
49	Implement the concept of Localization in Java Programming Language.	CO3
50	Java program to print the output by appending all the capital letters in the input string.	CO3
51	Java program that prints the duplicate characters from the string with its count.	CO3
52	Java program to check if two strings are anagrams of each other	CO3
53	Java Program to count the total number of characters in a string	CO3
54	Java Program to count the total number of punctuation characters exists in a String	CO3
55	Java Program to count the total number of vowels and consonants in a string	CO3
56	Java Program to show .equals method and == in java	CO3
57	Given a string, return a new string made of n copies of the first 2 chars of the original string where n is the length of the string. The string may be any length. If there are fewer than 2 chars, use whatever is there. If input is "Wipped" then output should be "WiWiWiWiWiWi".	CO3
58	Given two strings, a and b, create a bigger string made of the first char of a, the first char of b, the second char of a, the second char of b, and so on. Any leftover chars go at the end of the result. If the inputs are "Hello" and "World", then the output is "HWeolrllod".	CO3

59	JAVA program to show the usage of string builder.	CO3
60	JAVA program to show the usage of string buffer.	CO3
61	Creating and Running a Thread	CO4
62	Implementing Runnable Interface	CO4
63	Synchronizing Threads with lock	CO4
64	Synchronizing Threads without lock	CO4
65	JAVA program to implement even and odd threads by using Thread class .	CO4
66	JAVA program to implement even and odd threads by using Runnable interface.	CO4
67	JAVA program to synchronize the threads by using Synchronize statements and Synchronize block.	CO4
68	Demonstrate the concept of type annotations in the JAVA programming language.	CO4
69	Demonstrate the concept of user-defined annotations in the JAVA programming language.	CO4
70	JAVA program to implement that read a character stream from input file and print it into output file.	CO4
71	JAVA program to implement that merge the content of two files (file1.txt, file2.txt) into file3.txt.	CO4
72	Write a Java program that reads the contents of one file and copies them to another file.	CO4
73	Write a Java program that reads a text file and counts the number of words in it.	CO4
74	Write a Java program that reads a text file and counts the frequency of each word in it.	CO4
75	Write a Java program that reads a text file and adds line numbers to each line. The program should create a new file with the line numbers added to the beginning of each line.	CO4
76	Write a Java program that reads two binary files and compares them byte by byte to determine if they are identical. Display a message indicating whether the files are the same or different.	CO4
77	Program to create a frame with three button in AWT and swing	CO5
78	Program to display message with radio buttons in swing	CO5
79	Program to display "All The Best" in 5 different colors on screen. (Using AWT/Swing)	CO5
80	Program to implement event handling in a button “OK”	CO5
81	Java Program to implement BorderLayout	CO5
82	Java Program to implement GridLayout	CO5
83	Java Program to implement BoxLayout	CO5
84	Java Program to implement CardLayout	CO5
85	Java program to implement Generic class	CO5
86	Java program to illustrate Generic methods	CO5
87	Java program to implement wildcard in generics	CO5
88	Java program to implement of methods of HashSet	CO5
89	Java Program to implement methods available in HashMap class	CO5
90	Program to add, retrieve, and remove element from ArrayList	CO5
91	Create a method which can accept a collection of country names and add it to	CO5

	ArrayList with generic defined as String and return the List.	
92	Create a method which can create a HashSet containing values 1-10. The Set should be declared with the generic type Integer. The method should return the Set.	CO5
93	Java program to implement autoboxing	CO5
94	Java program to implement unboxing	CO5
95	Develop a java class with a method storeEvenNumbers(int N) using ArrayList to store even numbers from 2 to N, where N is a integer which is passed as a parameter to the method storeEvenNumbers(). The method should return the ArrayList (A1) created.	CO5
96	Create a method that accepts the names of five countries and loads them to an array list and returns the list.	CO5
97	Create a method which can accept a collection of country names and add it to ArrayList with generic defined as String and return the List.	CO5
Textbooks		
Sr. No.	**Book Details**	
1	Herbert Schildt,” Java: A Beginner’s Guide”, McGraw-Hill Education 2nd edition	
2	E Balagurusamy, “Programming with Java A Primer”, TMH, 4th edition.	
Reference Books		
Sr. No.	**Book Details**	
1	Cay S. Horstmann, “Core Java Volume I – Fundamentals”, Prentice Hall	
2	Joshua Bloch,” Effective Java”, Addison Wesley	
3	Herbert Schildt,” Java - The Complete Reference”, McGraw Hill Education 12th edition	
Links		
Module 1	https://www.youtube.com/watch?v=r59xYe3Vyks&list=PLS1QulWo1RIbfTjQvTdj8Y6yyq4R7g-Al	
Module 2	https://www.youtube.com/watch?v=ZHLdVRXIuC8&list=PLS1QulWo1RIbfTjQvTdj8Y6yyq4R7g-Al&index=18	
Module 3	https://www.youtube.com/watch?v=hBh_CC5y8-s	
Module 4	https://www.youtube.com/watch?v=qQVqfvs3p48	
Module 5	https://www.youtube.com/watch?v=2qWPpgALJyw	

Course Code: BNC0302	**Course Name: Environmental Science**	**L**	**T**	**P**	**C**
Course Offered in: All the branches		**2**	**0**	**0**	**2**

Pre-requisite: Basic knowledge of biology, chemistry, ecology, geology, mathematics, and understanding of human impacts on natural systems.

Course Outcome- After completion of the course, the student will be able to understand ecosystems, promote sustainability, address environmental issues, conserve biodiversity, and ensure responsible use of natural resources for future generations.		Bloom's Knowledge Level (KL)
CO1	Understand the basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem, food chains and food webs. Ecological pyramids, biodiversity.	K1,K2
CO2	Understand the different types of natural recourses like food, forest, Minerals and energy and their conservation.	K1,K2
CO3	Understand the different types of pollution, pollutants, their sources, effects and their control methods.	K1,K2
CO4	Understand the basic concepts of sustainable development, Environmental Impact Assessment (EIA) and different acts related to environment	K1,K2

CO-PO Mapping

CO/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	3	2	2	1	3	3	2	2	-	2	1	1
CO2	3	3	2	2	1	3	3	2	2	-	2	1	1
CO3	3	3	2	2	1	3	3	3	2	-	2	1	1
CO4	3	3	2	2	1	3	3	2	2	-	2	2	1

Course Contents / Syllabus

Module 1	**Basic Principle of Ecology and Biodiversity**	**5 hours**

Definition, Scope and basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem. Food chains and food. Webs. Ecological pyramids, Energy flow in ecological systems, Characteristics of different ecosystems. Biogeochemical Cycles: Importance, gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles. Biodiversity and their importance, Threats to biodiversity, major causes, extinction's, vulnerability of species to extinction, IUCN threat categories, Red data book. Strategies for biodiversity conservation, principles of biodiversity conservation in-situ and ex-situ conservation strategies Mega diversity zones and Hot spots, concepts, distribution and importance.

Module 2	**Natural Resources and Ecological succession**	**5 hours**

Natural resources and associated problems. Forest resources: Use and over- exploitation, deforestation. Timber extraction, mining, dams and their effects on forest and tribal people. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources. Food resources: World food problems, changes caused by agriculture and over- grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, and salinity. Land resources: Land as a resource, land degradation, man induced landslides. Equitable use of resources for sustainable lifestyles.

Non-Renewable Energy Resources: Fossil fuels and their reserves, Nuclear energy, types, uses and effects, Renewable Energy Resources: hydropower, Solar energy, geothermal, tidal and wind energy, Biomass energy, biogas and its advantages. Ecological succession-Types, stages, examples of ecological succession		
Module 3	**Pollution and Waste Management**	**5 hours**
Air pollution: sources of air pollution, Primary and secondary air pollutants. Origin and effects of SOX, NOX, Cox,CFC, Hydrocarbon, control of air pollution. Water pollution: sources and types of water pollution, Effects of water pollution, Eutrophication, Soil pollution: Causes of soil pollution, Effects of soil pollution, Major sources of and effects of noise pollution on health, Radioactive and thermal pollution sources and their effects on surrounding environment. Solid waste disposal and its effects on surrounding environment, Introduction to E- Waste, Types and classification of E- Waste, Impacts of E- Waste on environment and human health,E-Waste management and recycling., Climate change, global warming, acid rain, ozone layer depletion.		
Module 4	**Environmental Assessment and Legislation**	**5 hours**
Women education, Role of NGOs regarding environmental protection, Bio indicators and their role, Natural disasters and disasters management, Aims and objectives of Environmental Impact Assessment (EIA). Salient features of following Acts: Environmental Protection Act, 1986, Wildlife (Protection) Act, 1972.Water (Prevention and control of pollution) Act, 1974. Forest (Conserving) Act, 1980. Definition and concept of sustainability, impacted areas of sustainable development, Global initiative and issues on sustainable development UNSDsGs, System Thinking and Sustainability.		
	Total Lecture Hours	**20 hours**

Textbook:

S.No	Book Title	Author
1	Brady, N.C. 1990. The nature and properties of Soils, Tenth Edition. Mac Millan Publishing Co., New York	Brady, N.C
2	Sodhi G.S. 2005, Fundamentals of Environmental Chemistry: Narosa Publishing House, New Delhi.	Sodhi G.S
3	Dash, M.C. (1994), Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi.	Dash, M.C

S.No		
1	Rao M.N. and H.V.N. Rao, 1989 : Air Pollution, Tata McGraw Hill Publishing Co. Ltd., New Delhi	Rao M.N. and H.V.N. Rao
2	A Text Book of environmental Science By Shashi Chawla	Shashi Chawla

Module 1:	https://www.youtube.com/watch?v=T21OO0sBBfc, https://www.youtube.com/watch?v=qt8AMjKKPDo
Module 2:	https://www.youtube.com/watch?v=mOwyPENHhbc, https://www.youtube.com/watch?v=yqev1G2iy2

	https://www.youtube.com/watch?v=_74S3z3IO_I, https://www.youtube.com/watch?v=jXVw6M6m2
Module:3	https://www.youtube.com/watch?v=7qkaz8ChelI, https://www.youtube.com/watch?v=NuQE5fKmfME https://www.youtube.com/watch?v=9CpAjOVLHII, ttps://www.youtube.com/watch?v=yEci6iDkXYw
Module:4	https://www.youtube.com/watch?v=ad9KhgGw5iA, https://www.youtube.com/watch?v=nW5g83NSH9 M, https://www.youtube.com/watch?v=xqSZL4Ka8xo

Course Code: BASCC0401	**Course Name: Employability Skill Development - II**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M. Tech (Integrated)		**2**	**0**	**0**	**2**

Pre-requisite: Basic understanding of elementary mathematics

Course Objectives:

The objective of this course is to develop students' quantitative aptitude and logical reasoning skills through number theory, analytical puzzles, and business mathematics, enabling them to solve real-world and competitive exam problems with speed, accuracy, and logical thinking.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply fundamental number theory concepts such as divisibility, HCF & LCM, remainder theorem, and cyclicity to solve quantitative problems efficiently.	K2, K3
CO2	Solve problems involving logical reasoning and analytical thinking, including direction sense, blood relations, series patterns, and time-based puzzles like clocks and calendars.	K3
CO3	Solve real-life business math problems involving percentages, profit and loss, discounts, interest average calculations and using appropriate mathematical methods	K2, K3
CO4	Solve real-life business math problems involving averages, mixtures, and ratios using appropriate mathematical methods	K2, K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	**1**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

Course Contents / Syllabus

Module 1	**Speed Math and Number System**	**8 hours**
Classification of number, Divisibility Rule, Factorization, HCF & LCM, It's Application, Unit digit(Cyclicity), Last two digit, Remainder theorem, Factorial and Number of zeroes, Highest power		
Module 2	**Analytical and Logical Reasoning**	**8 hours**
Direction and Sense, Blood Relation, Number Series and Letter Series, Coding Decoding,		
Module 3	**Business Math I**	**8 hours**

Percentage, Profit and Loss, Discount, Simple Interest and Compound Interest, Average		
Module 4	**Business Math II**	**8 hours**
Ratio & Proportion, Partnership, Mixture & Allegation, Clock , Calendar		
Total Lecture Hours		**32 hours**

Reference Books:

S.No	**Book Title**	**Author**
1	Quicker math	M. Tyra (BSC publication co. Pvt. Ltd)
2	Quantitative Aptitude	RS Aggarwal
3	Verbal & Non-Verbal Reasoning	RS Aggarwal
4	Quantitative Aptitude - Quantum CAT	Sarvesh K Verma

NPTEL/ Youtube/ Faculty Video Link:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Code: BCSE0402	**Course Name: Database Management Systems**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		**3**	**0**	**0**	**3**

Pre-requisite: It is recommended to have fundamental computer knowledge that includes concepts of computer architecture, storage and hardware. Knowledge of data structures and algorithms and programming will be an added benefit.

Course Objectives:- The objective of the course is to introduce about database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively - information in relational & non-relational databases.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply ER model for conceptual design of the database.	K3
CO2	Execute SQL and apply the normalization to improve the database design.	K3
CO3	Implement complex queries in database with different applications.	K5
CO4	Execute the concept of PL/SQL, transaction and concurrency control.	K3
CO5	Implement Relational and Non-Relational databases using different tools and evaluate their effectiveness in real-world applications.	K5

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2	3	3	3	2	1	-	1	2	1	2	**2**	-
CO2	3	2	3	3	2	2	-	2	1	2	2	**2**	-
CO3	3	3	2	3	3	2	-	2	1	-	2	**2**	-
CO4	3	2	2	2	2	2	-	-	1	1	1	**2**	-
CO5	2	2	2	2	3	2	-	-	1	2	2	**2**	-

Course Contents / Syllabus

Module 1	**Introduction about the Database Conceptual Designing**	**08 hours**

Database system concept, architecture, History of Database, Data Independence, Database system Vs File system, Data models & Types of Data Models, schema and instances.ER model concepts, Degree of relationship, Notation for ER diagram, mapping constraints, Generalization, Aggregation, Reduction of an ER diagrams to tables. Extended ER Diagram & reduction of EER. Codd Rules.Types of SQL commands: -DDL, DML, DCL, TCL. Basic of Relation Algebra & Operations, Query Optimization.

Module 2	**Basic of SQL & Normalization**	**08 hours**

Super key, Candidate Key, Primary Key, Alternative Key, Foreign Key, unique. Constraints and Types of Constraints. Aggregate Function, Scalar Functions, Where, Group by, Having and Order by. SQL Operators. Like, Between, Aliases, distinct, limit.Functional Dependencies, attribute Closure, Normalization & Types of Normalization, Candidate Key, Canonical Cover of FD's.

Module 3	**Introduction of Complex Queries**	**08 hours**

Union, Intersect, Minus, Cartesian Product, join:-Inner Join: - Natural Join, Equi Join & Non Equi Join Outer Join: Left Outer Join, Right Outer Join and Full Outer Join, Division Operator.IN, NOT IN, Exists, Not Exists, All and Any. Managing Indexes, Synonyms and Sequences, Managing Views.Implementation of PL/SQL Function, Procedure, Trigger, Cursor.Database Connectivity with Java/Python Programming Languages.

Module 4	**Transaction and Concurrency Control**	**08 hours**

Life cycle of transaction, ACID Properties Schedule & Types of Schedule, Serializability, Recoverability, Deadlock Handling. Concurrency Control, Concurrency control Techniques: Locking Techniques, Timestamping, Validation Based Protocol, Transaction & Data Control: -Grant, Revoke, commit & Rollback

Module 5	**Introduction of NoSQL With MongoDB**	**08 hours**

Introduction of NoSQL Data Models, Overview of NoSQL Databases with their Types, Uses & Features of NoSQL Document Databases, CAP theorem, BASE Vs ACID, Comparison of relational databases to NoSQL stores, uses and deployment; - MongoDB, Cassandra, HBASE, Neo4j and Riak. Introduction and Features of MongoDB, MongoDB Operators, MongoDB Collection & Document,

MongoDB Shell & their commands, CRUD operations.Introduction of Cloud Database. MongoDB Cloud product : Stitch, Atlas & Cloud Manager.		
	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title**	**Author**
1	"Database Concepts", McGraw Hill, 7th Edition, 2020	Abraham Silberschatz, Henry Korth and S. Sudarshan,
2	"Fundamentals of Database Systems", Addision Wesley, 7th edition, 2016	Elmasri, Navathe,

Reference Books

Sr No	**Book Details**
1.	Thomas Cannolly and Carolyn Begg, Database Systems: A practical Approach to Design, Implementation and Management. Pearson Education,3rd Edition, 2007.
2.	Ted Hills, NoSQL and SQL Data Modeling: Bringing Together Data, Semantics, and Software, Ted Hills, 1st Edition,2016.

Links

Unit 1	DBMS L1 Inauguration & Introduction (youtube.com) DBMS L2 Introduction to Relational Model (youtube.com) DBMS L3 Introduction to SQL (youtube.com) DBMS L8C Entity Relationship Model (youtube.com) DBMS L8D Entity Relationship Model (Problem Solving and Discussion) (youtube.com)
Unit 2	DBMS L4A Joins, Set Operations and Aggregate Functions (youtube.com) DBMS L9A Relational Da DBMS L9B Relational Database Design (youtube.com) DBMS L9C Relational Database Design (youtube.com) DBMS L9D Discussion on Normalization (youtube.com) Relational Data Model and Notion of Keys - Relational Algebra (youtube.com) Operators in Relational Model - YouTube
Unit 3	DBMS L4B Joins, Set Operations and Aggregate Functions (youtube.com) DBMS L5A Nested Subqueris (youtube.com)

	DBMS L6A Intermediate SQL (youtube.com) DBMS L7 Advanced SQL (youtube.com) DBMS L12A Indexing and Hashing (youtube.com)
Unit 4	DBMS L15 Transactions – YouTube DBMS L16A Concurrency Control - YouTube DBMS L16B Concurrency Control (youtube.com) DBMS L16C Concurrency Control (youtube.com)
Unit 5	DBMS L10A Application Design and Development - YouTube DBMS L10B Application Design and Development (youtube.com) DBMS L19 Distributed Data Stores and NoSQL Databases (youtube.com) DBMS L18B Map Reduce and Hadoop - YouTube NoSQL Databases #1 (Data Models, CAP Theorem, BASE Property) - YouTube https://youtu.be/ekuQjQUnj20?si=_aL4T12EkHBZsvEK

Course Code: BCSE0401	**Course Name: Data Structures and Algorithms -II**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		**3**	**0**	**0**	**3**

Pre-requisite: C, Python

Course Objectives: The objective of the course is to learn the basic concepts of algorithm analysis, along with the implementation of non-linear data structures.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply tree structures effectively demonstrating proficiency in tree operations and algorithms.	K3
CO2	Analyse the graph data structure and implement various operations for problem solving.	K4
CO3	Implementation and analysis of dynamic programming for efficient problem-solving across diverse contexts.	K4
CO4	Apply efficient backtracking and branch &bound techniques across diverse problem-solving scenarios.	K3
CO5	Understand advanced data structures, their implementation and application for efficient data manipulation and retrieval.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PS12**	**PSO1**	**PSO2**
CO1	3	2	3	3	3	1	1	-	2	1	2	3	3	3
CO2	3	2	3	3	3	1	1	-	2	1	2	3	3	3
CO3	3	2	3	3	2	1	2	-	2	1	1	3	3	3
CO4	3	2	3	3	2	1	2	-	2	1	1	3	3	3
CO5	3	2	3	3	3	1	1	-	2	1	2	3	3	3

Course Contents / Syllabus

Module 1	**Design and Analysis of Algorithms: Trees**	**08 hours**
Trees: Terminology used with Trees, Binary Tree, Memory representation of Tree, Traversal Algorithms: In-order, Pre-order, and post-order. Constructing Binary Tree from given Tree Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search tree, Binary Heaps, Threaded Binary trees, Traversing Threaded Binary trees, AVL Tree.Priority Queue, Heap Sort, Huffman codes.		
Module 2	**Design and Analysis of Algorithms: Graphs**	**08 hours**
Terminology used with Graph, Data Structure for Graph Representations: Adjacency matrices, Adjacency List.Graph Traversal: Depth First Search and Breadth First Search. Connected Component, Spanning Trees, Minimum Cost Spanning.Trees: Prim' s and Kruskal's algorithm. Directed- Acyclic Graph, Transitive Closure and Shortest Path algorithms: Dijkstra Algorithm, Bellman Ford Algorithm, Floyd Warshall's Algorithm.		
Module 3	**Dynamic Programming**	**08 hours**
Dynamic Programming concepts 0/1 Knapsack, Longest Common Sub Sequence, Matrix Chain Multiplication, Resource Allocation Problem.		
Module 4	**Backtracking, Branch and Bound**	**08 hours**
Backtracking, Branch, and Bound with Examples Such as Travelling Salesman Problem, Graph Colouring, n-Queen Problem, Hamiltonian Cycles, and Sum of Subsets.		
Module 5	**Advanced- Data Structures**	**08 hours**
Red-Black Trees, B – Trees, B+ Trees, Binomial Heaps, Fibonacci Heaps, Tries		
	Total Lecture Hours	**40 hours**

Textbook:

S.No	**Book Title with publication agency & year**	**Author**

1	"Data Structure Using C", Oxford University Press, 2nd Edition, 2014.	Reema Thareja,
2	"Data Structure Using C", Pearson Education India, 2nd Edition,2011.	AK Sharma,
3	P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication, 1st Edition, 2004.	P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication, 1st Edition, 2004.

Reference Books:

S.No	**Book Title with publication agency & year**	**Author**
1	"Data Structures and Algorithms in Python (An Indian Adaptation)", Wiley Publication, 1st Edition, 2021.	Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser,
2	Grokking Algorithms: An Illustrated Guide for Programmers and Other Curious People, 2nd ed. USA: Manning Publications, 2024	Shelter Island, NY,

NPTEL/ Youtube/ Faculty Video Link:

Module 1:	https://www.youtube.com/watch?v=tORLeHHtazM&pp=ygUMdHJlZXMgIG5wdGVs
Module 2:	https://www.youtube.com/watch?v=9zpSs845wf8&pp=ygUcZ3JhcGggIGRhdGEgc3RydWN0dXJlICBucHRlbA%3D%3D
Module 3:	https://www.youtube.com/watch?v=5dRGRueKU3M&pp=ygUUZHluYW1pYyBwcm9ncmFtbWluZyA%3D
Module 4:	https://www.youtube.com/watch?v=DKCbsiDBN6c&list=PL-Y5_GYVx275I87vW3LUzEJ-g7TDgn0Ts https://www.youtube.com/watch?v=3RBNPc0_Q6g&pp=ygUuYmFja3RyYWNraW5nIGFuZCBicmFuY2ggYW5kIGJvdW5kIHByb2dyYW1 taW5nIA%3D%3D
Module 5:	https://www.youtube.com/watch?v=8h80p_rYv1Y&list=PLv9sD0fPjvSHqIOLTIvHJWjkdH0IdzmXT

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science in Emerging Technologies

Course Code: BASMC0401	Course Name: Applied Linear Algebra and Quantum Mechanics	L	T	P	C
Course Offered in: Department of Mathematics and Computing, B.Tech. 4th SEM(2024-28)		3	0	0	3

Pre-requisite: Basic Linear Algebra, Classical Mechanics, Introduction to Quantum Computing

Course Objectives:

- Understand the foundational concepts of linear algebra relevant to quantum mechanics.
- Apply vector spaces, eigenvalues/eigenvectors, and matrix decompositions in quantum computing.
- Develop understanding of quantum mechanics postulates using linear algebra.
- Model quantum systems and analyze quantum states using Dirac notation and operators.
- Bridge theoretical quantum mechanics with computational aspects relevant to quantum computing.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply vector spaces, inner products, and matrix operations in the context of quantum mechanics.	K3
CO2	Analyze quantum systems using linear transformations, eigenvalues, and eigenvectors.	K3
CO3	Interpret and manipulate quantum states and operators using Dirac notation.	K4
CO4	Apply the principles of quantum measurement, unitary evolution, and quantum postulates.	K4
CO5	Connect mathematical formalism with physical quantum systems and their simulation on quantum computers.	K5

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	-	-	-	1	-	2	2	3
CO2	3	3	3	2	2	-	-	-	1	-	2	2	3
CO3	3	3	2	2	3	-	-	-	1	-	2	2	3
CO4	3	3	3	2	3	-	-	-	1	-	2	2	3
CO5	3	3	3	3	3	-	-	-	1	-	2	2	3

Course Contents / Syllabus

Module 1	Vector Spaces and Linear Transformations	10 hours
Vector spaces, subspaces, basis, and dimension; Inner product spaces and orthogonality; Linear transformations and matrix representation; Change of basis and similarity transformations		
Module 2	**Matrix Theory and Eigen Concepts**	**10 hours**
Eigenvalues, eigenvectors, diagonalization; Spectral theorem for Hermitian matrices; Singular Value Decomposition (SVD); Applications to quantum state transformations		
Module 3	**Introduction to Quantum Mechanics**	**10 hours**
Postulates of quantum mechanics; Quantum states and wavefunctions; Operators, observables, and commutators; Dirac notation and Hilbert spaces		
Module 4	**Quantum Dynamics and Measurement**	**10 hours**
Unitary evolution and Schrödinger equation; Measurement postulate and projection; Quantum entanglement and density operators; No-cloning theorem and uncertainty principle		
Module 5	**Quantum Systems and Computation**	**8 hours**
Qubits and multi-qubit systems; Tensor product and entangled states; Quantum gates as unitary operations; Quantum teleportation and simple quantum algorithms		
Total Lecture Hours		**48 hours**

Textbook:

S.No	Book Title	Author
1	Linear Algebra and Its Applications, Pearson.	David C. Lay

2	Introduction to Quantum Mechanics, Cambridge University Press.	Griffiths and Schroeter
3	Quantum Computation and Quantum Information, Cambridge University Press.	Nielsen and Chuang

Reference Books:

S.No	**Book Title**	**Author**
1	Linear Algebra Done Right, Springer.	Sheldon Axler
2	Modern Quantum Mechanics, Pearson.	Sakurai & Napolitano,
3	Advanced Linear Algebra, Springer.	Roman

NPTEL/ Youtube/ Faculty Video Link:

Unit 1:	https://nptel.ac.in/courses/111104115
Unit 2:	https://ocw.mit.edu/courses/18-06-linear-algebra-spring-2010/
Unit 3:	https://nptel.ac.in/courses/115106065
Unit 4:	https://ocw.mit.edu/courses/8-04-quantum-physics-i-spring-2016/
Unit 5:	https://quantum.country/qcvc

Course Code: BASL0401N	**Course Name: Technical Communication**	**L**	**T**	**P**	**C**
Course Offered in: B. Tech. All branches (except CSBS)		**2**	**0**	**0**	**2**

Pre-requisite: Intermediate level (CEFR) and above

Course Objectives:

1. **Demonstrate effective verbal and non-verbal communication skills** in diverse professional settings, including meetings, presentations, and interpersonal interactions.
2. **Develop and apply clear, concise, and audience-appropriate written communication**, such as emails, letters, memos, resume', using correct grammar, tone, and format.
3. **Adapt communication style based on cultural, organizational, and situational contexts** to foster inclusive and respectful professional relationships.
4. **Employ digital communication tools and platforms** (e.g., video conferencing, business messaging apps) responsibly and effectively in remote or hybrid work environments.

Course Outcome: After completion of the course, the student will be able to

1. Comprehend the principles and functions of technical communication.
2. Write for specific audience and purpose to fulfil the provided brief.
3. Recognize and produce different kinds of technical documents.
4. Apply effective speaking skills to efficiently carry out official discourses.
5. Demonstrate their understanding of communication through digital media.

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1	1	1	1	1	2	1	1	2	3	1	2	-	-
CO2	1	1	1	1	1	1	1	1	2	3	1	2	-	-
CO3	1	1	1	1	1	1	1	1	2	3	1	2	-	-
CO4	1	1	1	1	1	1	1	1	2	3	1	2	-	-
CO5	1	1	1	1	1	1	1	1	2	3	1	2	-	-

Course Contents / Syllabus

Module 1	**Introduction to Technical Communication**	**4 Hours**

Technical Communication: Definition, Process, Types, Levels, and Flow; **Barriers to Technical Communication:** emphasis on gender neutral language and cultural sensitivity; **Significance of audience in technical communication**

Module 2	**Technical Writing 1**	**5 Hours**

Technical writing skill: characteristics, examples; **Business letters/emails**: Content organization, Tone and intent; **Agenda & Minutes of Meetings**

Module 3	**Technical Writing 2**	**5 Hours**

Job application, **Resume'**; **Report, proposal**; **Technical paper**: Abstract; **Ethical Writing:** Copy Editing, Referencing and Plagiarism

Module 4	**Public Speaking**	**6 Hours**

Components of effective speaking: Simplicity, order, balance in arranging ideas. Importance of *KOPPACT;* **Appearing for a job interview:** FAQs; **Telephonic & Online Interviews**

Module 5	**Virtual/Remote Communication**	**4 Hours**

Remote work: online platforms; **Video conferencing**; **Virtual etiquette**: email ids, usernames; **Writing Blogs & creating Vlogs**

Total Lecture Hours **24 Hours**

Textbook:

S.No	**Book Title**	**Author**
1	Technical Communication – Principles and Practices, 4th Edition	Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2022, New Delhi.

Reference Books:

S.No	Book Title	Author
1	Technical Communication, 15th Edition	John M. Lannon & Laura J. Gurak, Pearson, 2021.
2	Spoken English- A Manual of Speech and Phonetics (5th Edition).	R K Bansal & J B Harrison, Orient Blackswan, 2024, New Delhi.
3	Business Correspondence and Report Writing	Prof. R C Sharma, Krishna Mohan, and Virendra Singh Nirban (6Edition), Tata McGraw Hill & Co. Ltd., 2020, New Delhi

NPTEL/ Youtube/ Faculty Video Link:

Module 1:	https://onlinecourses.nptel.ac.in/noc24_ge37/preview
Module 2:	https://archive.nptel.ac.in/courses/109/106/109106094/
Module 3:	https://www.youtube.com/watch?v=kOJlwMJxEG0&t=8s
Module 4:	https://www.youtube.com/watch?v=Sg7Q_dC_fWU&list=PLPuC5CMHiqmuzq_KQ4aw0V9Q7xJY6aezb
Module 5:	https://www.youtube.com/watch?v=ymLFJDpjgCk&list=PLPuC5CMHiqmuzq_KQ4aw0V9Q7xJY6aezb&index=6

NIET Greater Noida

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)
School of Computer Science in Emerging Technologies

LAB Course Code BCSE0452Z	**LAB Course Name Database Management System Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		**0**	**0**	**4**	**1**
Pre-requisite: Basic knowledge of computer fundamentals, programming, data structures, relational database concepts.					
Course Objectives: To familiarize the students to the basics of Database Design and Implementation.					

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Design ER/EER models to solve real-world problems and Implement them into relational schemas using appropriate database tools.	K6
CO2	Apply SQL and PL/SQL to create complex data queries, and procedural operations comprising triggers and functions, along with database connectivity.	K6
CO3	Analyze database integrity using constraints, and implement unstructured databases using MongoDB with appropriate query operations.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	3	3	3	2	3	-	-	-	2	-	2	3	-
CO2	3	3	3	2	3	-	-	-	2	-	2	3	-
CO3	3	3	3	3	3	-	-	-	2	-	2	3	-
CO4	3	3	3	3	3	-	-	-	2	-	2	3	-
CO5	3	3	3	3	3	-	-	-	2	-	2	3	-

Sr. No	**Program Title**	**CO Mapping**
1	Understand and implement the different ER diagram notation with their relationship and Cardinalities.	CO1
2	Creating ER Diagram for company Database. Company database have entities like employee, departments, projects and dependents also implement the relationship and cardinalities between the entities with their relevant attribute.	CO1
3	Implement DDL, DML, DCL & TCL commands	CO1
4	Implementation of I/O Constraint: Primary Key, composite primary key, Foreign Key with on delete set null and on delete set null constraint, Unique Key	CO2

5	Implementation of Business Constraint: Null, Not Null, Default, Check.	CO2
6	Practicing Queries using Like, Between, Aliases, distinct Operator & Predicate. And Implement Aggregate Functions	CO2
7	Implementation of Queries using Where, Group by, Having and Order by Clause.	CO2
8	Create a table EMPLOYEE with following schema:-(Emp_no, E_name, E_address, E_ph_no, Dept_no, Dept_name,Job_id, Designation, Salary) Write SQL statements for the following query. i. List the E_no, E name, Salary of all employees working for MANAGER. ii. Display all the details of the employee whose salary is more than the Sal of any IT PROFF. iii. List the employees in the ascending order of Designations of those joined after 1981. iv. List the employees along with their Experience and Daily v. List the employee who are either 'CLERK' or 'ANALYST'. vi. List the employees who joined on 1-MAY-81, 3-DEC-81, 17-DEC-81. vii. List the e_name those are starting with 'S'. viii. Display total salary spent for each job category. ix. Display lowest paid employee details under each manager. x. Display number of employees working in each department and their department name. xi. Display the details of employees sorting the salary in increasing order.	CO3

	xii. Show the record of employee earning salary greater than 16000 in each department. xiii. Add constraints to check, while entering the empno value (i.e) empno> 100. xiv. Define the field DEPTNO as unique. Create a primary key constraint for the column (EMPNO).	
9	Implementation of Queries using set theory operators UNION, INTERSECT, MINUS.	CO3
10	Implementation of Queries using Inner Join:- Natural Join , Equi Join & Non Equi Join, Outer Join	CO3
11	Implementation of Queries nested Queries or Sub Queries: - IN, NOT IN, Exists, Not Exists, All and Any.	CO3
12	1. Apply the set theory operators, join's and nested queries on company database (Case Study-1) Write the SQL Queries for the following statement. I. Retrieve the names of employees in department 5 who work more than 10 hours per week on the 'ProductX'project. II. List the names of employees who have a dependent with the same first name as themselves. II. Find the names of employees that are directly supervised by 'Franklin Wong'. V. For each project, list the project name and the total hours per week (by all employees) spent on that project. V. Retrieve the names of all employees who work on every project controlled by department 5. VI. Retrieve the names of all employees who do not work on every project	CO3

	II. For each department, retrieve the department name, and the average salary of employees working in that department. II. Retrieve the average salary of all female employees. X. Find the names and addresses of all employees who work on at least one project located in Houston but whose department has no location in Houston. X. List the last names of department managers who have no dependents. XI. Retrieve the names of all employees who work in the department that has the employee with the highest salary among all employees.	
13	Understand & implement the Database Connectivity with Java/Python etc. programming language	CO3
14	Implementation and apply all the set theory operators, join and nested queries concept on Case study 1. I. Make a list of all project members for projects that involve an employee whose name is SCOTT either as a worker or as a manager of the department that controls the project. II. To retrieve the Social Security numbers of all employees who either work in department 5 or directly supervise an employee who works in department 5. III. To retrieve the SSN of all employee who work as a supervisor not a manager. IV. We want a list of all employee names as well as the name of the departments they manage if they happen to manage a department; if they do not manage one, we can indicate it with a NULL value. V. Retrieve the names of employees who have no dependents. VI. List the names of all employees with two or more dependents.	CO3

	VII. List the names of managers who have at least one dependent. III. Retrieve the names of all employees who do not have supervisors. IX. Retrieve the name of each employee who has a dependent with the same Last name as the employee.	
15	Implementation of Indexing, Views and sequence	CO3
16	I. Write a PL/SQL Program to Add Two Numbers II. Write PL/SQL Program for Fibonacci Series III. Write PL/SQL Program to Find Greatest of Three Numbers	CO3
17	Write a Pl/SQL code block to calculate the area of a circle for a value of radius varying from 3 to 7. Store the radius and the corresponding values of calculated area in an empty table named Areas, consisting of two columns Radius and Area.	CO3
18	Write a PL/SQL code block that will accept an account number from the user, check if the users balance is less than the minimum balance, only then deduct Rs.100/- from the balance.	CO3
19	Create a row level trigger for the customers table that would fire for INSERT or UPDATE or DELETE operations performed on the CUSTOMERS table. This trigger will display the salary difference between the old values and new values:	CO3
20	Implementation of commit and rollback statement with amount transfer example.	CO4
21	Implementation array, indexing, transaction concept on Case study 1. I. Implementation of Array Functions & Operators II. Implementation of Sequence • Creating Sequences • Modifying a Sequence Definition • Removing Sequences III. Implementation of Views	CO4

	• Creating Simple and Complex Views • Modifying Views • Removing Views IV. Implementation of Indexes • Manual and Automatic Indexes • Creating Indexes Removing Indexes	
22	Study of Open Source NOSQL Database and installation of MongoDB	CO5
23	Implementation of the MongoDB Shell commands	CO5
24	Implementation of the CRUD Operation in MongoDB	CO5
25	Implementation of Aggregate in MongoDB	CO5
26	Implementation of case Study on different domain I. E-commerce Platform II. Inventory Management III. Railway System IV. Hospital Data Management V. Voice-based Transport Enquiry System VI. SMS-based Remote Server Monitor system Banking System	CO1, CO2, CO3, CO4, CO5

LAB Course Code: BCSE0451	**LAB Course Name: Data Structures and Algorithms Lab -II**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		**0**	**0**	**4**	**1**
Pre-requisite: Programming Language					
Course Objectives: Learn to implement linear data structures.					

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Implementation of tree data structures for basic operations like insertion, deletion, searching and traversal.	K3
CO2	Implementation of algorithms based on graph data structures for solving real world problems.	K3
CO3	Implementing Dynamic Programming, Backtracking, Branch and Bound algorithms to solve complex data efficiently and effectively.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	3	3	3	1	2	-	2	1	2	3	3	3
CO2	3	2	3	3	3	1	2	-	2	1	2	3	3	3
CO3	3	2	3	3	2	1	2	-	2	1	2	3	3	3

Lab Experiments

List of Practical's

Sr. No.	**Program Title**	**CO Mapping**
1	**Write a program to implement an in-order traversal of a binary tree and print the nodes.**	**CO1**
2	**Write a program to implement a pre-order traversal of a binary tree and print the nodes.**	**CO1**
3	**Write a program to implement a post-order traversal of a binary tree and print the nodes.**	**CO1**
4	**Write a program to count number of nodes in a binary tree**	**CO1**

5	Write a program to find the height of the tree	CO1
6	Write a program to check if the Binary tree is balanced or not.	CO1
7	Write a Program to search a number in Binary Search Tree (BST)	CO1
8	Write a program to insert a node in a Binary Search Tree (BST).	CO1
9	Write a program to delete a node from a Binary Search Tree (BST).	CO1
10	Write a program to implement a max-heap and perform heap sort on an array of integers.	CO1
11	Write a Program to implement human coding algorithm	CO1
12	Write a program to implement priority queue using max heap.	CO1
13	Write a program to create a graph using an adjacency matrix.	CO2
14	Write a program to create a graph using an adjacency list.	CO2
15	Write a program to perform Depth-First Search (DFS) on a graph.	CO2
16	Write a program to perform Breadth-First Search (BFS) on a graph.	CO2

17	Write a program to check if there is a path between two nodes in a graph using DFS.	CO2
18	Write a program to find all the vertices reachable from a given vertex in a graph using BFS.	CO2
19	Write a program to detect a cycle in an undirected graph using DFS.	CO2
20	Write a program to detect a cycle in a directed graph using DFS.	CO2
21	Write a program to find the degree of each vertex in an undirected graph.	CO2
22	Write a program to count the number of connected components in an undirected graph.	CO2
23	Write a program to implement Dijkstra Algorithm.	CO2
24	Write a program to implement Prims Algorithm.	CO2
25	Write a program to implement Kruskal Algorithm.	CO2
26	Write a program to implement Floyd Warshall’s all pair shortest path algorithm.	CO3
27	Write a program to implement Bellman ford Algorithm.	CO3
28	Write a program to implement Longest common subsequence (LCS).	CO3
29	Write a program to implement sum of subset problem using backtracking.	CO3
30	Write a program to implement insertion and search operations in a Tree.	CO3

NIET Greater Noida

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Code: BCSE0455	LAB Course Name: Web Technologies	L	T	P	C
Course Offered in: CSE/CSE (R)/ IT/ CSE(Twin)/IT(Twin)/ CSE(Prof)/IT(Prof)/ CS/ CSE(DS)/CSE(IOT) /CSE(AIML)/CSE(AI)/CSE(CYS)/ M&C/M.Tech (Integrated)		0	0	6	3

Pre-requisite: Basic Understanding of Web Development: Familiarity with web development concepts, such as client-server architecture, HTTP, and URLs.

Course Objectives: Develop a comprehensive understanding of the web development lifecycle, including planning, design, development, and deployment, while gaining proficiency in core web technologies such as HTML, CSS, JavaScript, and server-side programming. Acquire the skills to create responsive, accessible, and user-friendly websites that address real-world problems and meet the functional and aesthetic requirements of users and stakeholders.

Course Outcome: After completion of the course, the student will be able to		**Bloom's Knowledge Level (KL)**
CO1	Understand various HTML5 elements and construct web pages using HTML5 and CSS3.	K3
CO2	Develop responsive web pages using Bootstrap framework.	K4
CO3	Understand and apply JavaScript and ES6 features to create user-interactive web pages.	K6
CO4	Analyze and implement concepts of XML and JSON.	K5
CO5	Design and develop dynamic web pages using PHP as a server-side scripting language	K6

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	2	-	-	-	2	2	-	3	1
CO2	3	2	3	2	3	-	-	-	2	1	2	1	2
CO3	3	2	3	-	3	-	-	-	2	2	2	2	3
CO4	3	3	3	2	3	-	1	-	2	2	2	3	2
CO5	3	3	3	2	3	-	-	-	2	2	2	2	1

Course Contents / Syllabus

Module 1	**Introduction to HTML & CSS**	**2L+4P**

HTML Basics, Tables, List, Working with Links, Image Handling, Frames, HTML Forms for User Input and New Form Elements CSS3: What CSS can do, CSS Syntax ,Types of CSS, Working with Text and Fonts-Text Formatting, Text Effects, Fonts, CSS Selectors- Type Selector, Universal Selector, ID Selector, Class selector, Colors and Borders, Implementing CSS3 in the "Real World", Modernizr, HTML5 Shims, SASS, and Other CSS Preprocessors, CSS Grid Systems, CSS Frameworks.

Module 2	**Responsive Websites with Bootstrap**	**4L+8P**

Setting The Viewport, Responsive Images, Responsive Text Size, Media Queries, Responsive Web Page (Full). Introduction, Getting Started with Bootstrap, Bootstrap Basics- Bootstrap grid system, Bootstrap Basic Components, Bootstrap Components: Page Header, Breadcrumb, Button Groups, Dropdown, Nav & Navbars

Module 3	**Introduction to JavaScript and ES6**	**6L+8P**

JavaScript Essentials: Introduction to Java Script , Javascript Types :Implementation of Java Script Types Var, Let and Const Keywords: Implementation of var, let and const keywords Operators in JS, Conditions Statements, Java Script Loops, Implementation of JS Operators and Control Statement JS Popup Boxes: Implementation of Popup Boxes JS Events, Implementation of Java Script Event JS Arrays, Working with Arrays: Implementation of Java script Array. Error Handling by using try/catch block Validation of Forms, implementing validation of forms Arrow functions and default

arguments: Implementing arrow function and default argument. Implementation of de-structuring Spread and Rest Operator Implementing Spread and Rest Operator Typescript fundamentals: Typescript OOPs- Classes, Interfaces, Constructor, Implementation of Typescript OOPs concepts. Decorator and Spread Operator: Implementation of Decorator and Spread Operator, Difference == & ===, Asynchronous Programming in ES6, Promise Constructor, Promise with Chain, Promise Race: Implementation of Asynchronous Programming in ES6 Implementation of Promise constructor, Implementation of Promise with Chain and Promise Race Multiple Random Variables: Joint density and distribution Function, Properties of Joint Distribution function, Marginal density Functions, Conditional Distribution and Density, Statistical Independence, Central Limit Theorem (Proof not expected).		
Module 4	**Introduction to XML and JSON**	**5L+10P**
Introduction to XML, Uses of XML: Implementation of XML, simple XML, XML key components: Describing various XML Key Components.XML DTD and Schema. Well-formed XML, Using XML Application: Implementing Well-formed XML, XML with applicationIntroduction to XSL, XML transformed with simple example, XSL elements,transforming with XSLT: Implementing XSL and XSLT.Introduction, Object, Array, Comments, Compare, Server, PHP JSON		
Module 5	**Introduction to PHP**	**5L+12P**
Introduction to PHP, Basic Syntax, Variables & Constants: Implementation of Basic Syntax, variable and constants Data Type: Implementation of Data Types, Operator & Expressions, Control flow and Decision making statements: Implementation of control flow and decision making statement ,Functions, Strings, Arrays, Implementation of Functions String and Array.Working with files and directories: Understanding file& directory, Opening and closing, a file, Coping, renaming and deleting a file, working with directories, Creating and deleting folder, File Uploading & Downloading. Implementing on Working with files and directories.Session & Cookies: Introduction to Session Control, Session Functionality, Cookie, Setting Cookies with PHP. Introduction to MySql Database and its Connectivity with PHP		
	Total Lecture Hours	**72 hours**

Text Books:

1. Web Technology and Design", 1nd Edition 2003, New Age International.
2. Internet and Web Technologies", 2nd Edition 2017,Mc Graw Hill Education.
3. Beginning PHP Laravel",2nd Edition 2020, kindle Publication.

Reference Books:

1. Collaborative Web Development" 5th Edition 1999, Addison Wesley
2. Fundamentals of Web Development",3rd Edition 2016,
3. Introduction to Web Development with HTML,CSS, JavaScript.

Links: NPTEL/You Tube/Web Link

Unit 1	https://www.youtube.com/watch?v=x3c1ih2NJEg
Unit 2	https://www.youtube.com/watch?v=x3c1ih2NJEg
Unit 3	https://www.youtube.com/watch?v=PMsVM7rjupU&list=PL6n9fhu94yhUA99nOsJkKXBqokT3MBK0b

Unit 4	https://www.youtube.com/watch?v=uDwSnnhl1Ng&list=PLsyeobzWxl7qtP8Lo9TReqUMkiOp446cV
Unit 5	https://www.techradar.com/in/web-hosting/what-are-the-different-types-of-web-hosting

List of Practical

1	Implementation of various html tags.	CO1
2	Apply various colors to suitably distinguish keywords , also apply font styling like italics, underline and two other fonts to words you find appropriate , also use header tags.	CO1
3	Create a webpage with HTML describing your department use paragraph and list tags	CO1
4	Create links on the words e.g. —Wi-Fi and —LAN to link them to Wikipedia pages.	CO1
5	Insert an image and create a link such that clicking on image takes user to other page.	CO1
6	Change the background color of the page; At the bottom create a link to take user to the top of the page.	CO1
7	Use frames such that page is divided into 3 frames 20% on left to show contents of pages, 60% in center to show body of page, remaining on right to show remarks.	CO1
8	Design a HTML registration form that takes user name, user password and mobile number with submit button control	CO1
9	Design a HTML5 document that implement of date, number, range, email, search and data list.	CO1
10	Create a simple form to submit user input like his name, age, address and favourite subject, movie and singer.	CO1
11	Add few form elements such as radio buttons, check boxes and password field. Add a submit button at last.	CO1
12	Add CSS property assign a style or behavior to an HTML element such as: color, border, margin and font-style	CO1
13	Add To Style Text Elements with Font, Size, and Color in CSS	CO1
14	Applying a block element in CSS acquires up the full width available for that content.	CO1
15	Resize an image to fit its content box, and position the image 5px from the left and 10% from the top inside the content boxes	CO1
16	Applying CSS Table: Styling even and odd cells	CO1

17	Applying list-style-type property in CSS with example	CO1
18	Design a web page by applying css id and class selectors	CO1
19	Demonstrating the CSS Box model with consists of: borders, padding, margins, and the actual content.	CO1
20	Design a web page by applying CSS grouping and dimensions property.	CO1
21	Design a web page by applying CSS Display and Positioning property	CO1
22	Design a web page by applying CSS Display and Positioning property.	CO1
23	Design a web page by applying CSS pseudo classes.	CO1
24	Design a web page by applying CSS Navigation Bar.	CO1
25	Design a web page such as home page, contact us, about us etc. by using 3 ways of CSS layout	CO1
26	Design a basic structure of Bootstrap Grid system.	CO2
27	Design All Bootstrap Components with example.	CO2
28	Design a responsive web page by using setting viewport, image and media control.	CO2
29	Create an image gallery where users can click on an image thumbnail to view the full-sized image with interactive features like zooming or sliding.	CO3
30	Utilize the HTML5 canvas element and JavaScript to create dynamic animations, such as a bouncing ball, a moving character, or a visual representation of a physics concept.	CO3
31	Use JavaScript and the HTML5 canvas element to apply various image manipulation techniques like filters, cropping, resizing, or adding text overlays.	CO3
32	Implement a text-to-speech feature on a webpage using JavaScript and the Web Speech API, allowing users to have the text read aloud to them..	CO3
33	Creating a Java Script program to implement Dialog, Confirm and Alert Popup Boxes.	CO3
34	Design a HTML form validation using Java Script.	CO3
35	Write a program to implement Arrow function with default argument in ES6	CO3
36	Implementing a program in ES6 to implement Template string concepts	CO3
37	Implementing a program in ES6 to implement all string methods	CO3
38	Implementing a program to implement call back functions in ES6.	CO3
39	Implementing a program for de-structuring of an array in ES6	CO3
40	Javascript code that should compile by Typescript compiler as’tsc’	CO3
41	Javascript code to implement object and class concepts in Typescript.	CO3

42	Write a Typescript program that implement interface and constructor.	CO3
43	Write a code in typescript that implement decorator and spread operator	CO3
44	Write a code in typescript that implement Asynchronous Programming concepts.	CO3
45	Write a program in Typescript that implement promise constructor	CO3
46	Implementing promise and chain concepts in Typescript	CO3
47	Write a code in typescript that implement Promise.race() static method.	CO3
48	Creating a XML document that defines the self-descriptive tags	CO4
49	Designing XML document that store various book data such as: book category, title, author, year and price	CO4
50	To Describe the various types of XML key components	CO4
51	Design XML DTD to define the structure and legal element and attribute of XML document	CO4
52	Design a XML document of CD Catalog through each <CD> element, and displays the values of the <ARTIST> and the <TITLE> elements in an HTML table	CO4
53	Create a XSL/XSLT document.	CO4
54	Show how Parsing, Implementing and Modification of JSON Data is done.	CO4
55	Create a constant by using define() function with its proper syntax	CO5
56	Creating PHP script that return any data types whatever you use.	CO5
57	Crating a program that implement control flow and decision making statement.	CO5
58	Creating PHP to implements parameterized function	CO5
59	Creating program in PHP to store multiple string and concatenate these string and print it.	CO5
60	Implements single dimension array in PHP	CO5
61	Write a PHP code to open and close a file in a proper manner	CO5
62	Write a PHP script to copying, renaming and deleting a file.	CO5
63	Write a PHP script to create and delete directory structure	CO5
64	Program to upload and download a file in PHP	CO5
65	PHP program to create and destroy a session.	CO5
66	PHP program to set and delete a cookie.	CO5

67	PHP program to manually register and destroy the session variable	CO5
68	PHP program to create databse and show mysql database connectivity	CO5
69	PHP program to insert record into a table.	CO5
70	PHP program delete record from a table	CO5
71	PHP program to update a record into MYSQL. database	CO5
72	PHP program restore the session the session	CO5
73	PHP program to show all records from database.	CO5
74	PHP program to manually set the session variable and destroy it.	CO5

NIET Greater Noida	NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science in Emerging Technologies

Course Code: BCSCC0452	**Course Name: Problem Solving Approaches**	**L**	**T**	**P**	**C**
Course Offered in: B. Tech. All branches (except CSBS)		**2**	**0**	**0**	**1**
Pre-requisite: Programming Language C/C++ or Java or Python					

Course Objectives:

1. **Demonstrate effective verbal and non-verbal communication skills** in diverse professional settings, including meetings, presentations, and interpersonal interactions.
2. **Develop and apply clear, concise, and audience-appropriate written communication**, such as emails, letters, memos, resume', using correct grammar, tone, and format.
3. **Adapt communication style based on cultural, organizational, and situational contexts** to foster inclusive and respectful professional relationships.
4. **Employ digital communication tools and platforms** (e.g., video conferencing, business messaging apps) responsibly and effectively in remote or hybrid work environments.

Course Outcome: After completion of the course, the student will be able to

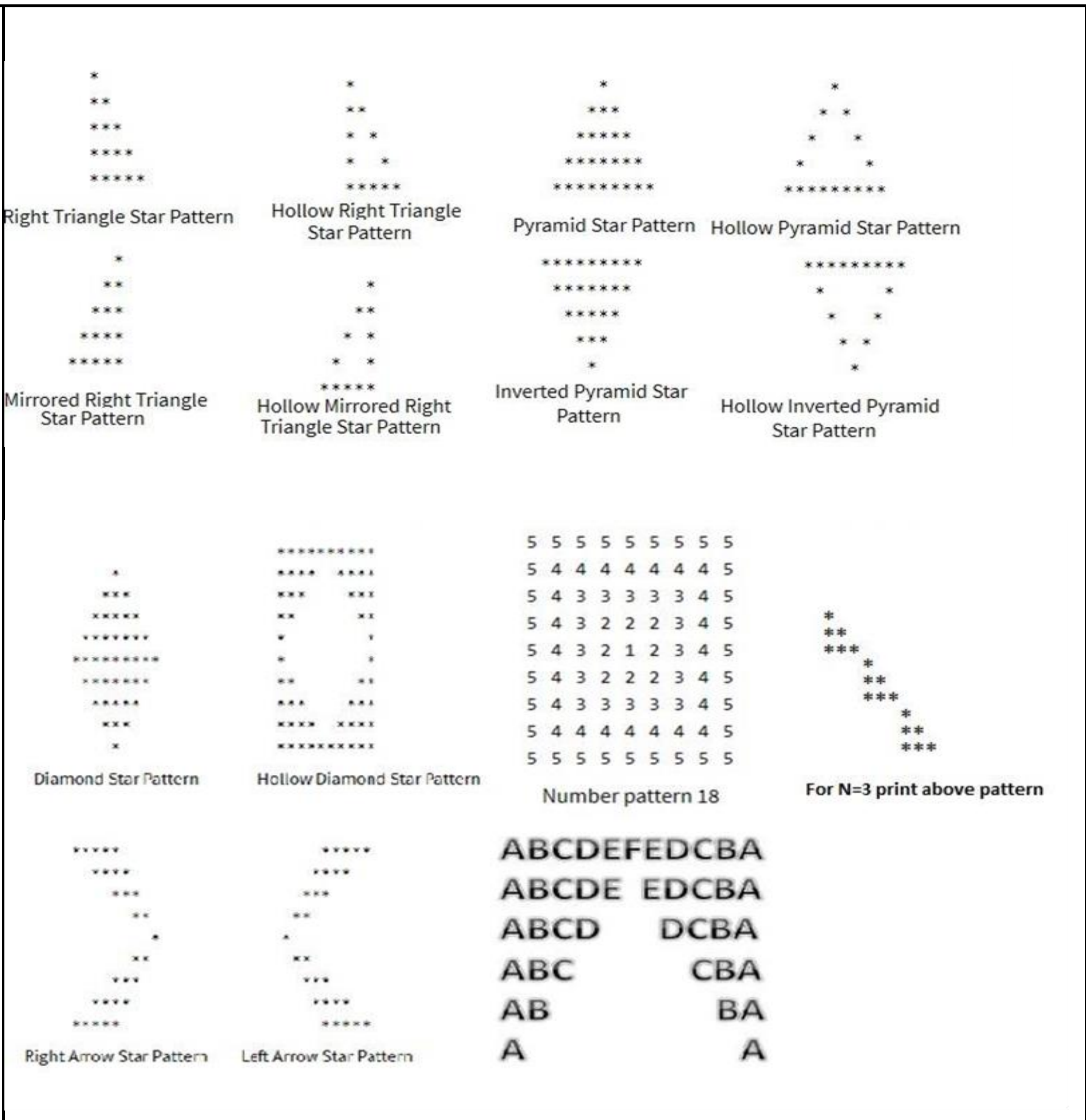
CO1	Develop logic-based solutions using control statements, recursion and bit manipulation to solve basic and intermediate computational problems.	K6
CO2	Implement and manipulate arrays and strings using fundamental and advanced searching sorting techniques.	K3
CO3 6	Analyze and debug code for logical errors and improve the efficiency of the solution using appropriate data structures and algorithmic patterns.	K4

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	2	2	1	2	2	-	-	2	3	3	3
CO2	3	3	2	2	2	-	2	-	-	-	2	2	2	3
CO3	3	3	2	2	3	1	2	2	-	-	3	3	3	3

Sr. No	**Program Title**	**CO Mapping**
1	**Secure Password Generator** A company wants to create a secure password generator for their employees. The password must be based on specific numeric properties to enhance its complexity and security. Write a program to validate and generate a secure password according to the following rules: ***1. Prime Number Validation:*** • The user must input a 3-digit number. The program should first check if the number is a prime number. • If it is not a prime number, the user should be prompted to enter another number until a valid prime number is provided. ***2. Sum of Digits Check:***	CO1

	• Once a valid prime number is entered, calculate the sum of its digits. If the sum of the digits is not divisible by 3, ask the user to enter another prime number until a valid one is found. ***3. Armstrong Number Check:*** • Check entered prime number is Armstrong or not? If Armstrong are found, prompt the user to enter another prime number and repeat the process. **Password Generation:** Concatenate the 1 if entered prime number is Armstrong otherwise 2 with the sum of the digits of the valid prime number to form the secure password. **Example Scenario:** ***Sample Input*** Enter a 3-digit prime number: 153 Sum of digits of 153 = 9 The sum is divisible by 3. 153 is Armstrong number ***Sample Output*** Secure Password: 19	
2	Write a function to input electricity unit charges and calculate total electricity bill according to the given condition: For first 50 units Rs. 0.50/unit For next 100 units Rs. 0.75/unit For next 100 units Rs. 1.20/unit For unit above 250 Rs. 1.50/unit An additional surcharge of 20% is added to the bill	CO1
3	Write a method to generate a secure code which the sum of all possible palindrome numbers between given two numbers. For Example: **Input**: 10, 80 **Output**: 308 **Explanation**: All palindrome numbers between 10 & 80 are: 11,22,33,44,55,66,77 Password= 11+22+33+44+55+66+77 = 308	CO1
4	Draw **the following Patterns for N=5**	CO1



```
*
**
***
****
*****
```

Right Triangle Star Pattern

```
*
**
* *
*  *
*****
```

Hollow Right Triangle Star Pattern

```
    *
   ***
  *****
 *******
*********
```

Pyramid Star Pattern

```
    *
   * *
  *   *
 *     *
*********
```

Hollow Pyramid Star Pattern

```
    *
   **
  ***
 ****
*****
```

Mirrored Right Triangle Star Pattern

```
    *
   **
  * *
 *  *
*****
```

Hollow Mirrored Right Triangle Star Pattern

```
*********
 *******
  *****
   ***
    *
```

Inverted Pyramid Star Pattern

```
*********
 *     *
  *   *
   * *
    *
```

Hollow Inverted Pyramid Star Pattern

```
    *
   ***
  *****
 *******
*********
 *******
  *****
   ***
    *
```

Diamond Star Pattern

```
**********
****  ****
***    ***
**      **
*        *
*        *
**      **
***    ***
****  ****
**********
```

Hollow Diamond Star Pattern

```
5 5 5 5 5 5 5 5 5
5 4 4 4 4 4 4 4 5
5 4 3 3 3 3 3 4 5
5 4 3 2 2 2 3 4 5
5 4 3 2 1 2 3 4 5
5 4 3 2 2 2 3 4 5
5 4 3 3 3 3 3 4 5
5 4 4 4 4 4 4 4 5
5 5 5 5 5 5 5 5 5
```

Number pattern 18

```
*
**
***
    *
    **
    ***
        *
        **
        ***
```

For N=3 print above pattern

```
*****
 ****
  ***
   **
    *
   **
  ***
 ****
*****
```

Right Arrow Star Pattern

```
    *****
   ****
  ***
 **
*
 **
  ***
   ****
    *****
```

Left Arrow Star Pattern

```
ABCDEFEDCBA
ABCDE EDCBA
ABCD   DCBA
ABC     CBA
AB       BA
A         A
```

5	Write a program that takes an integer n as input and prints the multiplication table of n from n * 1 to n * 10. The output should clearly show each multiplication step.	CO1
6	Write a program to calculate the sum of all integers from 1 to a given number N. The program should take N as input and output the total sum using iteration or recursion.	CO1
7	**Find the GCD of Two Numbers Using Recursion:** Write a recursive function to calculate the Greatest Common Divisor (GCD) of two numbers using Euclid’s algorithm. The function should take two integers as input and return their GCD.	CO1
8	**Find the LCM of Two Numbers Using Recursion:**	CO1

	Write a program to compute the Least Common Multiple (LCM) of two numbers using recursion. You may use the relationship LCM(a, b) = |a * b| / GCD(a, b) and a recursive function for GCD.	
9	Write a program to count the number of set bits (1s) in the binary representation of a given integer. The program should efficiently use bitwise operations to perform the task without converting the number to a string.	CO1
10	Write a program that takes a number and a bit position as input and checks whether the bit at that position is set (1) or clear (0). Use bitwise operators to perform the check	CO1
11	Given a number and a position, write a program to toggle (invert) the bit at the given position using bitwise operations. The result should reflect the updated value of the number after flipping the bit.	CO1
12	Write a program to compute the XOR of all numbers from 1 to n using a mathematical pattern (not a loop). Use bitwise XOR properties to achieve an efficient solution.	CO1
13	Given an array of size n-1 containing unique elements from 1 to n, find the missing number using bit manipulation (preferably XOR approach) without sorting or using extra space.	CO1
14	Given an array where all elements repeat twice except two elements that appear only once, write a program to find the two non-repeating elements using bitwise operations in linear time and constant space.	CO1
15	Write a program to check if a given number is a power of two using bit manipulation. A number is a power of two if it has exactly one set bit in its binary representation.	CO1
16	Given two integers A and B, write a program to count how many bits need to be flipped to convert A to B. Use XOR to find differing bits and count the number of set bits.	CO1
17	Write an efficient program to count the total number of set bits in binary representations of all numbers from 1 to n. Optimize the approach using bitwise logic and recursion.	CO1

18	Write a program to calculate the square of a number using only bitwise operations and addition. Do not use multiplication, division, or any power functions.	CO1
19	Write a function to add two integers using bitwise operations only. Avoid using the + or - operators. Implement logic using XOR and AND operations for binary addition.	CO1
20	Write a program to generate the power set (all subsets) of a given set using bitwise representation. Each subset can be represented by a binary number where each bit indicates inclusion of the corresponding element.	CO1
21	Sarah is assisting the "MathMinds Club" in creating passwords for their online platform. They have a list of numbers, some stable and some unstable. Define a function that can help Sarah calculate the password according to the given scenario. Scenario: • There are N numbers provided. • A number is stable if each digit appears the same number of times. • A number is unstable if the frequency of its digits is not the same. • The password is computed as the sum of all stable numbers minus the sum of all unstable numbers. • Consider only those numbers in the list that have more than equal to three digits. For example: Input: N=5 List: 12, 1313, 122, 678, 898 Output: Password: 971	CO2, CO3
22	Given an array of integers, including possible negative values, you are allowed to modify at most one element by doubling its value. The goal is to find the maximum possible sum of any subarray after making this modification. **Input**: arr = [-2, 1, -3, 4, -1, 2, 1, -5, 4] Expected Output: • Original Maximum Subarray Sum: 6 (achieved from [4, -1, 2, 1])	CO2, CO3

	• Maximum Sum After Modification: 10(achieved from [8, -1, 2, 1], where the value 4 is doubled to 8).	
23	For a given string, generate a pattern based on the following rules: **Input:** A string of characters (e.g., "HAT"). ***Output:*** *Generate patterns by replacing characters with the numeric value 1 and process the patterns as described below:* 1. **Replace one character at a time with 1:** ○ For each character in the string, replace it with 1, keeping the other characters unchanged. ○ Example for "HAT": 1AT, H1T, HA1 2. **Replace two characters at a time with 1:** ○ Replace every combination of two characters with 1, keeping the remaining character unchanged. ○ If 1s are consecutive, replace them with their sum (e.g., 11T becomes 2T). ○ Example for "HAT": 11T → 2T, H11 → H2, 1A1 3. **Replace all characters with 1:** ○ Replace all characters in the string with 1. ○ If there are consecutive 1s, sum them up (e.g., 111 becomes 3). ○ Example for "HAT": 111 → 3 ***Final Output*** For the string "HAT", the output should be: 1AT, H1T, HA1, 2T, H2, 1A1, 3.	CO2, CO3
24	Given a sorted array arr [] and a target value, the task is to count triplets (i, j, k) of valid indices, such that arr[i] + arr[j] + arr[k] = target and i < j < k. **Examples**: Input: arr[] = [-3, -1, -1, 0, 1, 2], target = -2 Output: 4	CO2, CO3

25	You are given an array prices[] where prices[i] represents the price of a given stock on day i. You want to maximize your profit by choosing a single day to buy one stock and choosing a different day in the future to sell that stock. Write a program to return the maximum profit you can achieve from this transaction. If no profit is possible, return 0.	CO2, CO3
26	Find **the "Kth" max and min element of an array:** Given k, find the k-th smallest and k-th largest element in the array. Input: arr = [7, 10, 4, 3, 20, 15], k = 3 Output: Kth Smallest: 7, Kth Largest: 10	CO2, CO3
27	Sort a binary array with values 0, 1, and 2 using constant space and one pass (Dutch National Flag algorithm). **Input:** [0, 2, 1, 2, 0] **Output:** [0, 0, 1, 2, 2]	CO2, CO3
28	Find **longest consecutive subsequence:** Return the length of the longest consecutive elements sequence. Input: [1, 9, 3, 10, 4, 20, 2] Output: 4 (Sequence: 1, 2, 3, 4)	CO2, CO3
29	Given a number of bits and a number K. In one flip you can toggle exactly K consecutive bits. With only this flip operation available, convert the string into all 1. Input String: 0000110000 and K=3 Following are four flip operations by using which all bits converted into 1's. Flip1-1110110000 Flip2- 1110110111 Flip3-1111000111 Flip4- 1111111111 If it is not possible to convert all bits into one's then print "IMPOSSIBLE".	CO2, CO3
30	Given a list of non-negative integers, arrange them in such a way that they form the largest possible number. Since the result can be very large, return it as a string in **O(N log N)** time complexity.	CO2, CO3

	Example-1 **Input**: N = 5 Arr[] = {3, 30, 34, 5, 9} **Output**: 9534330 **Example-2** **Input**: N = 4 Arr[] = {54, 546, 548, 60} **Output**: 6054854654	
31	Given an array arr[] of size n containing distinct integers within the range [1, n+2], find the two missing numbers from the first n+2 natural numbers. **Constraints:** • The solution must run in **O(N) time** and use **O(1) extra space**. • The array does not contain duplicate values. **Examples:** **Input:** arr[] = [1, 2, 4, 6, 3, 8], n = 6 **Output:** 5, 7	CO2, CO3
32	Given a string str of lowercase alphabets and a number k, the task is to print the minimum value of the string after removal of k characters. The value of a string is defined as the sum of squares of the count of each distinct character present in the string. Return the minimum possible required value. **Examples:** **Input:** str = “abccc”, k = 1 **Output:** 6 **Input**: str = “aabcbcbcabcc”, k = 3 **Output**: 27 **Expected Time Complexity:** O(n+klog(p)) **Note**: Here n is the length of string and p is number of distinct alphabets and k number of alphabets to be removed.	CO2, CO3
33	Given a non-negative integer **S** represented as a string, remove **K** digits from the number so that the new number is the smallest possible. **Note :** The given *num* does not contain any leading zero. **Expected Time Complexity:** O(|S|).	CO2, CO3

	Example 1: **Input:** S = "149811", K = 3 **Output:** 111 **Example 2:** **Input**: S = "1002991", K = 3 **Output:** 21	
34	You are given a two-dimensional grid board[][] of size n * m consisting of English letters and a string target. Your task is to determine whether the target word can be formed by sequentially connecting letters from the grid. You may move to adjacent cells **horizontally or vertically** (not diagonally), and **a cell may not be reused** once it is part of the current path. **Examples:** **Input:** board[][] = [['C', 'A', 'T'], ['R', 'A', 'K'], ['T', 'O', 'N']], target = "CART" **Output:** true **Explanation:** You can trace the word "CART" through the path: C → A → R → T (moving horizontally and vertically, without repeating cells).	CO2, CO3
35	Given an encoded string **s**, the task is to decode it. The encoding rule is: - **k[encodedString],** where the **encodedString** inside the square brackets is being repeated exactly **k** times. Note that **k** is guaranteed to be a positive integer, and encodedString contains only lowercase english alphabets. **Note:** The test cases are generated so that the length of the output string will never exceed 10^5. **Examples:** **Input:** s = "1[b]" **Output:** "b" **Input:** s = "3[b2[ca]]" **Output:** "bcacabcacabcaca"	CO2, CO3

NIET Greater Noida

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY

GREATER NOIDA-201306

(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Code: BNC0301	Course Name: Artificial Intelligence and Cyber Ethics	L	T	P	C
Course Offered in: B. Tech.		2	0	0	2

Pre-requisite: Basic understanding of AI, Cybercrime, Computer System and Ethics

Course Objectives: The course aims to foster critical thinking about ethical issues, promote responsible use of technology, and ensure students can identify, analyze, and address ethical dilemmas in Artificial Intelligence and cyber domains.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Learn key principles of AI ethics, summarizing ethical considerations and applications in AI development and deployment.	K2
CO2	Apply policies and framework for Fairness in AI and Machine Learning.	K3
CO3	Apply privacy and security concepts, risk management and regulatory compliance in the field of AI and Cyber Security.	K3
CO4	Understand the nature of cybercrimes, the principles of intellectual property rights (IPR), and the legal measures necessary to address and prevent these issues.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	1	-	-	-	1	2	-	-	-	2	1	1
CO2	2	3	2		2	1	2	-	2	1	2	2	1
CO3	2	3	2	1	2	3	3	-	2	2	2	2	2
CO4	2	2	-	-	1	3	3	-	2	2	2	2	1

Course Contents / Syllabus

Module 1	**An Overview to AI Ethics**	**6 hours**

Definition of AI Ethical principles in AI, Sources of AI data, Legal implications of AI Security Breaches, Privacy and AI Regulations, Key Principles of Responsible AI, Transparency and Accountability, Dual-Use Dilemma, Human-Centric Design, Introduction to Cyber Laws and Ethics, Historical Development of Cyber laws, Legal frameworks.

Module 2	**Fairness and Favoritism in Machine Learning**	**8 hours**

Introduction to Fairness and Bias in AI, Types of Fairness and Bias, Impact of Bias and Fairness in AI, Techniques for Measuring Fairness and Bias, Techniques for Mitigating Bias, Current Policies and Frameworks for Fairness in AI, Bias in Data Collection, Fairness in Data Processing, Generative AI, Types of Bias in Generative AI.

Module 3	**AI Ethics and Cybersecurity Principles**	**8 hours**

Importance of Privacy and Security in AI, AI specific Security Tools and Software, Privacy-Preserving Machine Learning (PPML) and Privacy-Preserving Data Mining (PPDM), Risk Management: Risk Assessment and Incident Response, Regulatory Compliance: GDPR, HIPAA, Case Studies: Implementation of AI Ethics guidelines and best practices in engineering projects.

Module 4	**Cybercrimes, IPR and Legal Measures**	**8 hours**

Types of Cybercrimes and their Impact, Legal measures for Cybercrime Prevention and Prosecution, IPR: Copyrights, Trademarks, Patents, and Trade Secrets, Ethical Implications of Intellectual Property, Cyber Security and Privacy Issues, Cyber Crime Investigations and Digital Evidence Handling, Overview of Indian Cyber Laws (IT Act 2000 and Amendments), Comparative Overview: Indian vs Global Cyber Laws, Case Study: The ATM Heist – Cosmos Bank Cyber Attack (India, 2018).

	Total Lecture Hours	**30 hours**

Textbook:

1. Artificial Intelligence: A Guide for Thinking Humans by Melanie Mitchell, Penguin Books, 2019.
2. Cyber Ethics: Morality and Law in Cyberspace by Richard Spinello, Jones & Bartlett Learning, 7th Edition (2023).

Reference Books:

1. Artificial Intelligence and Ethics by S. B. Kishor, Debajit Biswas, BPB
2. Publications, 2023.

	Cyber Security and Cyber Laws by Alfred Basta, Nadine Basta, Sattwik Panda, Cengage India, 2022.	
NPTEL/ YouTube/ Faculty Video Link:		
1.	https://www.youtube.com/watch?v=VqFqWIqOB1g	
2.	https://www.youtube.com/watch?v=hVJqHgqF59A	
3.	https://www.youtube.com/watch?v=O5RX_T4Tg24	
4.	https://www.youtube.com/watch?v=RJZ0pxcZsSQ	

Course Code: BCS0411	**Course Name: Introduction to Cloud Computing**	**L**	**T**	**P**	**C**
Course Offered in: Computer Science		**3**	**0**	**0**	**3**

Pre-requisite: Knowledge of basic computing units

Course Objectives: To introduce students to the core concepts, models, and technologies of cloud computing, enabling foundational understanding of cloud-based services and infrastructure.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Interpret foundational concept of cloud computing and its evolution.	K2
CO2	Compare cloud services and their deployment models.	K4
CO3	Understand architectural principles and standards in cloud design.	K2
CO4	Relate security measures in cloud computing to enable interoperability.	K2

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	**2**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**-**	**1**	**2**	**1**	**1**
CO2	**2**	**2**	**1**	**2**	**1**	**2**	**1**	**1**	**-**	**2**	**2**	**1**	**1**
CO3	**1**	**2**	**2**	**2**	**1**	**2**	**2**	**1**	**-**	**2**	**2**	**2**	**2**
CO4	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**2**

Course Contents / Syllabus

Module 1	**Introduction to Cloud**	**7 hours**

Introduction to Cloud Computing, Definition of Cloud, Evolution of Cloud Computing, Underlying Principles of Parallel and Distributed Computing, Cloud, Characteristics, Multi-tenancy & Elasticity in Cloud, On-demand Provisioning, Cloud economics, Merits of Cloud computing, Obstacles for cloud technology, Cloud vulnerabilities, Cloud challenges.

Module 2	**Cloud Services and Deployment Models**	**8 hours**

Types of Deployment models (Public, Private, Hybrid and community cloud), Service Models in cloud (SaaS, PaaS, IaaS- Storage-as-a-Service), AWS cloud Services (EC2, S3, Elastic File Storage, Elastic Block Storage, Relational Database Services, Virtual Private Cloud, Virtual Machines, CloudWatch), Managed and Unmanaged services.

Module 3	**Cloud Architecture**	**7 hours**

Layered Cloud Architecture Design, NIST Cloud Computing Reference Architecture, Service Level Agreement, Role of governance, IBM-CCRA, Architectural Design Challenge, Open Architecture challenges, Service Oriented Architecture, Web Services, Publish-Subscribe Model, SOAP and REST architecture.

Module 4	**Cloud Security and Resource Management**	**8 hours**

Cloud Security Challenges, Security Governance, IAM, Security Standards, MFA, Authentication and Authorization, CIA, Introduction to Firewall, Security Group, User & Access control.

Inter Cloud Resource Management, Resource Provisioning and Resource Provisioning Methods, Global Exchange of Cloud Resources, Interoperability, Portability, Migration in cloud, Disaster Recovery, Federation in the Cloud, Four Levels of Federation, Federated Services and Applications, Future of Federation

Total Lecture Hours	**30 hours**

Textbook:

S.No	**Book Title**	**Author**
1.	Fundamentals of Cloud Computing, Nitya Publication, 2020	Dr. Arun Singh Chouhan, Bipin Pandey, Vishwas Srivastava
2.	Cloud Computing Basics: A Non-Technical Introduction, Apress, 2022	Anders Lisdorf

Reference Books:

S.No	**Book Title**	**Author**
1.	Cloud Computing revised and updated edition, 2023	Nayan B. Ruparelia

NPTEL/ Youtube/ Faculty Video Link:	
1.	https://nptel.ac.in/courses/106/104/106104182/ https://www.youtube.com/watch?v=M988_fsOSWo&t=4s https://www.youtube.com/watch?v=JYq1AQkMdhE https://www.youtube.com/watch?v=iSG_72VNBVs&t=55s
2.	https://nptel.ac.in/courses/106/105/106105167/ https://youtu.be/FZR0rG3HKIk?si=i9Ol3TdIeWtC-UUJ
3.	https://aws.amazon.com/ https://www.youtube.com/watch?v=36zducUX16w https://www.youtube.com/watch?v=3WIJ4axzFlU
4.	4 https://www.youtube.com/watch?v=m8iz4CFVWK0 https://www.youtube.com/watch?v=IKxigcbhsGk https://www.youtube.com/watch?v=NbkPRn1mqlU
5.	https://youtube.com/playlist?list=PL1TLTEHdRxDbFyipEb0KENRuBTI9yUu26&si=Si2LGUG6fu6v0Jr3

Course Code: BCSAI0411	**Course Name: DATA ANALYTICS**	**L**	**T**	**P**	**C**
Course Offered in: CSE(CYS)		**3**	**0**	**0**	**3**

Pre-requisite: Basic Knowledge of Statistics and Probability.

Course Objectives:

To introduce the fundamental concepts and scope of cyber security, attacks, and vulnerabilities and explore basic security mechanisms and protective technologies to prepare the students for future learning in advanced security domains.

Course Outcome: After completion of the course, the student will be able to	Bloom's Knowledge Level (KL)
CO1: Understand the fundamental concepts of data analytics in the areas that plays major role within the realm of data science.	K1
CO2: Explain and exemplify the most common forms of data and its representations.	K2
CO3: Understand and apply data pre-processing techniques.	K3
CO4: Analyze data using exploratory data analysis.	K4
CO5: Illustrate various visualization methods for different types of data sets and application scenarios.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	**3**	**2**	**2**	**1**	**2**	**1**	**1**	**0**	**1**	**0**	**2**	**3**	**2**	**3**
CO2	**3**	**2**	**1**	**1**	**2**	**1**	**0**	**0**	**1**	**0**	**1**	**2**	**3**	**3**
CO3	**3**	**3**	**2**	**2**	**3**	**2**	**0**	**1**	**1**	**0**	**2**	**3**	**3**	**3**
CO4	**3**	**3**	**2**	**3**	**3**	**2**	**0**	**1**	**2**	**0**	**2**	**3**	**3**	**3**
CO5	**3**	**2**	**2**	**1**	**3**	**2**	**0**	**1**	**2**	**0**	**2**	**2**	**3**	**3**

Course Contents / Syllabus

Module 1	**Introduction To Data Science**	**08 hours**

Introduction to Data Science, Big Data, the 5 V's, Evolution of Data Science, Datafication, Skillsets needed, Data Science Lifecycle, types of Data Analysis, Data Science Tools and technologies, Need for Data Science, Analysis Vs Analytics Vs Reporting, Big Data Ecosystem, Future of Data Science, Applications of Data Science in various fields, Use cases of Data science-Facebook, Netflix, Amazon, Uber, AirBnB.

Module 2	**Data Handling**	**08 hours**

Types of Data: structured, semi-structured, unstructured data, Numeric, Categorical, Graphical, High Dimensional Data, Transactional Data, Spatial Data, Social Network Data, standard datasets, Data Classification, Sources of Data, Data manipulation in various formats, for example, CSV file, pdf file, XML file, HTML file, text file, JSON, image files etc. import and export data in R/Python.

Module 3	**Data Pre-processing**	**08 hours**

Form of Data Pre-processing, data Attribute and its types, understanding and extracting useful variables, KDD process, Data Cleaning: Missing Values, Noisy Data, Discretization and Concept hierarchy generation (Binning, Clustering, Histogram), Inconsistent Data, Data Integration and Transformation. Data Reduction: Data Cube Aggregation, Data Compression, Numerosity Reduction.

Module 4	**Exploratory Data Analysis**	**08 hours**

Handling Missing data, Removing Redundant variables, variable Selection, identifying outliers, Removing Outliers, Time series Analysis, Data transformation and dimensionality reduction techniques such as Principal Component Analysis (PCA), Factor Analysis (FA) and Linear Discriminant Analysis (LDA), Univariate and Multivariate Exploratory Data Analysis. Data Munging, Data Wrangling- APIs and other tools for scrapping data from the web/ internet using R/Python..

Module 5	**Data Visualization**	**08 hours**

Introductions and overview, Debug and troubleshoot installation and configuration of the Tableau. Creating Your First visualization: Getting started with Tableau Software, Using Data file formats, connecting your Data to Tableau, creating

basic charts (line, bar charts, Tree maps), Using the Show me panel.Tableau Calculations: Overview of SUM, AVR, and Aggregate Features Creating custom calculations and fields, Applying new data calculations to your visualization. Manipulating Data in Tableau: Cleaning-up the data with the Data Interpreter, structuring your data, Sorting, and filtering Tableau data, Pivoting Tableau data.Advanced Visualization Tools: Using Filters, Using the Detail panel Using the Size panels, customizing filters, Using and Customizing tooltips, Formatting your data with colours, Creating Dashboards & Stories, Distributing & Publishing Your Visualization	
Total Lecture Hours	**40 hours**

Textbook:

1. Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 200 Glenn J. Myatt,
2. Data Analysis and Data Mining, 2nd Edition & Sons Publication, 2014. John Wiley

Reference Books:

1. Data Mining Concepts and Techniques, Third Edition2012. Jiawei Han, Micheline Kamber, Jian Pei, Morgan Kaufmann,

NPTEL/YouTube/Faculty Video Link:

Module1	https://www.youtube.com/playlist?list=PL15FRvx6P0OWTlNBS_93NHG2hIn9cynVT
Module 2	https://www.youtube.com/playlist?list=PLLy_2iUCG87DxxkLX4Pc3wCvsF1yAvz0T
Module 3	https://www.youtube.com/watch?v=lhO3fBiMDag
Module 4	https://www.youtube.com/watch?v=q4pyaVZjqk0

Course Code: BCSCY0411	Course Name: Fundamentals of Cyber Security	L	T	P	C
Course Offered in: CSE(CYS)		3	0	0	3

Pre-requisite: Basic knowledge of Computer Systems, Familiarity with Internet Usage and Web Browsing.

Course Objectives:

To introduce the fundamental concepts and scope of cyber security, attacks, and vulnerabilities and explore basic security mechanisms and protective technologies to prepare the students for future learning in advanced security domains.

Course Outcome: After completion of the course, the student will be able to	Bloom's Knowledge Level (KL)
CO1: Understand the basic principles and terminology of cyber security.	K1
CO2: Recognize common cyber threats and attack vectors.	K2
CO3: Demonstrate knowledge of basic cyber defense tools and techniques.	K3
CO4: Adopt safe online behavior and promote cyber hygiene.	K3

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	1	1	-	1	-	1	-	2	-	2
CO2	3	3	2	2	2	2	-	2	-	2	-	2	2	3
CO3	3	3	3	2	3	1	-	3	2	2	1	3	3	3
CO4	2	2	2	1	2	2	1	3	2	2	-	3	-	3

Course Contents / Syllabus

Module 1	Introduction to Cyber Security	8 hours

Definition, Evolution, and Need of Cyber Security, Difference between Information Security and Cyber Security, Cyber Forensics, **The CIA Triad (**Confidentiality, Integrity and Availability), **Basic Terminologies:** Threats, Vulnerabilities, Exploits, Risks, **Cyber Security Objectives:** Prevention, Detection, Response and Recovery, **Cyber Security Domains:** Network Security, Information Security, Application Security, Cloud Security and IoT Security, Security Goals, Roles of Security Policies, Procedures, and Awareness.

Module 2	Cyber Threats and Attacks	8 hours

Malware Types: Virus, Worm, Trojan Horse, Ransomware, Spyware, Adware, **Social Engineering Attacks**: Phishing, Baiting, Pretexting, Tailgating, **Web-Based Attacks**: SQL Injection, Cross-Site Scripting (XSS), Clickjacking, **Network Attacks**: Denial-of-Service (DoS), DDoS, Spoofing, Sniffing, Insider threats and APTs (Advanced Persistent Threats), Emerging Threats: IoT Vulnerabilities, Mobile Threats.

Module 3	Cyber Defense Mechanisms	8 hours

Authentication Mechanisms: Passwords, OTPs, Biometrics, **Access Control Models:** DAC, MAC, RBAC, **Firewalls:** Types, Configurations, Limitations, Intrusion Detection and Prevention Systems (IDS/IPS), **Cryptography:** Basic Idea of Encryption and Decryption, **Endpoint Protection:** Antivirus, Anti-Malware, **Backup Types:** Full, Incremental, Differential, Incident Response Basics.

Module 4	Network & System Security Basics	6 hours

Basic Network Security Concepts: IP, MAC, Ports, Protocols (HTTP, HTTPS, FTP), **Network Security Devices:** Routers, Switches, Firewalls, Proxies, **Secure System Configuration:** OS Hardening, User Privileges, Patch Management and Software Updates, Secure Coding Principles and Common Software Flaws, Safe Browsing Habits, Secure Downloads, Email Security.

Total Lecture Hours	30 hours

Textbook:

1. William Stallings – Cybersecurity: Principles and Practice, Pearson.
2. Chuck Easttom – Computer Security Fundamentals, Pearson.

Reference Books:

1. Fundamentals of Cyber Security, CRC Press
2. Cyber Security, Wiley India

NPTEL/YouTube/Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=z5nc9MDbvkw
Unit 2	https://nptel.ac.in/courses/106106129
Unit 3	https://www.youtube.com/watch?v=BdluJhRaAMA
Unit 4	https://nptel.ac.in/courses/106105183

Course Code: BCSE0411	**Course Name: Python web development with Django**	**L**	**T**	**P**	**C**
Course Offered in: CSE(CYS)		**3**	**0**	**0**	**3**

Pre-requisite: Students should have good knowledge of Python Programming and Python coding experience.

Course Objectives:

To introduce the fundamental concepts and scope of cyber security, attacks, and vulnerabilities and explore basic security mechanisms and protective technologies to prepare the students for future learning in advanced security domains.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO 1	Apply the knowledge of python programing that are vital in understanding Django application and analyze the concepts, principles and methods in current client-side technology to implement Django application over the web.	K3,K6
CO 2	Demonstrate web application framework i.e. Django to design and implement typical dynamic web pages and interactive web based applications.	K3, K6
CO 3	Implementing and analyzing the concept of Integrating Accounts & Authentication on Django.	K3, K4
CO 4	Understand the impact of web designing by database connectivity with SQLite in the current market place where everyone uses to prefer electronic medium for shoping, commerce, and even social life also.	K2, K3
CO 5	Analyzing and creating a functional website in Django and deploy Django Web Application on Cloud.	K3, K6

CO-PO Mapping (Scale 1: Low, 2: Medium, 3: High)

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	3	1	3	-	1	3	-	3	3	3	3	2
CO2	2	2	3	1	3	-	1	-	-	2	3	3	3	2
CO3	2	2	2	2	2	-	-	2	-	2	2	2	2	2
CO4	2	1	2	1	2	-	-	1	1	2	2	3	3	3
CO5	2	1	3	2	3	-	-	3	2	3	3	2	2	2

Course Contents / Syllabus

Module 1	**Python libraries for web development**	**8 hours**

Collections-Container datatypes, Tkinter-GUI applications, Requests-HTTP requests, BeautifulSoup4-web scraping, Scrapy, Zappa, Dash, CherryPy, Turbo Gears, Flask, Web2Py, Bottle, Falcon, Cubic Web, Quixote, Pyramid.

Module 2	**Introduction to Django Framework**	**8 hours**

Understanding Django environment, Features of Django and Django architecture, MVC and MTV, Urls and Views, Mapping the views to URLs, Django Template, Template inheritance Django Models, Creating model for site, Converting the model into a table, Fields in Models, Integrating Bootstrap into Django, Creating tables, Creating grids, Creating carousels.

Module 3	**Integrating Accounts & Authentication on Django**	**8 hours**

Introduction to Django Authentication System, Security Problem & Solution with Django Creating Registration Form using Django, Adding Email Field in Forms, Configuring email settings, Sending emails with Django, Adding Grid Layout On Registration Page, Adding Page Restrictions, Login Functionality Test and Logout.

Module 4	**Connecting SQLite with Django**	**8 hours**

Database Migrations, Fetch Data From Database, Displaying Data On Templates, Adding Condition On Data, Sending data from url to view, Sending data from view to template, Saving objects into database, Sorting objects, Filtering objects, Deleting objects, Difference between session and cookie, Creating sessions and cookies in Django.

Module 5	**Deploying Django Web Application on Cloud**	**8 hours**
	Total Lecture Hours	**40 hours**

Textbook:

1. Martin C. Brown, “Python: The Complete Reference Paperback”, 4th Edition 2018, McGraw Hill Education Publication.
2. Reema Thareja, “Python Programming: Using Problem Solving Approach”, 3rd Edition 2017, Oxford University Press Publication
3. Daniel Rubio, Apress,” Beginning Django Web Application Development and Deployment with Python”, 2nd Edition 2017, Apress Publication.
4. William Jordon, “Python Django Web Development: The Ultimate Django web framework guide for Beginners”, 2nd Edition 2019, Kindle Edition.

Reference Books:

1. Tom Aratyn, “Building Django 2.0 Web Applications: Create enterprise-grade, scalable Python web applications easily with Django 2.0”, 2nd Edition 2018, and Packt Publishing.
2. Nigel George, “Build a website with Django”, 1st Edition 2019, GNW Independent Publishing Edition.
3. Ray Yao,” Django in 8 Hours: For Beginners, Learn Coding Fast! 2nd Edition 2020, independently published Edition.

NPTEL/YouTube/Faculty Video Link:

Module 1	https://youtu.be/eoPsX7MKfe8?list=PLIdgECt554OVFKXRpo_kuI0XpUQKk0ycO https://youtu.be/tA42nHmmEKw?list=PLh2mXjKcTPSACrQxPM2_1Ojus5HX88ht7 https://youtu.be/8ndsDXohLMQ?list=PLDsnL5pk7-N_9oy2RN4A65Z-PEnvtc7rf https://youtu.be/QXeEoD0pB3E?list=PLsyeobzWxl7poL9JTVyndKe62ieoN-MZ3 https://youtu.be/9MmC_uGjBsM?list=PL3pGy4HtqwD02GVgM96-V0sq4_DSinqvf
Module 2	https://youtu.be/F5mRW0jo-U4 https://youtu.be/yD0_1DPmfKM?list=PLQVvvaa0QuDe9nqlirjacLkBYdgc2inh3 https://youtu.be/rHux0gMZ3Eg https://youtu.be/jBzwzrDvZ18 https://youtu.be/RiMRJMbLZmg
Module 3	https://youtu.be/8DF1zJA7cfc https://youtu.be/CTrVDi3tt8o https://youtu.be/FzGTpnI5tpo https://youtu.be/z4lfVsb_7MA https://youtu.be/WuyKxdLcw3w
Module4	https://youtu.be/UxTwFMZ4r5k https://youtu.be/2Oe55iXjZQI https://youtu.be/zV8GOI5Zd6E https://youtu.be/uf2tdzh7Bq4 https://youtu.be/RzkVbz7Ie44
Module 5	https://youtu.be/kBwhtEIXGII https://youtu.be/Q_YOYNiSVDY https://youtu.be/_3AKAdHUY1M https://youtu.be/6DI_7Zja8Zc https://youtu.be/UkokhawLKDU

List of Practical

Sr. No	Program Title	CO Mapping
35.	**Implementation of Linux Commands** Introduction of Unix/Linux Operating system and their architecture	CO1

	Display system information using uname, hostname, and date etc. File operations using cat, touch, cp, mv, rm, and chmod ,umask etc. Create, view, and navigate directories using mkdir, rmdir, cd, pwd, ls etc. Disk Commands df,du,mount,unmount,mkfs,fsck etc. Use redirection and piping in commands File compression and archiving using tar, gzip, zip, unzip etc. Process commands ps,kill, killall,nice, pgrep, top,htop etc. Network commands ifconfig, ping, netstat, host,ip route etc. Administrator Commands Adduser,Passwd, deluser, usermod, groupadd etc	
36.	**Shell Scripting Programming**	**CO1**
	Write a shell script to ask your name, program name and enrollment number and print it on the screen.	
	Write a shell script to find the sum, the average and the product of the four integers entered.	
	write shell script to find average of numbers given at command line	
	Write a shell program to exchange the values of two variables	
	Write a shell program to Print Numbers 1 to 10 using while & do while loop.	
	Write a shell program to Print Numbers 1 to 10 using for loop.	
	Write a shell script to display the digits which are in odd position in a given 5-digit number**.**	
	Write a shell program to search for a given number from the list of numbers provided using binary search method.	
	Write a shell program to concatenate two strings and find the length of the resultant string	
	Write a shell script to find the smallest of three numbers	
	Write a shell program to count number of words, characters, white spaces and special symbols in a given text	
	Process & Thread Management	
37.	Introduction to C Programming (Statement, Conditional Statement, Loop, Array & Function)	**CO2**
38.	Implement FCFS CPU Scheduling algorithm.	**CO2**
39.	Implement the SJF CPU Scheduling algorithm (For both Pre-emptive and non-pre-emptive).	**CO2**

40.	Implement PRIORITY CPU Scheduling Algorithm (For both Pre-emptive and non-pre-emptive).	**CO2**
41.	Implement Round-Robin CPU Scheduling Algorithm	**CO2**
42.	Implement Multi-Level Queue CPU Scheduling algorithm.	**CO2**
43.	Implement Multilevel Queue CPU Scheduling Algorithm.	**CO2**
	Concurrency and Deadlock Management	
44.	Execute the RACE Condition of Process Synchronization.	**CO2**
45.	Implement the Producer–consumer problem using semaphores.	**CO2**
46.	Design a code and implement the Dinning Philosopher problem.	**CO2**
47.	Implement Banker's algorithm of Deadlock Avoidance.	**CO2**
48.	Execute an algorithm for Deadlock Detection.	**CO2**
	Memory Management	
49.	Implement Contiguous memory variable size partition scheme.	**CO3**
50.	Simulate the First-Fit contiguous memory allocation technique.	**CO3**
51.	Simulate the Best-Fit contiguous memory allocation technique.	**CO3**
52.	Simulate the Worst-Fit contiguous memory allocation technique.	**CO3**
53.	Implement the Non-contiguous Memory Allocation by using Paging.	**CO3**
54.	Implement Contiguous memory variable size partition scheme.	**CO3**
	Page Replacement	
55.	Write a Program to simulate the FIFO page replacement algorithm.	**CO3**
56.	Write a Program to simulate the LRU page replacement Algorithm.	**CO3**
57.	Write a Program to simulate the Optimal page replacement Algorithm.	**CO3**
	Disk Scheduling	**CO3**
58.	Write a program to simulate FCFS Disk Scheduling Algorithm.	**CO3**
59.	Write a Program to simulate the SSTF Disk Scheduling Algorithm.	**CO3**
60.	Write a program to simulate SCAN Disk Scheduling Algorithm.	**CO3**
61.	Write a Program to simulate the C SCAN Disk Scheduling Algorithm.	**CO3**
62.	Write a Program to simulate the LOOK Disk Scheduling Algorithm.	**CO3**

	Modern Operating System	**CO3**
63.	Introduction of CUDA Programming.	**CO3**
64.	Write a program in CUDA print message “Welcome CUDA programming”	**CO3**
65.	Implement matrix multiplication using shared memory in CUDA.	**CO3**
66.	Connects to VMware vCenter and lists all virtual machines along with their power state.	**CO3**
67.	Create a new virtual machine in Azure with specified configurations.	**CO3**
68.	Deploy a simple HTTP-triggered distributed Azure Function.	**CO3**
Total Hours:		**48**