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

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

Evaluation Scheme & Syllabus
For

Bachelor of Technology
Computer Science and Engineering (Cyber Security)
Second Year

(Effective from the Session: 2025-26)

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

Bachelor of Technology
Computer Science and Engineering (Cyber Security)

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	BCSCY0302	Cyber Security Essentials	Mandatory	2	0	0	30	20	50		50		100	2
6	BCSE0305X	Computer Architecture & Parallel Processing	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	BCSCY0352	Cyber Security Essentials 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	BMC0010	Comprehensive Training on Unix and Linux OS Fundamentals	Infosys Wingspan (Infosys Springboard)	29h 53m	2
2	BMC0012	Data Structures and Algorithms using Python - Part 1	Infosys Wingspan (Infosys Springboard)	29h 27m	2

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.

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Bachelor of Technology
Computer Science and Engineering (Cyber Security)

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	BASCC00401	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	BCSCY0303	Ethical Hacking	Mandatory	3	0	0	30	20	50		100		150	3
5	BASL0401N	Technical Communication	Mandatory	2	0	0	30	20	50		50		100	2
6		Department Elective - I	Departmental Elective	3	0	0	30	20	50		100		150	3
7	BCSE0451	Database Management Systems Lab	Mandatory	0	0	4				50		50	100	2
8	BCSE0452Z	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	BMC0008	Object Oriented Programming Using Python	Infosys Wingspan (Infosys Springboard)	46h 13m	3.5
2	BMC0014	Programming Using Java	Infosys Wingspan (Infosys Springboard)	113h 2m	4

PLEASE NOTE: -

- **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.

DEPARTMENTAL ELECTIVES

Subject Code	Subject Name	Types of subjects	Bucket Name	Branch	Semester
BCSE0411	Python web development with Django	Departmental Elective- I	Full stack Bucket	CSE (CYS)	4
BCSCY0412	Cyber Threat Intelligence	Departmental Elective- I	Cyber Security-II Bucket	CSE (CYS)	4
BCSAI0411	Data Analytics	Departmental Elective- I	AI Driven Analytics Bucket	CSE (CYS)	4

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A student will be eligible to get Under Graduate 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: III Semester		**2**	**0**	**0**	**2**

Pre-requisite: 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 sets, relations, functions to computational problem-solving	K3
CO2	Understand and implement the steps in the software development life cycle using logical reasoning and flowcharts.	K3
CO3	Design and develop small-scale software projects or games using structured programming and project-based approaches.	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**	**PSO3**
CO1	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**1**	**1**	1
CO2	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**2**	**1**	3
CO3	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**3**	**1**	2
CO4	**3**	**3**	**3**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**-**	**1**	**2**	2

Course Contents / Syllabus

Module 1	**Foundations of Computer Systems and Mathematical Concepts**	**4 hours**

Computer System Fundamentals: 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	**Software Development Fundamentals**	**6 hours**

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	**Project-Based Learning**	**10 hours**

Introduction to the basics of C++, 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/Game Development**	**10 hours**

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

Total Lectures: 30 hours

Reference Books:

S.No	**Book Title**	**Author**
1	A Project-Based Introduction to Programming	Access Point Publishing
2	Programming: Principles and Practice Using C++	Bjarne Stroustrup
3	Effective Modern C++	Scott Meyers

NPTEL/ YouTube/ Faculty Video Link:	
1	
2	

Mode of Evaluation

CIE							ESE	Total
ST1	**ST2**	**ST3**	**TA1** **10**	**TA2** **10**	**TA3** **10**	**Attendance** **10**		
60			**40**					**100**

Course Code: BAS0303N	**Course Name: Statistics and Probability**	**L**	**T**	**P**	**C**
Course Offered in: B.Tech. Second Year Sem-III/IV AI/AIML/AI(TWIN)/AIML(TWIN)/CYS/DS/CS/CSE/CSE-R/IT/M. Tech (Int.)/IT (TWIN)/CSE(TWIN)		**3**	**1**	**0**	**4**

Pre-requisite:

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**	**PSO3**	**PSO4**
CO1	3	2	2	3	1	1	-	1	2	2	2	1	1	1	1
CO2	3	2	2	3	1	1	-	1	2	2	2	1	1	1	1
CO3	3	2	1	2	-	-	-	-	1	2	2	1	1	1	1
CO4	3	2	2	3	1	1	-	1	2	2	2	1	1	1	1
CO5	3	2	2	3	1	1	-	1	2	2	2	1	1	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**
1	Bali, N.P., Textbook of Engineering Mathematics- IV
2	Jain, R.K., Advanced engineering mathematics
3	Grewal, B.S., Higher engineering mathematics
4	Gupta, S.P., Statistical methods
5	ZILL, DENNIS G., Advanced engineering mathematics

Reference Books:

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

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/

Mode of Evaluation

CIE							**ESE**	**Total**
ST1	**ST2**	**ST3**	**TA1** **5**	**TA2** **5**	**TA3** **5**	**Attendance** **5**		
30			**20**				**100**	**150**

NIET Greater Noida

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GREATER NOIDA-201306
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Course Code: BCSE0303A	Course Name: Operating Systems	L	T	P	C
Course Offered in: CSE/CSE-R/IT/CS/AI/AIML/ IOT/DS/CYS		2	0	0	2

Pre-requisite: Basic knowledge of computer fundamentals, C programming, Data structure and Computer organization**.**

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)
CO1	Understand operating system architecture and types, and use the Linux CLI for basic Operations.	K2
CO2	Implement the CPU scheduling algorithms including uses of multithreading models.	K4
CO3	Implement concurrency control, process synchronization techniques, and deadlock handling techniques	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	PO1 0	PO1 1	PSO1	PSO 2	PSO3	PSO 4
CO1	3	2	2	1	2	0	0	0	0	1	1	2	1	2	2
CO2	3	3	3	2	2	0	0	0	0	1	1	2	2	1	2
CO3	3	3	3	2	2	0	0	0	0	1	1	2	3	3	2
CO4	3	3	3	2	2	0	0	0	0	1	1	2	2	1	2
CO5	3	2	3	2	2	0	0	0	0	1	2	2	2	2	2

Course Contents / Syllabus

Unit 1	Fundamentals & Shell scripting	04 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

Applications: Automating system administration tasks using shell scripts in Ubuntu/Linux (e.g., backup scheduling).

Unit 2	Process & Thread Management	08 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
Applications: Analyse and implement CPU Scheduling in Real-Time Embedded Systems and RTOS

Unit 3	**Concurrency and Deadlock Management**	**08 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.
Applications: Deadlock avoidance in database transaction management systems like Oracle or MySQL.

Unit 4	**Memory Management**	**08 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 paging,

Virtual Memory:- Virtual Memory Concepts, Demand Paging, Performance of Demand Paging, Page Replacement Algorithms: FIFO, LRU, Optimal and LFU, Belady's Anomaly, Thrashing

Applications: Virtual memory management in modern OS like Windows 10 and how paging impacts performance.

Unit 5	**File Management & Modern Operating System**	**04 hours**

File Management: - 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

Applications: Large File Storage in a Distributed Manner.

	Total Lecture Hours	**32 hours**

Textbook:

1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne" Operating System Concepts Essentials" , Willey Publication,10th Edition,2018.
2	Marks G. Sobell "A practical guide to Linux: Commands, Editors and Shell Programming", CreateSpace Independent Publishing Platform, 4th Edition,2017.
3	Jason Cannon "LINUX for beginners", 1stEdtion,2014

Reference Books:

1	William Stallings "Operating Systems: Internals and Design Principles", Pearson Education , 9th Edition, 2019.
2	Charles Patrick Crowley, "Operating System: A Design-oriented Approach" , McGraw Hill Education ,2017.
3	Ganesh Naik "Learning Linux Shell Scripting", Packt Publishing ,2nd Edition 2018.

NPTEL/ Youtube/ Faculty Video Link:

Unit 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&in dex=2
Unit 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_DitCz1 cvQ&index=3
Unit 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)
Unit 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
Unit 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&inde x=4 https://www.youtube.com/watch?v=_BtDcroOTSA CUDA Programming Course – High-Performance Computing with GPUs

Mode of Evaluation

CIE						ESE	Total
ST1	ST2	ST3	TA1 5	TA2 5	Attendance 10		
30			20			50	100

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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Course Code: BCSE0301	Course Name: DATA STRUCTURES AND ALGORITHMS-1	L	T	P	C
Course Offered in: CSE/CS/CSR-R/M.TECH(INT) /IT/CSE(AI)/CSE(AIML)/CSE(DS)/CSE(CS)		3	0	0	3

Pre-requisite: The concept of Programming Language.

Course Objective:

The objective of the course is to learn the basic concepts of algorithm analysis, along with the implementation of linear data structure.

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

S. No	Course Outcome	Bloom's Level
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.	K3
CO5	Implement and analyse divide & conquer algorithm and greedy approaches for efficient problem-solving across diverse context.	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	3	3	1	1	1	1	1	2	3	1	2	2
CO2	3	3	2	2	3	1	1	1	1	1	2	3	1	2	2
CO3	3	3	2	2	3	1	1	1	1	1	2	3	1	2	2
CO4	3	3	3	2	3	1	1	1	1	1	2	3	1	2	2
CO5	3	3	3	3	3	1	1	1	1	1	3	3	1	2	3

Course Contents / Syllabus

Unit 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.

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

<table>
<tr><td colspan="3">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.</td></tr>
<tr><td><b>Unit 3</b></td><td><b>Design and Analysis of Algorithms: Linked lists Data Structure</b></td><td><b>10 hours</b></td></tr>
<tr><td colspan="3">Comparison of Array, List and Linked list Types of linked list: Singly Linked List, Doubly Linked List, Circular Linked List Polynomial Representation and Addition of Polynomials.</td></tr>
<tr><td><b>Unit 4</b></td><td><b>Design and Analysis of Algorithms: Stacks Data Structure, Recursion and Queue Data Structure</b></td><td><b>10 hours</b></td></tr>
<tr><td colspan="3">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</td></tr>
<tr><td><b>Unit 5</b></td><td><b>Design and Analysis of Algorithms: Divide and Conquer Algorithm and Greedy Algorithms</b></td><td><b>9 hours</b></td></tr>
<tr><td colspan="3">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.</td></tr>
<tr><td colspan="2" align="right"><b>Total Lecture Hours</b></td><td><b>48 hours</b></td></tr>
</table>

Textbook:

1. Michael T. Goodrich, Roberto Tamassia, "Data Structures and Algorithms in Python: An Indian Adaptation", 1st Edition, 2021.
2. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd, 2nd Edition, 2017.
3. Horowitz and Sahani, “Fundamentals of Data Structures”, Computer Science Press, 1st Edition, 1993.

Reference Books:

1. T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, Introduction to Algorithms, 4th ed. Cambridge, MA, USA: MIT Press, 2022.
2. N. Karumanchi, Data Structures and Algorithms Made Easy: Data Structure and Algorithmic Puzzles, 5th ed. Noida, India: CareerMonk Publications, 2016.
3. A. Y. Bhargava, Grokking Algorithms: An Illustrated Guide for Programmers and Other Curious People, 2nd ed. Shelter Island, NY, USA: Manning Publications, 2024.
4. R. Sedgewick and K. Wayne, Algorithms, 4th ed. Boston, MA, USA: Addison-Wesley, 2011.
5. S. S. Skiena, The Algorithm Design Manual, 2nd ed. London, U.K.: Springer, 2011.

NPTEL/ YouTube/ Faculty Video Link:

Unit 1	https://youtu.be/u5AXxR4GnRY
Unit 2	https://www.youtube.com/watch?v=LQx9E2--p5c&pp=ygUMYXJyYXlzIG5wdGVs
Unit 3	https://www.youtube.com/watch?v=K7VIKlUdo20&pp=ygUPbGluayBsaXN0IG5wdGVs

Unit 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
Unit 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

Mode of Evaluation:

CIE						ESE	Total
ST1	**ST2**	**ST3**	**TA1 (5)**	**TA2 (5)**	**Attendance (10)**		
30			**20**			**100**	**150**

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 Systems Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE-R/IT/CS/AI/AIML/ IOT/DS/CYS		**0**	**0**	**4**	**2**

Pre-requisite: Basic knowledge of computer fundamentals, C programming, Data structure and Computer organization.

Course Objectives: The course aims to provide hands-on experience with Linux and shell programming, while the lab focuses on implementing and analyzing key OS algorithms and simulating modern operating systems.

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.	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**	**'SO3**	**PSO4**
CO1	2	1	1	1	3	-	-	2	2	-	3	2	1	2	2
CO2	3	3	3	2	2	-	-	2	2	-	2	2	2	3	3
CO3	3	2	3	2	3	-	-	2	2	-	3	2	3	3	3

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

1 **Implementation of Linux Commands**

i. Introduction of Unix/Linux Operating system and their architecture
ii. Display system information using uname, hostname, and date etc.
iii. File operations using cat, touch, cp, mv, rm, and chmod ,umask etc.
iv. Create, view, and navigate directories using mkdir, rmdir, cd, pwd, ls etc.
v. Disk Commands df,du,mount,unmount,mkfs,fsck etc.
vi. Use redirection and piping in commands
vii. File compression and archiving using tar, gzip, zip, unzip etc.
viii. Process commands ps,kill, killall,nice, pgrep, top,htop etc.
ix. Network commands ifconfig, ping, netstat, host,ip route etc.
x. Administrator Commands Adduser,Passwd, deluser, usermod, groupadd etc
xi. Implement different types of system calls in Unix/Linux.

2 **Shell Scripting Programming**

i. Write a shell script to ask your name, program name and enrollment number and print it on the screen.
ii. Write a shell script to find the sum, the average and the product of the four integers entered.
iii. write shell script to find average of numbers given at command line
iv. Write a shell program to exchange the values of two variables
v. Write a shell program to Print Numbers 1 to 10 using while & do while loop.
vi. Write a shell program to Print Numbers 1 to 10 using for loop.
vii. Write a shell script to display the digits which are in odd position in a given 5-digit number**.**
viii. Write a shell program to search for a given number from the list of numbers provided using binary search method.
ix. Write a shell program to concatenate two strings and find the length of the resultant string
x. Write a shell script to find the smallest of three numbers
xi. 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)
4	Implement FCFS CPU Scheduling algorithm.
5	Implement the SJF CPU Scheduling algorithm (For both Pre-emptive and Non-pre-emptive).
6	Implement PRIORITY CPU Scheduling Algorithm (For both Pre-emptive and Non-pre-emptive).
7	Implement Round-Robin CPU Scheduling Algorithm.
8	Implement Multi-Level Queue CPU Scheduling algorithm.
9	Implement Multilevel Feedback Queue CPU Scheduling Algorithm.
	Concurrency and Deadlock Management
10	Execute the RACE Condition of Process Synchronization.
11	Implement the Producer–consumer problem using semaphores.
12	Design a code and implement the Dinning Philosopher problem.
13	Implement Banker's algorithm of Deadlock Avoidance.
14	Execute an algorithm for Deadlock Detection.
	Memory Management
15	Implement the Memory Fixed-size partition scheme.
16	Implement the Memory Variable-size partition scheme.
17	Simulate the First-Fit contiguous memory allocation technique.
18	Simulate the Best-Fit contiguous memory allocation technique.
19	Simulate the Worst-Fit contiguous memory allocation technique.
20	Implement the Non-contiguous Memory Allocation by using Paging.
	Page Replacement
21	Write a Program to simulate the FIFO page replacement algorithm.
22	Write a Program to simulate the LRU page replacement Algorithm.
23	Write a Program to simulate the Optimal page replacement Algorithm.
	Disk Scheduling
24	Write a program to simulate FCFS Disk Scheduling Algorithm.
25	Write a Program to simulate the SSTF Disk Scheduling Algorithm.
26	Write a program to simulate SCAN Disk Scheduling Algorithm.
27	Write a Program to simulate the C SCAN Disk Scheduling Algorithm.
28	Write a Program to simulate the LOOK Disk Scheduling Algorithm.
29	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.
	Modern Operating System
30	Introduction of CUDA Programming.
31	Write a program in CUDA print message "Welcome CUDA programming"
32	Implement matrix multiplication using shared memory in CUDA.
33	Connects to VMware vCenter and lists all virtual machines along with their power state.
34	Create a new virtual machine in Azure with specified configurations.
35	Deploy a simple HTTP-triggered distributed Azure Function.
	Total Hours: 48 hrs.

Mode of Evaluation

CIE	PE	Total

PS1	**PS2**	**PS3**	**(If mentioned in curriculum)**	
10	**20**	**20**		
50			**50**	**100**

LAB Course Code: BCSE0351	**LAB Course Name: DATA STRUCTURE AND ALGORITHMS-I LAB**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/CSR-R/M.TECH(INT) /IT/CSE(AI)/CSE(AIML)/CSE(DS)/CSE(CS)		**0**	**0**	**4**	**2**

Pre-requisite: The concept of Programming Language

Course Objective:

The objective of the course is to compare the time complexities of various algorithm and implementation of linear data structure.

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.	K3
CO3	Implement divide and conquer and greedy algorithms to solve problems like sorting, scheduling and optimization.	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**	**PSO3**	**PSO4**
CO1	3	3	2	3	3	1	1	1	1	1	2	3	1	2	2
CO2	3	3	3	2	3	1	1	1	1	1	2	3	1	2	2
CO3	3	3	3	3	3	1	1	1	1	1	3	3	1	2	3

List of Practical (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 program to find the maximum element in an array.
4. Construct a program to calculate the sum of all elements in an array.
5. Construct a program to reverse the elements of an array.
6. Construct a program to check if an array is sorted in ascending order.
7. Construct a program to count the occurrence of a specific element in an array.
8. Construct a program for creation and traversal of 2D Array in row major and column major order.
9. Construct a program to print the transpose of a given matrix using function.
10. Construct a program to find if a given matrix is Sparse or Not and print Sparse Matrix.

11. Construct a program to represent a sparse matrix in triplet form.
12. Construct a program to implement Linear Search.
13. Construct a program 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. Construct a program to create a single linked list and perform basic operations (insertion, deletion, traversal).
20. Construct a program to create a double linked list and perform basic operations (insertion, deletion, traversal).
21. Construct a program to create a circular linked list and perform basic operations (insertion, deletion, traversal).
22. Construct a program to create a circular double linked list and perform basic operations (insertion, deletion, traversal).
23. Construct a program to reverse a single linked list.
24. Construct a program to check if a linked list is palindrome.
25. Construct a program to reverse a double linked list.
26. Construct a program to find the middle element of a single linked list.
27. Construct a program to find the middle element of a double linked list.
28. Construct a program to merge two sorted single linked lists.
29. Construct a program to detect and remove a loop in a circular linked list.
30. Construct a program 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 program to infix to postfix conversion using a stack.
34. Construct a program for balanced parentheses checker using a stack.
35. Construct a program to reverse a string using a stack.
36. Construct a program to implement Binary search using recursion.
37. Construct a program to print Fibonacci series using recursion.
38. Construct a program to implement Tower of Hanoi.
39. Construct a program to implement queue using array.
40. Construct a program 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.

Total Hours	**48 Hours**

Mode of Evaluation

CIE	**PE (If mentioned in curriculum)**	**Total**
PS		
50	**50**	**100**

Course Code: BCSCY0302	**CYBER SECURITY ESSENTIALS**	**L**	**T**	**P**	**C**
Course Offered in: CSE(CYS)		**2**	**0**	**0**	**2**

Pre-requisite: Basic knowledge of Computer Systems, Basic understanding of networking, operating systems, Fundamental Logical Thinking.

Course Objectives:

To provide a comprehensive understanding of key cybersecurity concepts and tools. Students will learn to identify and respond to various cyber-attacks, design and deploy VPN networks using OpenVPN, and analyze Password cracking Techniques.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Acquire foundational understanding of cybersecurity principles, identify various cyber-attacks on different devices, and apply basic defensive strategies.	K1
CO2	Configure and manage secure remote access solutions using OpenVPN, ensuring confidentiality, integrity, and authenticity of network communication.	K2
CO3	Understanding and Learn security at different levels of OSI model security . ˙	K3
CO4	Develop proficiency in using Kali Linux tools for vulnerability assessment, password-cracking techniques, understand password security, and acquire the skills to assess password vulnerabilities and implement more robust security measures	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**
CO1	**3**	**2**	**1**	**1**	**1**	**1**	**1**	**-**	**1**	**-**	**2**	**-**	**2**	**1**
CO2	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**-**	**2**	**-**	**2**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**2**	**2**	**1**	**3**	**3**	**3**	**3**
CO4	**2**	**2**	**2**	**1**	**2**	**2**	**3**	**2**	**2**	**-**	**3**	**-**	**3**	**3**

Course Contents / Syllabus

Unit 1	**Cyber Security attacks**	**08 hours**

Cybersecurity & its key principles, cybersecurity threats landscapes, Attacks on different Devices, Attacks on Personal Computers and Laptops, Network attacks, IOT attacks, Server & cloud attacks, POS attacks, Smart Vehicles attacks

Unit 2	**Virtual Private Networks and Open VPN Configuration**	**08 hours**

Introduction to Virtual Private Networks (VPNs), VPN protocols and encryption algorithms, OpenVPN installation and configuration Secure communication using OpenVPN

Unit 3	**Introduction to OSI Model security**	**08 hours**

Physical Layer: - Security measures for hardware, Protection against unauthorized access **Data Link layer:** MAC address filtering. VLANs for traffic. **Network Layer -** Access control lists (ACLs) and firewalls. **Transport Layer (Layer 4):** SSL/TLS encryption. Firewalls and traffic policies. **Application Layer**:-Web application security

Unit 4	**Introduction to Kali Linux**	**08 hours**

Overview of Kali Linux and its features. Installation, Basic commands of Kali linux,

	Total Lecture Hours	**32 hours**

Textbook:

1. Raphael Hertzog, Jim O'Gorman -Kali Linux Revealed: Mastering the Penetration Testing Distribution"
2. David Kennedy -"Metasploit: The Penetration Tester's Guide"

Reference Books:

1. Fundamentals of Cyber Security, CRC Press
2. Eric F Crist "Mastering OpenVPN"

NPTEL/YouTube/Faculty Video Link:

Unit 1	https://www.youtube.com/watch?v=Dk-ZqQ-bfy4
Unit 2	https://www.youtube.com/watch?v=JFXBjlT5cGU
Unit 3	https://www.youtube.com/watch?v=UG26SS9pjwE
Unit 4	https://www.youtube.com/watch?v=AnwgxRtWXLI&list=PLhfrWIlLOoKMe1Ue0IdeULQvEgCgQ3a1B
Unit 5	https://www.youtube.com/watch?v=frL21o37klM

Mode of Evaluation

CIE							ESE	Total
ST1	ST2	ST3	TA1 5	TA2 5	TA3 5	Attendance 5		
30			20				50	100

Course Code: BCSE0305X	Course Name: Computer Architecture & Parallel Processing	L	T	P	C
Course Offered in: CSE/CSE-R/IT/CS/AI/AIML/ IOT/DS/CYS		3	0	0	3

Pre-requisite: Basic knowledge of computer systems, Logic gates and their operations.

Course Objectives: This course aims to provide a comprehensive understanding of computer organization and architecture, covering processor design, memory systems, and control units. It explores advanced topics such as cache coherence, parallel architectures, and scalable shared memory systems. Students will gain insight into system performance through instruction execution, arithmetic operations, synchronization, and interconnect strategies.

	Course Outcome: After completion of the course, the student will be able to	Bloom's Knowledge Level (KL)
CO1	Understand the basic structure and operation of a digital computer system.	K2
CO2	Analyze the design of arithmetic & logic unit and understand the fixed point and floating-point arithmetic operations.	K4
CO3	Implement control unit techniques and the concept of Pipelining.	K3
CO4	Analyze parallel architectures and coherence protocols by exploring memory hierarchy, cache coherence mechanisms, and multiprocessor design techniques to ensure correctness and performance in parallel systems.	K4
CO5	Analyze scalable shared memory systems by evaluating directory coherence protocols, memory consistency models, synchronization mechanisms, and interconnect strategies to ensure system	K4, 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	PSO3	PSO4
CO1	3	2	1	0	0	0	0	1	0	2	1	1	1	2	1
CO2	3	3	2	1	1	0	0	1	1	2	2	1	2	2	1
CO3	3	3	2	1	2	0	0	1	1	2	2	1	2	1	1
CO4	3	3	3	2	3	1	1	2	2	3	2	1	1	2	1
CO5	3	3	3	3	3	1	1	2	3	3	3	1	1	1	1

Course Contents / Syllabus

Unit 1	Introduction	**08 hours**

Computer Organization and Architecture, Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration and its types. Register, bus and memory transfer. Processor organization, general registers organization, stack organization and addressing modes.

Unit 2	ALU Unit	**08 hours**

Arithmetic and logic unit: Multiplication: Signed operand multiplication, Booth's algorithm and array multiplier. Division and logic operations. Floating point arithmetic operation, Arithmetic &logic unit design. IEEE Standard for Floating Point Numbers.

Unit 3	Control Unit	**08 hours**

Control Unit: Instruction types, formats, instruction cycles and sub cycles (fetch and execute etc.), micro-operations, execution of a complete instruction. Program Control, Reduced Instruction Set Computer, Complex Instruction Set Computer, Pipelining. Hardwire and microprogrammed control, Concept of horizontal and vertical microprogramming, Flynn's classification.

Unit 4	Introduction to Parallel Architectures	**08 hours**

Introduction to Parallel Architectures, Parallel Programming models and Architectures, Memory Hierarchy- Cache and Virtual memory, Overview of Cache coherence, Coherence Protocols- Snooping, Directory based protocols, VI protocol, MSI, MESI, Dragon protocol and Correctness of coherence protocols- Types of cache misses, update vs invalidate protocol, Snoop based multiprocessor design, Single and multi-level cache with atomic and bus split transaction bus

Unit 5	Parallel Systems	**04 hours**

Scalable shared memory systems: Directory coherence protocols- Memory based, cache based, correctness, Case study: Origin- Architecture, protocol, correctness; Sequent NUMA Q- Architecture, protocol, correctness, Memory consistency models- Sequential, Relaxed consistency models, Synchronization- LL-SC, point to point, barrier synchronization, Interconnects- Introduction, Topologies, routing, flow control

Total Lecture Hours	**32 hours**

Textbook:

1	M. Mano, "Computer System Architecture", 3rd Edition, Pearson Publication, 2007.
2	John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998.
3	William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
4	D. E. Culler and J. P. Singh with A. Gupta, Parallel Computer Architecture. Morgan- Kaufmann publishers.
5	J.L. Hennessy and D. A. Patterson, Computer Architecture: A Quantitative Approach. Morgan- Kaufmann publishers.
6	M. Dubois, M. Annavaram, Per Stenstrom, Parallel Computer Organization and Design. Cambridge University Press.

Reference Books:

1	Carl Hamacher, ZvonkoVranesic, SafwatZaky, Computer Organization, McGraw-Hill, Fifth Edition, Reprint2012
2	Ray A K, Bhurchandi K M , Advanced Microprocessors and Peripherals, TM
3	Kai Hwang , "Computer Architecture & Parallel Processing" Mcgraw Hill Education

NPTEL/ Youtube/ Faculty Video Link

Unit 1	https://www.youtube.com/watch?v=L9X7XXfHYdU&list=PLxCzCOWd7aiHMonh3G6QNKq53C6oNXGrX
Unit 2	https://www.youtube.com/watch?v=WLgXUPOjKEc

Unit 3	https://www.youtube.com/watch?v=BPhWlFIU1rc
Unit 4	https://www.youtube.com/watch?v=6R7JDkpG1Wk&list=PLrjkTql3jnm8HbdMwBYIMAd3UdstWChFH
Unit 5	https://www.youtube.com/watch?v=nxryfWg5Hm4 https://www.youtube.com/watch?v=txAyA_UozmM

Mode of Evaluation

CIE						ESE	Total
ST1	ST2	ST3	TA1 5	TA2 5	Attendance 10		
30			20			100	150

LAB Course Code: BCSE0353A	LAB Course Name: Operating Systems Lab	L	T	P	C
Course Offered in: CSE/IT/CS/AI/AIML/ IOT/DS/CYS		**0**	**0**	**4**	**2**

Pre-requisite: Basic knowledge of computer fundamentals, C programming, Data structure and Computer organization.

Course Objectives: The course aims to provide hands-on experience with Linux and shell programming, while the lab focuses on implementing and analyzing key OS algorithms and simulating modern operating systems.

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.	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**		**PSO4**
CO1	2	1	1	1	3	-	-	2	2	-	3	2	1	2	2
CO2	3	3	3	2	2	-	-	2	2	-	2	2	2	3	3
CO3	3	2	3	2	3	-	-	2	2	-	3	2	3	3	3

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

1	**Implementation of Linux Commands** xii. Introduction of Unix/Linux Operating system and their architecture xiii. Display system information using uname, hostname, and date etc. xiv. File operations using cat, touch, cp, mv, rm, and chmod ,umask etc. xv. Create, view, and navigate directories using mkdir, rmdir, cd, pwd, ls etc. xvi. Disk Commands df,du,mount,unmount,mkfs,fsck etc. xvii. Use redirection and piping in commands **viii.** File compression and archiving using tar, gzip, zip, unzip etc. **xix.** Process commands ps,kill, killall,nice, pgrep, top,htop etc. **xx.** Network commands ifconfig, ping, netstat, host,ip route etc. **xxi.** Administrator Commands Adduser,Passwd, deluser, usermod, groupadd etc **xxii.** Implement different types of system calls in Unix/Linux.
2	**Shell Scripting Programming** xii. Write a shell script to ask your name, program name and enrollment number and print it on the screen. xiii. Write a shell script to find the sum, the average and the product of the four integers entered. xiv. write shell script to find average of numbers given at command line

	xv. Write a shell program to exchange the values of two variables xvi. Write a shell program to Print Numbers 1 to 10 using while & do while loop. vii. Write a shell program to Print Numbers 1 to 10 using for loop. **viii.** Write a shell script to display the digits which are in odd position in a given 5-digit number**.** xix. Write a shell program to search for a given number from the list of numbers provided using binary search method. xx. Write a shell program to concatenate two strings and find the length of the resultant string xxi. Write a shell script to find the smallest of three numbers **xii.** 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)
4	Implement FCFS CPU Scheduling algorithm.
5	Implement the SJF CPU Scheduling algorithm (For both Pre-emptive and Non-pre-emptive).
6	Implement PRIORITY CPU Scheduling Algorithm (For both Pre-emptive and Non-pre-emptive).
7	Implement Round-Robin CPU Scheduling Algorithm.
8	Implement Multi-Level Queue CPU Scheduling algorithm.
9	Implement Multilevel Feedback Queue CPU Scheduling Algorithm.
	Concurrency and Deadlock Management
10	Execute the RACE Condition of Process Synchronization.
11	Implement the Producer–consumer problem using semaphores.
12	Design a code and implement the Dinning Philosopher problem.
13	Implement Banker’s algorithm of Deadlock Avoidance.
14	Execute an algorithm for Deadlock Detection.
	Memory Management
15	Implement the Memory Fixed-size partition scheme.
16	Implement the Memory Variable-size partition scheme.
17	Simulate the First-Fit contiguous memory allocation technique.
18	Simulate the Best-Fit contiguous memory allocation technique.
19	Simulate the Worst-Fit contiguous memory allocation technique.
20	Implement the Non-contiguous Memory Allocation by using Paging.
	Page Replacement
21	Write a Program to simulate the FIFO page replacement algorithm.
22	Write a Program to simulate the LRU page replacement Algorithm.
23	Write a Program to simulate the Optimal page replacement Algorithm.
	Disk Scheduling
24	Write a program to simulate FCFS Disk Scheduling Algorithm.
25	Write a Program to simulate the SSTF Disk Scheduling Algorithm.
26	Write a program to simulate SCAN Disk Scheduling Algorithm.
27	Write a Program to simulate the C SCAN Disk Scheduling Algorithm.
28	Write a Program to simulate the LOOK Disk Scheduling Algorithm.
29	Simulate all file allocation strategies a) Sequential b) Indexed c) Linked.
	Modern Operating System
30	Introduction of CUDA Programming.

31	Write a program in CUDA print message “Welcome CUDA programming”
32	Implement matrix multiplication using shared memory in CUDA.
33	Connects to VMware vCenter and lists all virtual machines along with their power state.
34	Create a new virtual machine in Azure with specified configurations.
35	Deploy a simple HTTP-triggered distributed Azure Function.
	Total Hours: 48 hrs.

Mode of Evaluation

CIE			**PE** **(If mentioned in curriculum)**	**Total**
PS1	**PS2**	**PS3**		
10	**20**	**20**		
50			**50**	**100**

LAB Course Code: BCSE0351	LAB Course Name: DATA STRUCTURES AND ALGORITHMS-I LAB	L	T	P	C
Course Offered in: CSE/CS/IT/CSE-TWIN/IT-TWIN/CSE(AI)/CSE(AIML)/CSE(DS)/CSE(CS)		**0**	**0**	**4**	**2**

Pre-requisite: The concept of Programming Language

Course Objective:

The objective of the course is to compare the time complexities of various algorithm and implementation of linear data structure.

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.	K3
CO3	Implement divide and conquer and greedy algorithms to solve problems like sorting, scheduling and optimization.	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	PSO3	PSO4
CO1	3	3	2	3	3	1	1	1	1	1	2	3	1	2	2
CO2	3	3	3	2	3	1	1	1	1	1	2	3	1	2	2
CO3	3	3	3	3	3	1	1	1	1	1	3	3	1	2	3

List of Practical (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 program to find the maximum element in an array.
4. Construct a program to calculate the sum of all elements in an array.
5. Construct a program to reverse the elements of an array.
6. Construct a program to check if an array is sorted in ascending order.
7. Construct a program to count the occurrence of a specific element in an array.
8. Construct a program for creation and traversal of 2D Array in row major and column major order.
9. Construct a program to print the transpose of a given matrix using function.

10. Construct a program to find if a given matrix is Sparse or Not and print Sparse Matrix.
11. Construct a program to represent a sparse matrix in triplet form.
12. Construct a program to implement Linear Search.
13. Construct a program 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. Construct a program to create a single linked list and perform basic operations (insertion, deletion, traversal).
20. Construct a program to create a double linked list and perform basic operations (insertion, deletion, traversal).
21. Construct a program to create a circular linked list and perform basic operations (insertion, deletion, traversal).
22. Construct a program to create a circular double linked list and perform basic operations (insertion, deletion, traversal).
23. Construct a program to reverse a single linked list.
24. Construct a program to check if a linked list is palindrome.
25. Construct a program to reverse a double linked list.
26. Construct a program to find the middle element of a single linked list.
27. Construct a program to find the middle element of a double linked list.
28. Construct a program to merge two sorted single linked lists.
29. Construct a program to detect and remove a loop in a circular linked list.
30. Construct a program 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 program to infix to postfix conversion using a stack.
34. Construct a program for balanced parentheses checker using a stack.
35. Construct a program to reverse a string using a stack.
36. Construct a program to implement Binary search using recursion.
37. Construct a program to print Fibonacci series using recursion.
38. Construct a program to implement Tower of Hanoi.
39. Construct a program to implement queue using array.
40. Construct a program 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.

Total Hours	**48 Hours**

Mode of Evaluation

CIE	**PE (If mentioned in curriculum)**	**Total**
PS		
50	**50**	**100**

LAB Course Code: BCSCY0352	LAB Course Name: CYBER SECURITY ESSENTIALS Lab	L	T	P	C
Course Offered in: CSE(CYS)		0	0	2	1

Pre-requisite: Basic knowledge of Computer Systems, Basic understanding of networking eg: lan, man wan and operating systems

Course Objectives: The course objectives for the practicals are to provide students with hands-on experience and skills in various aspects of cybersecurity using the mentioned tools. The practicals aim to equip students with the knowledge and skills necessary to address cybersecurity challenges and contribute effectively to the industry.

The course objectives for the practicals are to provide students with hands-on experience and skills in various aspects of cybersecurity using the mentioned tools. The practicals aim to equip students with the knowledge and skills necessary to address cybersecurity challenges and contribute effectively to the industry.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Apply their proficiency in vulnerability recognition to identify and defend against cybersecurity attacks, while applying expertise in configuring secure Virtual Private Networks (VPNs) using OpenVPN.	K3
CO2	Apply practical skills in network traffic analysis and penetration testing techniques through hands-on experience with Wireshark and Kali Linux, enabling them to analyze network traffic and perform security assessments	K4
CO3	Apply password cracking techniques using various tools, enabling them to analyze password vulnerabilities and strengthen security measures	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
CO1	2	3	3	2	2	3	2	2	3			2	2	3
CO2	2	3			2			3	2			2	2	3
CO3	2	3			3	3	2	3	3	3	1	3	3	3

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

Setup a router with default credentials and insecure configurations.

1. Task: Exploit the default settings to gain unauthorized access, then secure the router.

Provide firmware images from IoT devices.

1. Task: Use tools like Binwalk and Firmware Analysis Toolkit to identify vulnerabilities.
2. To set up a basic OpenVPN server and client.
3. To configure OpenVPN with user authentication using a username and password.
4. To configure OpenVPN to use TLS for additional security.
5. To configure an OpenVPN server to handle multiple client connections.
6. To configure and monitor OpenVPN logs for security and troubleshooting.
7. Write kali linux command to implement file management, file navigation and password cracking.
8. Write kali linux commands to perform network scanning and network configration
9. Write kali linux commands to identify vulnerable access points in a network, file integrity and analysis
10. Write kali linux command to automate vulnerability scanning of a website,shell scripting,process management
11. Write kali linux command to exploit a known vulnerability in a target system,service management,search files,permission management
12. Develop a program to crack password hashes using various techniques supported by John the Ripper.
13. Create a program to generate custom wordlists for password cracking.

14. Design a program to perform a brute-force attack on a given password-protected file.
15. Build a program to assess the strength of user passwords based on a given policy.
16. Develop a program to create and apply custom rules for password cracking using John the Ripper.

Total Hours: 24 hrs.

Mode of Evaluation

CIE			**PE**	**Total**
PS1 **10**	**PS2** **5**	**PS3** **10**		
25			**25**	**50**

NIET Greater Noida

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
(An Autonomous Institute)

School of Computer Science in Emerging Technologies

Course Code: BCSE0352	Course Name: Object Oriented Techniques using Java	L	T	P	C
		0	0	6	3

Course Offered in: CSE/CS/IT/CSE(AI)/CSE(AIML)/CSE(IOT)/CSE(AI)/CSE(DS)/CSE-R/M.Tech int

Pre-requisite: Knowledge of basic programming concepts. Basic understanding of computer usage, including the command line.

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

S. No	Course Outcome	Bloom's Level
CO1	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 Java Socket Programming Concepts.	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	PSO3
CO1	3	3	3	3	2	2	1	-	1	-	2	2	2	2
CO2	3	3	3	3	2	2	1	-	1	1	2	2	2	2
CO3	3	3	3	3	3	2	2	-	2	1	2	2	3	2
CO4	3	3	3	3	3	2	2	1	2	1	2	3	3	3
CO5	3	3	3	3	3	2	2	1	2	1	2	3	3	3

Course Contents / Syllabus

Unit 1	Basics of Java Programming	hours

Object Oriented Programming: Introduction and Pillars of OOP with real life example, jvm architecture and its components **Modelling Concepts:** Introduction, Class Diagram and Object Diagram, UML concepts: Association, Composition, aggregation, realization, and Generalization.
Control Statements: Decision Making, Looping and Branching, Argument Passing Mechanism: Command Line Argument, Console Input.

Class and Object: Object Reference, Constructor, Abstraction: Abstract Class, Interface and its uses, Defining Methods, Use of "this" and "super" keyword, Garbage Collection and finalize () Method etc.

Unit 2	OOPs features, arrays and lambda expressions	16 hours

Inheritance: Introduction and Types of Inheritance in Java, Access Modifiers, Constructors and super constructor in Inheritance.

Polymorphism: Introduction and Types, Overloading and Overriding.

Lambda expression: Introduction and Working with Lambda Variables.

Arrays: Introduction and its Types. Jagged Array with example

Unit 3	**Packages, Exception Handling and String Handling**	**16 hours**
Packages: Introduction and Types, Access Protection in Packages, Import and Execution of Packages. **Exception Handling, Assertions and Localizations:** Introduction and Types, Exceptions vs. Errors, Handling of Exception. Finally, Throws and Throw keyword, Multiple Catch Block, Nested Try and Finally Block, Customized Exceptions, Tokenizer. Assertions and Localizations Concepts and its working. **String Handling:** Introduction and Types, Operations, Immutable String, Method of String class, String Buffer and String Builder class.		
Unit 4	**Concurrency in Java and I/O Stream**	**16 hours**
Threads: Introduction and Types, Creating Threads, Thread Life-Cycle, Thread Priorities, Daemon Thread,Runnable Class, Synchronizing Threads etc. **I/O Stream:** Introduction and Types, Common I/O Stream Operations, Interaction with I/O Streams Classes. character and byte oriented stream classes with example **Java Socket Programming**: Introduction and types(TCP, UDP), java socket program with server-side and client-side by using connection.		
Unit 5	**GUI Programming, Generics and Collections**	**16 hours**
GUI Programming: Introduction and Types, Swing, AWT, Components and Containers, Layout Managersand User-Defined Layout and Event Handling. **Generics:** Introduction to Generic Classes, types of generic defined in brief, bounded type parameter(Upper and Lower bound), Initializing a Generic Object, Classes, Methods and Interfaces Use enumerated type. **Collections:** Introduction, main interfaces of collections(Collection, List Set, Map, Queue), classes of collections(ArrayList,Linked list, HashtSet, HashMap and TreeSet) and methods(List, Set Map) Collection using Iterators		
	Total Lecture Hours	**80 hours**
Textbook: 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: 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		
NPTEL/ Youtube/ Faculty Video Link:		
Unit 1	https://www.youtube.com/watch?v=r59xYe3Vyks&list=PLS1QulWo1RIbfTjQvTdj8Y6yyq4R7g-Al	
Unit 2	https://www.youtube.com/watch?v=ZHLdVRXIuC8&list=PLS1QulWo1RIbfTjQvTdj8Y6yyq4R7g-Al&index=18	
Unit 3	https://www.youtube.com/watch?v=hBh_CC5y8-s	
Unit 4	https://www.youtube.com/watch?v=qQVqfvs3p48	
Unit 5	https://www.youtube.com/watch?v=2qWPpgALJyw	

Mode of Evaluation

CIE							ESE	Total
ST1	ST2	ST3	TA1 5	TA2 5	TA3 5	Attendance 5		
30			20				100	150

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

1.Understanding Text Editors to Write Programs Compile and run first java file Byte Code and class file

2. Sketch a class and object diagram describing the sales order system of restaurant

3. Sketch a class diagram describing the circle and rectangle class

4. Sketch a class diagram for a college platform including, classroom, playground, chair, table, smart board, teaching staff etc.

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.

6.Program to display default value of all Primitive data types

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.
Assume that four command line arguments name, marks1, marks2, marks3 will be passed to the main()
method in the below class with name Total And AvgMarks.

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 check Balance 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.

9. A class Number Palindrome with a public method is Number Palindrome 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

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

11. Write a Java Program to find the Factorial of a given number.

12. Java Program to create a class, methods and invoke them inside main method.

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.

14. Java program to illustrate the static field in the class.

15. Java Program to illustrate static class.

16. Write a java program to access the class members using super keyword

17. Java program to access the class members using this keyword

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.

19.Java program to demonstrate nested interface inside a interface.

20.Java program to demonstrate nested interface inside a class.

21.Java program to explicit implementation of garbage collection by using finalize() method

22.Java program to implement Single Inheritance

23.Java program to implement multi- level Inheritance

24.Java program to implement constructor and constructor overloading.

25.Java program implement method overloading.

26.Java program to implement method overriding.

27.Java program to implement lambda expression without parameter.

28.Java program to implement lambda expression with single parameter.

29.Java program to implement lambda expression with multi parameter.

30. Java program to implement lambda expression that iterate list of objects

31.Java program to define lambda expressions as method parameters

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

33.Java program to show the multiplication of two matrices using arrays.

34.Java Program to search an element using Linear Search

35.Java program to search an element using Binary Search

36.Java Program to sort element using Insertion Sort

37.Java Program to sort element using Selection Sort– Largest element Method

38.Java program to Sort elements using Bubble Sort

39.Java program to create user defined package.

40.Java Program to create a sub- classing of package

41.Implement the following:

1. Import package.*;
2. import package.classname;
51. Using fully qualified name.

42.Implement and demonstrate package names collision in java

43.Java program to handle and Arithmetic Exception Divided by zero

44.Java Program to implement User Defined Exception in Java

45.Java program to illustrate finally block

46.Java program to illustrate Multiple catch blocks

47.Java program for creation of illustrating throw in exception handling.

48.Implement the concept of Assertion in Java Programming Language

49.Implement the concept of Localization in Java Programming Language.

50.Java program to print the output by appending all the capital letters in the input string.

51.Java program that prints the duplicate characters from the string with its count.

52.Java program to check if two strings are anagrams of each other

53.Java Program to count the total number of characters in a string

54.Java Program to count the total number of punctuation characters exists in a String

55.Java Program to count the total number of vowels and consonants in a string

56.Java Program to show .equals method and == in java

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 "WiWiWiWiWi".

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".

59.Java program to show the usage of string builder.

60.Java program to show the usage of string buffer.

61.Creating and Running a Thread

62.Implementing Runnable Interface

63.Synchronizing Threads with lock

64.Synchronizing Threads without lock

65.Java program to implement even and odd threads by using Thread class .

66.Java program to implement even and odd threads by using Runnable interface.

67.Java program to synchronize the threads by using Synchronize statements and Synchronize block.

68.Write a program where the client sends a message to the server, and the server prints it by using TCP

69.Implement a server that can handle multiple clients simultaneously using UDP

70.Write a client-server application where the client uploads a file and the server saves it by using TCP/UDP.

71. Java program to implement that read a character stream from input file and print it into output file.

72.Java program to implement that merge the content of two files (file1.txt, file2.txt) into file3.txt.

73.Write a Java program that reads the contents of one file and copies them toanother file.

74.Write a Java program that reads a text file and counts the number of words in it.

75.Write a Java program that reads a text file and counts the frequency of each word in it.

76.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.

77.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.

78.Program to create a frame with three button in AWT and swing

79.Program to display message with radio buttons in swing

80.Program to display "All The Best" in 5 different colors on screen. (Using AWT/Swing)

81.Program to implement handling in a button “OK”

82.Java Program to implement BorderLayout

83.Java Program to implement GridLayout

84. Java Program to implement BoxLayout

85. Java Program to implement CardLayout

86. Java program to implement Generic class

87. Java program to illustrate Generic methods

88.Java program to implement wildcard in generics

89.Java program to implement of methods of HashSet

90.Java Program to implement methods available in HashMap class

91.Program to add, retrieve, and remove element from ArrayList

92.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.

93.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.

94. Java program to implement autoboxing

95.Java program to implement unboxing

96.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.

97.Create a method that accepts the names of five countries and loads them to an array list and returns the list.

98.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.

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

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		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**	**PSO3**	**PSO4**
CO1	3	3	2	2	-	3	3	2	2	-	2	1	1	1	1
CO2	3	3	2	2	-	3	3	2	2	-	2	1	1	1	1
CO3	3	3	2	2	-	3	3	2	2	-	2	1	1	1	1
CO4	3	3	2	2	-	3	3	3	2	-	2	2	1	2	2

Course Contents / Syllabus

Module 1	**Basic Principle of Ecology and Biodiversity 4 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 4 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 4 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 4 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**
1	Brady, N.C. 1990. The nature and properties of Soils, Tenth Edition. Mac Millan Publishing Co., New York
2	Sodhi G.S. 2005, Fundamentals of Environmental Chemistry: Narosa Publishing House, New Delhi.
3	Dash, M.C. (1994), Fundamentals of Ecology, Tata Mc Graw Hill, New Delhi.

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

Unit 1:	https://www.youtube.com/watch?v=T21OO0sBBfc, https://www.youtube.com/watch?v=qt8AMjKKPDo
Unit 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
Unit 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
Unit 4	https://www.youtube.com/watch?v=ad9KhgGw5iA, https://www.youtube.com/watch?v=nW5g83NSH9 M, https://www.youtube.com/watch?v=xqSZL4Ka8xo

Mode of Evaluation

CIE							**ESE**	**Total**
ST1	**ST2**	**ST3**	**TA1** **5**	**TA2** **5**	**TA3** **5**	**Attendance** **5**		
30			**20**				**50**	**100**

Course Code: BNC0301	**Course Name: Artificial Intelligence and Cyber Ethics**	**L**	**T**	**P**	**C**
Course Offered in: All Branches		**2**	**0**	**0**	**-**

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
CO5	Describe the impact of AI in Society, employment and workforce.	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	PSO3	PSO4
CO1	2	2	1	1	2	2	3	1	2	1	2	1	3	2	1
CO2	2	3	3	2	2	2	3	1	2	1	2	1	3	2	1
CO3	3	3	2	3	2	2	3	1	1	1	2	3	3	3	2
CO4	2	2	1	1	1	3	3	1	2	1	2	2	2	3	2
CO5	1	1	1	1	1	3	3	2	3	2	3	1	2	2	1

Course Contents / Syllabus

Module 1	**An Overview to AI Ethics**	**5 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**	**6 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**	**5 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).

Module 5	**AI Contribution to Social Evolution**	**6 hours**

Positive and Negative Political impacts of AI, Role of AI in Social Media and Communication Platforms, AI-Generated Content and Deepfakes, Key Technical Stakeholders in AI Deployment: Developers, Researchers, Policymakers, Technical Impacts on Employment and Workforce Automation Technologies: Robotic Process Automation (RPA), Autonomous Systems.

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 Publications, 2023
2.	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
5.	https://www.youtube.com/watch?v=I9FOswjTSGg

Mode of Evaluation

CIE							**ESE**	**Total**
ST1	**ST2**	**ST3**	**TA1** **5**	**TA2** **5**	**TA3** **5**	**Attendance** **5**		
30			**20**				**50**	**100**

		L	T	P	C
Course Code: BASCC00401	**Course Name: Employability Skill Development – II**	**L**	**T**	**P**	**C**
Course Offered in:		**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	PSO1	PSO2	PSO3	PSO4
CO1	1	1	1	1	-	-	-	-	-	-	-	1	1	1	1
CO2	1	1	1	1	-	-	-	-	-	-	-	2	1	1	2
CO3	1	1	1	1	-	-	-	-	-	-	-	2	1	1	2
CO4	1	1	1	1	-	-	-	-	-	-	-	1	1	1	1

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

Reference Books:

S.No	Book Title
1	M. Tyra (BSC publication co. Pvt. Ltd), Quicker math
2	RS Aggarwal , Quantitative Aptitude
3	RS Aggarwal, Verbal & Non-Verbal Reasoning

4	Sarvesh K Verma, Quantitative Aptitude - Quantum CAT

NPTEL/ YouTube/ Faculty Video Link:

Mode of Evaluation

CIE							ESE	Total
ST1	ST2	ST3	TA1	TA2	TA3	Attendance		
			5	5	5	5		
30			20				50	100

NIET Greater Noida

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
GREATER NOIDA-201306
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School of Computer Science in Emerging Technologies

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

Pre-requisite: Basic understanding of computer fundamentals such as architecture, storage, and hardware. In addition, familiarity with data structures, algorithms, and basic programming concepts will be beneficial.

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 this course students will be able to		Bloom's Knowledge Level (KL)
CO 1	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	valuate and implement Relational and Non-Relational databases using different tools and their effectiveness in real-world applications.	K5

CO-PO Mapping

CO-PO Mapping	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	3	3	3	2	1	1	1	2	1	2	3	1	2	1
CO2	3	2	3	3	2	2	1	2	1	2	2	3	2	2	1
CO3	3	3	2	3	3	2	-	2	1	-	2	3	3	2	1
CO4	3	2	2	2	2	2	1	-	1	1	1	3	3	2	2
CO5	2	2	2	2	3	2	1	-	1	2	2	3	3	2	2

Course Contents / Syllabus

Module 1	**Introduction about the Database Conceptual Designing**	**8 hours**

Basic Concept: Database system concept, architecture, History of Database, Data Independence, Database system Vs File system, Data models & Types of Data Models, schema and instances.

Data Modelling using the Entity Relationship Model: 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.

Introduction on SQL: Types of SQL commands: -DDL, DML, DCL, TCL. Basic of Relation Algebra & Operations, Query Optimization.

Module 2	**Basic of SQL & Normalization**	**8 hours**

Keys & Types of Keys: Super key, Candidate Key, Primary Key, Alternative Key, Foreign Key, unique. Constraints and Types of Constraints.

Use of Functions, Clause and Predicates: Aggregate Function, Scalar Functions, Where, Group by, Having and Order by, SQL Operators. Like, Between, Aliases, distinct, limit.
Normalization: Functional Dependencies, attribute Closure, Normalization & Types of Normalization, Candidate Key, Canonical Cover of FD's.

Module 3	**Introduction of Complex Queries**	**8 hours**

Use of Operators: 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.
Nested Query or Sub Query: IN, NOT IN, Exists, Not Exists, All and Any. Managing Indexes, Synonyms and Sequences, Managing Views.
Introduction of PL/SQL: Implementation of PL/SQL Function, Procedure, Trigger, Cursor.
Database connectivity: Database Connectivity with Java/Python Programming Languages.

Module 4	**Transaction and Concurrency Control**	**8 hours**

Transaction system: Life cycle of transaction, ACID Properties Schedule & Types of Schedule, Serializability, Recoverability, Deadlock Handling.
Concurrency Control Techniques: 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**	**8 hours**

Introduction of NoSQL With MongoDB : 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.
Cloud Database Introduction of Cloud Database. MongoDB Cloud product : Stitch, Atlas & Cloud Manager.

Total Lecture Hours	**40**

Textbook:

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

Reference Book

S.No	**Book Title**
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.

NPTEL/ Youtube/ Faculty Video Link:

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 Database Design - YouTube 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 - YouTube Introduction to 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

Mode of Evaluation

CIE							ESE	Total
ST1	**ST2**	**ST3**	**TA1**	**TA2**	**TA3**	**Attendance**		
			5	**5**	**5**	**5**		
30			**20**				**100**	**150**

NIET Greater Noida

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School of Computer Science in Emerging Technologies

Course Code: BCSE0401	**Course Name: DATA STRUCTURES AND ALGORITHMS-II**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CS/IT/CSE(AI)/CSE(AIML)/CSE(DS)/CSE(CS)		**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

S.No	**Course Outcome**	**Bloom's Level**
CO 1	Apply tree structures to solve specific problems using various tree operations and algorithms.	K3
CO 2	Analyse the graph data structure and evaluate the efficiency of its operations for problem solving.	K4
CO 3	Evaluate dynamic programming solutions for efficient problem-solving across diverse contexts.	K4
CO 4	Apply efficient backtracking and branch –and –bound techniques across diverse problem-solving scenarios.	K3
CO 5	Understand principles of advanced data structures, including their implementation and applications.	K2

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

CO-PO Mapping	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO11**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	3	3	2	1	1	2	1	1	2	1	-	2	1	2	1
CO2	3	3	2	1	**1**	2	1	1	2	1	-	2	1	2	1
CO3	3	3	2	2	2	2	1	1	2	2	-	2	1	2	1
CO4	3	3	3	2	2	2	1	1	2	1	-	2	1	2	1
CO5	3	3	3	2	2	2	1	1	2	2	-	2	1	2	1

Course Contents / Syllabus

Unit 1	**Design and Analysis of Algorithms: Tree**	**8 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.

Application of Trees: Priority Queue, Heap Sort, Huffman codes.

Unit 2	**Design and Analysis of Algorithms: Graphs**	**8 hours**

Graphs: 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.

Algorithms on Graphs: 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.

Unit 3	**Dynamic Programming**	**8 hours**
Dynamic Programming: Dynamic Programming concepts 0/1 Knapsack, Longest Common Sub Sequence, Matrix Chain Multiplication, Resource Allocation Problem.		
Unit 4	**Backtracking, Branch and Bound**	**8 hours**
Backtracking: Backtracking, Branch, and Bound with Examples Such as Travelling Salesman Problem, Graph Colouring, n-Queen Problem, Hamiltonian Cycles, and Sum of Subsets.		
Unit 5	**Advanced- Data Structures**	**8 hours**
Red-Black Trees, B – Trees, B+ Trees, Binomial Heaps, Fibonacci Heaps, Trees.		
	Total Lecture Hours	**40 hours**

Textbook:

S.No.	**Book Details**
1	Michael T. Goodrich, Roberto Tamassia, "Data Structures and Algorithms in Python: An Indian Adaptation", 1st Edition, 2021
2	Lipschutz, "Data Structures" Schaum's Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd, 2nd Edition, 2017.
3	Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", Printice Hall of India, 4th Edition, 2022

Reference Books:

S.No.	**Book Details**
1	Reema Thareja, "Data Structure Using C", Oxford University Press, 2nd Edition, 2014.
2	AK Sharma, "Data Structure Using C", Pearson Education India, 2nd Edition,2011.
3	P. S. Deshpandey, "C and Data structure", Wiley Dreamtech Publication, 1st Edition, 2004.

NPTEL/ YouTube/ Faculty Video Link:

Unit 1	https://youtu.be/u5AXxR4GnRY
Unit 2	https://www.youtube.com/watch?v=LQx9E2--p5c&pp=ygUMYXJyYXlzIG5wdGVs
Unit 3	https://www.youtube.com/watch?v=K7VIKlUdo20&pp=ygUPbGluayBsaXN0IG5wdGVs
Unit 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

Unit 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

Mode of Evaluation

CIE						ESE	Total
ST1	ST2	ST3	TA1 5	TA2 5	Attendance 5		
30			20			100	150

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY
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LAB Course Code: BCSE0451	LAB Course Name: Database Management Systems Lab	L	T	P	C
Course Offered in: CSE/CSE-R/IT/M. Tech Int./CSE(Twin)/IT(Twin)/CSE(Prof)/IT(Prof)/M&C/AI/AI(TWIN)/ AIML/AIML(TWIN)/ CS/CYS/DS/IOT		0	0	4	2

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 Outcomes (CO)

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

V 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	PSO 3	PSO4
CO1	3	3	3	3	2	1	-	1	2	1	2	3	1	2	1
CO2	3	3	3	3	2	2	-	2	1	2	2	3	3	2	1
CO3	2	2	2	2	3	2	-	-	1	2	2	3	3	2	2

Sr. No	Program Title
1	Understand and implement the different ER diagram notation with their relationship and Cardinalities.
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.
3	Implement DDL, DML, DCL & TCL commands
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
5	Implementation of Business Constraint: Null, Not Null, Default, Check.
6	Practicing Queries using Like, Between, Aliases, distinct Operator & Predicate. And Implement Aggregate Functions
7	Implementation of Queries using Where, Group by, Having and Order by Clause.
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. 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.
10	Implementation of Queries using Inner Join:- Natural Join , Equi Join & Non Equi Join, Outer Join
11	Implementation of Queries nested Queries or Sub Queries: - IN, NOT IN, Exists, Not Exists, All and Any.
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. III. Find the names of employees that are directly supervised by 'Franklin Wong'. IV. 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 VII. For each department, retrieve the department name, and the average salary of employees working in that department. VIII. Retrieve the average salary of all female employees. IX. 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
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.

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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</td></tr>
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</table>

PS	**(If mentioned in curriculum)**	
50	**50**	**100**

Course Code: BCSE0401	**Course Name: DATA STRUCTURES AND ALGORITHMS - II**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE-R/M. Tech(int)//IT/CSE (AI)/CSE(AIML)/ CSE(IOT)/ CSE(CS) CSE(DS)/CS		**3**	**0**	**0**	**3**

Pre-requisite: Data Structures and Algorithms II

Course Objectives:

To equip students with knowledge of non-linear data structures and advanced algorithms, enabling them to analyze and implement efficient solutions for complex problems.

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

		Bloom's Knowledge Level (KL)
CO1	Apply tree structures to solve specific problems using various tree operations and algorithms.	K3
CO2	Analyse the graph data structure and evaluate the efficiency of its operations for problem solving.	K4
CO3	Evaluate dynamic programming solutions for efficient problem-solving across diverse contexts.	K4
CO4	Apply efficient backtracking and branch –and –bound techniques across diverse problem-solving scenarios.	K3
CO5	Understand principles of advanced data structures, including their implementation and applications.	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**	**PO12**	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	3	2	3	3	3	1	1	-	2	1	2	3	2	1	2	1
CO2	3	2	3	3	3	1	1	-	2	1	2	3	2	1	2	1
CO3	3	2	3	3	2	1	2	-	2	1	1	3	2	1	2	1
CO4	3	2	3	3	2	1	2	-	2	1	1	3	2	1	2	1
CO5	3	2	3	3	3	1	1	-	2	1	2	3	2	1	2	1

Course Contents / Syllabus

Unit 1	**Design and Analysis of Algorithms: Trees**	**12 hours**
Terminology used with Trees, Binary Tree, Memory representation of Tree, Traversal Algorithms: In-order, Pre-order, Post-order, Constructing Binary Tree from given Tree Traversal, Operations: 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.		
Unit 2	**Design and Analysis of Algorithms: Graphs**	**08 hours**
Terminology used with Graph, Data Structure for Graph Representation: Adjacency Matrices, Adjacency List, Graph Traversal: Depth First Search (DFS), Breadth First Search (BFS), Spanning Trees, Minimum Cost Spanning Trees: Prim's Algorithm, Kruskal's Algorithm, Shortest Path Algorithms: Dijkstra Algorithm, Bellman-Ford Algorithm.		
Unit 3	**Dynamic Programming**	**09 hours**
Dynamic Programming Concepts, Floyd-Warshall Algorithm, 0/1 Knapsack Problem, Longest Common Subsequence, Matrix Chain Multiplication, Resource Allocation Problem.		
Unit 4	**Backtracking and Branch & Bound**	**09 hours**
Travelling Salesman Problem, Graph Coloring, n-Queen Problem, Hamiltonian Cycles, Sum of Subsets.		
Unit 5	**Advanced Data Structures**	**10 hours**

Red-Black Trees, B-Trees, B+ Trees, Binomial Heaps, Fibonacci Heaps.

Total Lecture Hours	**48 hours**

Textbook:

1. Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, “Data Structures and Algorithms in Python (An Indian Adaptation)”, Wiley Publication
2. Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd.
3. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, “Introduction to Algorithms”, Printice Hall of India.
4. E. Horowitz & S Sahni, "Fundamentals of Computer Algorithms".
5. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008. LEE "Design & Analysis of Algorithms (POD)",McGraw Hill.

Reference Books:

1. Thareja, “Data Structure Using C” Oxford Higher Education.
2. AK Sharma, “Data Structure Using C”, Pearson Education India
3. P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication.
4. R. Kruse etal, “Data Structures and Program Design in C”, Pearson Education.
5. Berztiss, AT: Data structures, Theory and Practice, Academic Press.
6. Jean Paul Trembley and Paul G. Sorenson, “An Introduction to Data Structures with applications”, McGraw Hill.

NPTEL/ Youtube/ Faculty Video Link:

Unit 1	https://nptel.ac.in/courses/106/106/106106127/ https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F
Unit 2	https://www.youtube.com/watch?v=4OxBvBXon5w&list=PLBF3763AF2E1C572F&index=22 https://www.youtube.com/watch?v=cR4rxllyiCs&list=PLBF3763AF2E1C572F&index=23
Unit 3	https://nptel.ac.in/courses/106/106/106106127/ https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=24
Unit 4	https://www.youtube.com/watch?v=hk5rQs7TQ7E&list=PLBF3763AF2E1C572F&index=25
Unit 5	https://www.youtube.com/watch?v=KW0UvOW0XIo&list=PLBF3763AF2E1C572F&index=5

Mode of Evaluation

CIE						ESE	Total
ST1	ST2	ST3	TA1 5	TA2 5	Attendance 5		
30			20			100	150

		L	T	P	C
Course Code: BCSCY0303	**Course Name: ETHICAL HACKING**	**L**	**T**	**P**	**C**
Course Offered in: CYBERSECURITY		**3**	**0**	**0**	**3**

Pre-requisite: Basic understanding of computer networks and operating systems. Familiarity with programming concepts (preferably in languages like Python, C, or Java). Knowledge of cybersecurity fundamentals.

Course Objective: To equip students with the skills and knowledge to identify, exploit vulnerabilities in computer systems ethically, and to understand the legal responsibilities of ethical hacking.

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Understand the concept of hacking and perform hacking related activities ethically	K2
CO2	Acquire knowledge and skills of various tools used in footprints, port scanning, and reconnaissance techniques and will apply in the field of cyber security	K3
CO3	Identify, analyze, and mitigate security vulnerabilities in web applications using tool	K3
CO4	Develop the ability to conduct comprehensive scanning and enumeration to identify network resources, services, and potential vulnerabilities effectively using openVAS	K4
CO5	Execute and defend against system hacking techniques, including gaining unauthorized access, escalating privileges, and maintaining persistent control.	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**
CO1	2	2	1	1	2		3	2	1	1	2	2	3	3
CO2	3	3			3		2	1	1	2	2	3	3	2
CO3	3	3			3	1	2			1		3	2	3
CO4	3	3	2	3	3	1	2			1		3	2	3
CO5	3	3	2	3	3	2	3	2	1	1	2	3	2	3

Course Contents / Syllabus

Module 1	Introduction to Ethical Hacking	**09 hours**

Understanding the Concept of Ethical Hacking, History and Evolution of Hacking, Scope and Importance of Ethical Hacking in Cybersecurity, Legal and Ethical Considerations in Ethical Hacking, Common Terminologies and Tools Used in Ethical Hacking

Module 2	Footprinting and Reconnaissance	**10 hours**

Introduction to Cuckoo Sandbox, Basic Usage of Cuckoo Sandbox, Malware Analysis with Cuckoo Sandbox, Integrating Cuckoo Sandbox with Security Operations, Footprinting Concepts and Methodologies, Passive and Active Reconnaissance Techniques, Information Gathering through Search Engines, Social Media, and WHOIS Lookup, Network Scanning and Enumeration Techniques, Vulnerability Scanning and Analysis

Module 3	Secure Communication Protocols	**10 hours**

Introduction to Web Application Security, Common Web Vulnerabilities (SQL Injection, XSS, CSRF, etc.), Web Application Reconnaissance and Footprinting, Web Application Scanning and Enumeration, Secure Coding Practices and Web Application Hardening

Module 4	Network Attacks and Défense Mechanisms	**10 hours**

Port Scanning Techniques (TCP, UDP), Service Enumeration and Version Detection, OS Fingerprinting, Vulnerability Assessment and Analysis, Using Scanning Tools like Nmap, Nessus, and OpenVAS.

Module 5	System Hacking	**11 hours**

Wi-Fi Password Cracking Techniques, Escalating Privileges and Gaining Unauthorized Access, Exploiting System Vulnerabilities, Malware Analysis and Reverse Engineering, Countermeasures and Defensive Strategies against System Hacking

Total Lecture Hours	**50 hours**

Textbook:

1	The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy	Patrick Engebretson.

2	CEH Certified Ethical Hacker All-in-One Exam Guide	Matt Walker.
3	Web Application Hacker's Handbook: Finding and Exploiting Security Flaws	Dafydd Stuttard and Marcus Pinto.

Reference Books:

S.No	Book Title	Author(s)
1.	Penetration Testing: A Hands-On Introduction to Hacking	Georgia Weidman.
2.	Metasploit: The Penetration Tester's Guide	David Kennedy, Jim O'Gorman, Devon Kearns, and Mati Aharoni.
3.	Hacking: The Art of Exploitation	Jon Erickson
4.	OWASP Testing Guide	OWASP Foundation.
5.	Nmap Network Scanning: The Official Nmap Project Guide to Network Discovery and Security Scanning	Gordon Fyodor Lyon.

NPTEL/ Youtube/ Faculty Video Link:

1. https://www.youtube.com/watch?v=aFpI0VIkRKg
2. https://www.youtube.com/watch?v=lzhJGS2alvM
3. https://nptel.ac.in/courses/106105217

Mode of Evaluation

CIE							ESE	Total
ST1	ST2	ST3	TA1 5	TA2 5	TA3 5	Attendance 5		
30			20				100	150

Course Code: BASL0301N	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		Bloom’s Knowledge Level (KL)
CO1	Comprehend the principles and functions of technical communication.	K2
CO2	Write for specific audience and purpose to fulfil the provided brief	K3
CO3	Recognize and produce different kinds of technical documents.	K3
CO4	Apply effective speaking skills to efficiently carry out official discourses.	K3
CO5	Demonstrate their understanding of communication through digital media.	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	PSO3	PSO4
CO1	1	1	1	1	1	2	1	2	3	1	1	-	-	-	-
CO2	1	1	1	1	1	1	1	2	3	1	1	1	-	1	1
CO3	1	1	1	1	1	1	1	2	3	1	1	2	1	2	2
CO4	1	1	1	1	1	1	1	2	3	1	1	1	1	2	2
CO5	1	1	1	1	1	1	1	2	3	1	1	1	1	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:	
1	Technical Communication – Principles and Practices, 4th Edition by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2022, New Delhi.
Reference Books:	
1	Technical Communication, 15th Edition by John M. Lannon & Laura J. Gurak, Pearson, 2021
2	Spoken English- A Manual of Speech and Phonetics (5th Edition) by R K Bansal & J B Harrison, Orient Blackswan, 2024, New Delhi.
3	Business Correspondence and Report Writing by Prof. R C Sharma, Krishna Mohan, and Virendra Singh Nirban (6 Edition), Tata McGraw Hill & Co. Ltd., 2020, New Delhi.
4	Intercultural Communication in Virtual Exchange by Francesca Helm, Cambridge Univ. Press, 2024.
NPTEL/ You tube/ Faculty Video Link:	
Unit 1	https://onlinecourses.nptel.ac.in/noc24_ge37/preview

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

Mode of Evaluation

CIE						ESE	Total
ST1	**ST2**	**ST3**	**TA1** **5**	**TA2** **5**	**Attendance 10**		
30			**20**			**50**	**100**

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 Systems Lab**	**L**	**T**	**P**	**C**
Course Offered in: CSE/IT/CSE(Twin)/IT(Twin)/CSE(Prof)/IT(Prof)/M&C/AI/AI(TWIN)/ AIML/AIML(TWIN)/ CS/CYS/DS/IOT		**0**	**0**	**4**	**2**

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 Outcomes (CO)

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**	**PSO3**	**PSO4**
CO1	3	3	3	3	2	1	-	1	2	1	2	3	1	2	1
CO2	3	3	3	3	2	2	-	2	1	2	2	3	3	2	1
CO3	2	2	2	2	3	2	-	-	1	2	2	3	3	2	2

Sr. No	**Program Title**
1	Understand and implement the different ER diagram notation with their relationship and Cardinalities.
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.
3	Implement DDL, DML, DCL & TCL commands
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
5	Implementation of Business Constraint: Null, Not Null, Default, Check.

6	Practicing Queries using Like, Between, Aliases, distinct Operator & Predicate. And Implement Aggregate Functions
7	Implementation of Queries using Where, Group by, Having and Order by Clause.
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. xv. List the E_no, E name, Salary of all employees working for MANAGER. xvi. Display all the details of the employee whose salary is more than the Sal of any IT PROFF. xvii. List the employees in the ascending order of Designations of those joined after 1981. xviii. List the employees along with their Experience and Daily xix. List the employee who are either ‘CLERK’ or ‘ANALYST’. xx. List the employees who joined on 1-MAY-81, 3-DEC-81, 17-DEC-81. xxi. List the e_name those are starting with ‘S’. xxii. Display total salary spent for each job category. xxiii. Display lowest paid employee details under each manager. xxiv. Display number of employees working in each department and their department name. xxv. Display the details of employees sorting the salary in increasing order. xxvi. Show the record of employee earning salary greater than 16000 in each department. xxvii. Add constraints to check, while entering the empno value (i.e) empno> 100. xxviii. Define the field DEPTNO as unique. xxix. Create a primary key constraint for the column (EMPNO).
9	Implementation of Queries using set theory operators UNION, INTERSECT, MINUS.
10	Implementation of Queries using Inner Join:- Natural Join , Equi Join & Non Equi Join, Outer Join
11	Implementation of Queries nested Queries or Sub Queries: - IN, NOT IN, Exists, Not Exists, All and Any.
12	Apply the set theory operators, join’s and nested queries on company database (Case Study-1) Write the SQL Queries for the following statement. XII. Retrieve the names of employees in department 5 who work more than 10 hours per week on the 'ProductX'project. XIII. List the names of employees who have a dependent with the same first name as themselves. IV. Find the names of employees that are directly supervised by 'Franklin Wong'.

	XV. For each project, list the project name and the total hours per week (by all employees) spent on that project. VI. Retrieve the names of all employees who work on every project controlled by department 5. VII. Retrieve the names of all employees who do not work on every project VIII. For each department, retrieve the department name, and the average salary of employees working in that department. IX. Retrieve the average salary of all female employees. XX. 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. XI. List the last names of department managers who have no dependents. XII. 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
14	Implementation and apply all the set theory operators, join and nested queries concept on Case study 1. x. 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. xi. 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. xii. To retrieve the SSN of all employee who work as a supervisor not a manager. xiii. 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. xiv. Retrieve the names of employees who have no dependents. xv. List the names of all employees with two or more dependents. xvi. List the names of managers who have at least one dependent. xvii. Retrieve the names of all employees who do not have supervisors. VIII. Retrieve the name of each employee who has a dependent with the same Last name as the employee.
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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.
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.
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:
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23	Implementation of the MongoDB Shell commands
24	Implementation of the CRUD Operation in MongoDB
25	Implementation of Aggregate in MongoDB
26	Implementation of case Study on different domain vii. E-commerce Platform viii. Inventory Management ix. Railway System x. Hospital Data Management xi. Voice-based Transport Enquiry System xii. SMS-based Remote Server Monitor system xiii. Banking System
	Total Hours: 30 hrs.
Mode of Evaluation	

CIE	PE (If mentioned in curriculum)	Total
PS		
50	50	100

LAB Course Code: BCSE0452Z	**LAB Course Name: Data Structures and Algorithms Lab II**	**L**	**T**	**P**	**C**
Course Offered in: CSE/CSE-R/M.Tech(int)/IT/CSE(AI)/CSE(AIML)/ CSE(IOT)/ CSE(CS)/ CSE(DS)/CS		**0**	**0**	**2**	**1**

Pre-requisite: DSA I

Course Objectives:

To enable students to practically implement and analyze non-linear data structures and algorithms for solving complex computational problems effectively.

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

1. Implement tree data structures for basic operations like insertion, deletion, searching, and traversal.
2. Implement algorithms based on graph data structures for solving real world problems.
3. Implement dynamic programming, backtracking, branch and bound algorithms to solve complex data efficiently and effectively.

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**	**PSO 3**	**PSO4**
CO1	3	2	3	3	3	1	2	-	2	1	2	3	2	-	2	1
CO2	3	2	3	3	3	1	2	-	2	1	2	3	2	-	2	1
CO3	3	2	3	3	2	2	3	-	2	1	1	3	2	-	2	1

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

1 . In-order Traversal of a Binary Tree

Problem Statement:

A binary tree is often used in computer science for organizing data hierarchically. For example, in a library system, book categories are structured as a binary tree. Implement an in-order traversal to retrieve book titles in sorted order.

Input:

- Number of nodes, followed by Node Parent Relation (L for left, R for right).

Output:

- Nodes of the tree printed in in-order traversal.

Constraints:

- 1≤number of nodes≤1000

2 . Pre-order Traversal of a Binary Tree

Problem Statement:

Use a pre-order traversal to determine the layout of bookshelves for each category in a bookstore to decide where to start arranging.

Input:

- Number of nodes, followed by Node Parent Relation.

Output:

- Nodes of the tree printed in pre-order traversal.

Constraints:

- 1≤number of nodes≤1000

3. Post-order Traversal of a Binary Tree

Problem Statement:

In a hierarchical task execution system, tasks are organized in a binary tree. Use post-order traversal to determine the order of execution.

Input:

- Number of nodes, followed by Node Parent Relation.

Output:

- Nodes of the tree printed in post-order traversal.

Constraints:

- 1≤number of nodes≤1000

4. Menu-Driven Program for Binary Tree Traversals

Problem Statement:

Design a system for an automated logistics company where the manager can view routes using in-order, pre-order, or post-order traversal, and search for specific routes in the system.

Input:

- Number of nodes, followed by Node Parent Relation and query for traversal type or search.
- Traversal type:
  - 1 for In-order
  - 2 for Pre-order
  - 3 for Post-order
  - 4 for Searching

Output:

- Traversal result based on the query.
- For search, print "Found" or "Not Found."

Constraints:

- 1≤number of nodes≤1000

5. Counting Nodes in a Binary Tree

Problem Statement:

In an organizational hierarchy stored as a binary tree, count the number of employees under a given manager.

Input:

- Number of nodes, followed by Node Parent Relation.

Output:

- Total number of nodes.

Constraints:

- 1≤number of nodes≤10^ 4

6. Height of a Binary Tree

Problem Statement:

Determine the longest chain of commands in a company's decision-making process stored in a binary tree.

Input:

- Number of nodes, followed by Node Parent Relation.

Output:

- Height of the binary tree.

Constraints:

- 1≤number of nodes≤10^4

7. Checking if a Binary Tree is Balanced

Problem Statement:

Check if a family tree is well-balanced, ensuring no sibling group has an unequal distribution of members.

Input:

- Number of nodes, followed by Node Parent Relation.

Output:

- Print "Balanced" or "Not Balanced."

Constraints:

- 1≤number of nodes≤10^4

8. Searching in a Binary Search Tree (BST)

Problem Statement:

Search for an item in an e-commerce inventory system structured as a BST.

Input:

- Number of nodes, followed by Node Parent Relation, and the item to search for.

Output:

- "Found" or "Not Found."

Constraints:

- 1≤number of nodes≤1041 \leq \text{number of nodes} \leq 10^41≤number of nodes≤104.

9. Inserting a Node in a Binary Search Tree (BST)

Problem Statement:

Insert a new product into an e-commerce inventory system represented as a BST.

Input:

- Number of nodes, followed by Node Parent Relation, and the product ID to insert.

Output:

- BST updated in pre-order traversal.

Constraints:

- 1≤number of nodes≤10^4

10. Deleting a Node from a Binary Search Tree (BST)

Problem Statement:

Remove a discontinued product from an inventory system represented as a BST.

Input:

- Number of nodes, followed by Node Parent Relation, and the product ID to delete.

Output:

- BST updated in pre-order traversal.

Constraints:

- 1≤number of nodes≤10^4

11. Insertion and Search Operations in a Binary Tree

Problem Statement:

Develop a binary tree-based database to allow insertion and search of client records.

Input:

- Number of operations nnn, followed by operation type (insert/search) and value.

Output:

- "Inserted Successfully" for insert operations.
- "Found" or "Not Found" for search operations.

Constraints:

- 1≤n≤10^4.

12. Calculate the Balance Factor of Each Node in an AVL Tree

Problem Statement:

In a dynamic social networking site, each user is represented as a node in an AVL tree. Calculate the balance factor for every user to ensure the tree remains balanced after every operation.

Input:

- Number of nodes, followed by Node Parent Relation.

Output:

- Balance factor for each node in level-order traversal.

Constraints:

- 1≤number of nodes≤10^4

13. Implement a Max-Heap and Perform Heap Sort

Problem Statement:

Sort a list of deadlines for tasks in a project using heap sort.

Input:

- Number of deadlines n, followed by n integers representing deadlines.

Output:

- Deadlines sorted in ascending order.

Constraints:

- $1 \leq n \leq 10^6$.
- Each deadline is a positive integer 10^9

14. Implement a Priority Queue Using a Max-Heap

Problem Statement:

Develop a system to prioritize emergency cases in a hospital using a priority queue.

Input:

- Number of operations n, followed by n operations (insert x or extract_max).

Output:

- For extract_max, return the highest-priority case.

Constraints:

- $1 \leq n \leq 10^5$.
- Priorities are integers between 1 and 10^9

15. Create a Graph Using an Adjacency Matrix

Problem Statement:

Model the road network of a city using an adjacency matrix representation.

Input:

- Number of vertices nnn, number of edges mmm, followed by mmm edges u,vu, vu,v.

Output:

- The adjacency matrix of the graph.

Constraints:

- $1 \leq n \leq 1000$
- $0 \leq m \leq n(n-1)/2$.

16. **Create a Graph Using an Adjacency List**

Problem Statement:

Represent a social network where each person is a node and connections are edges using an adjacency list.

Input:

- Number of vertices nnn, number of edges mmm, followed by mmm edges u,vu, vu,v.

Output:

- The adjacency list of the graph.

Constraints:

- 1≤n≤10^5
- $0 \leq m \leq n(n-1)/2$

17. Perform Depth-First Search (DFS) on a Graph

Problem Statement:

Find all possible paths for delivering goods in a city network represented as a graph.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v and the starting vertex.

Output:

- DFS traversal starting from the given vertex.

Constraints:

- 1≤n≤10^5
- 0≤m≤n(n−1)/2.

18. Perform Breadth-First Search (BFS) on a Graph

Problem Statement:

Simulate a level-wise reachability in a communication network.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v and the starting vertex.

Output:

- BFS traversal starting from the given vertex.

Constraints:

- 1≤n≤10^5
- 0≤m≤n(n−1)/2

19. **Check Path Between Two Nodes Using DFS**

Problem Statement:

Determine if a product can be transported between two warehouses connected by routes represented as a graph.

Input:

- Number of vertices nnn, number of edges mmm, followed by mmm edges u,vu, vu,v, and two nodes x,yx, yx,y.

Output:

- "Path Exists" or "No Path Exists."

Constraints:

- $1 \leq n \leq 10^5$
- $0 \leq m \leq n(n-1)/2$

20. Detect Cycle in an Undirected Graph

Problem Statement:

Detect if there is a circular dependency in a task scheduling graph for a set of interdependent projects.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v.

Output:

- "Cycle Detected" if a cycle exists, otherwise "No Cycle Detected."

Constraints:

- $1 \leq n \leq 10^5$
- $0 \leq m \leq n(n-1)/2$

21. Detect Cycle in a Directed Graph

Problem Statement:

Identify circular dependencies in a workflow represented by a directed graph.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v.

Output:

- "Cycle Detected" if a cycle exists, otherwise "No Cycle Detected."

Constraints:

- 1≤n≤10^5.
- 0≤m≤n(n−1).

22. Find the Shortest Path in an Unweighted Graph

Problem Statement:

In a city represented as an unweighted graph, find the shortest path between two locations.

Input:

- Number of vertices nnn, number of edges mmm, followed by mmm edges u,vu, vu,v, and two nodes start,endstart, endstart,end.

Output:

- The shortest path distance between start and end.

Constraints:

- 1≤n≤10^5.
- 0≤m≤n(n−1)

23. Implement Dijkstra’s Algorithm for Weighted Graphs

Problem Statement:

Find the fastest route between two cities using Dijkstra’s algorithm.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v and two nodes start,end.

Output:

- The shortest path distance between start and end.

Constraints:

- $1 \le n \le 10^5$.
- $0 \le m \le n(n-1)$
- Edge weights w are positive integers.

24. Find Connected Components in an Undirected Graph

Problem Statement:

Identify isolated groups in a social network represented as a graph.

Input:

- Number of vertices nnn, number of edges mmm, followed by mmm edges u,vu, vu,v.

Output:

- Number of connected components in the graph.

Constraints:

- $1 \le n \le 10^5$
- $0 \le m \le n(n-1)/2$

25. Implement Topological Sort

Problem Statement:

Schedule tasks in a project workflow based on their dependencies using topological sorting.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v.

Output:

- A valid topological order of vertices.

Constraints:

- $1 \le n \le 10^5$
- $0 \le m \le n(n-1)$

26. Find the Minimum Spanning Tree Using Kruskal’s Algorithm

Problem Statement:

Connect multiple islands with the least cost using Kruskal’s algorithm.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v.

Output:

- Total weight of the minimum spanning tree.

Constraints:

- 1≤n≤10^5.
- 0≤m≤n(n−1)/2

27. Find the Minimum Spanning Tree Using Prim’s Algorithm

Problem Statement:

Design an optimal cable network between multiple offices using Prim’s algorithm.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v.

Output:

- Total weight of the minimum spanning tree.

Constraints:

- 1≤n≤10^5
- 0≤m≤n(n−1)/2

28. Find Articulation Points in a Graph

Problem Statement:

Identify critical servers in a computer network, whose removal disconnects the network.

Input:

- Number of vertices nnn, number of edges mmm, followed by mmm edges u,vu, vu,v.

Output:

- List of articulation points.

Constraints:

- 1≤n≤10^5
- 0≤m≤n(n−1)/2

29. Implement Floyd-Warshall Algorithm for All-Pairs Shortest Path

Problem Statement:

Compute the shortest delivery time between all warehouses in a logistics network.

Input:

- Number of vertices n, number of edges m, followed by m edges u,v.

Output:

- A matrix showing the shortest path distance between every pair of vertices.

Constraints:

- $1 \le n \le 500$.
- Edge weights w can be negative but without negative cycles.

30. Solve the Traveling Salesman Problem Using Dynamic Programming

Problem Statement:

Plan the most cost-effective route for a traveling salesman to visit all cities exactly once and return to the starting point.

Input:

- Number of cities n, followed by a $n \times n$ cost matrix.

Output:

- Minimum cost of the round trip.

Constraints:

- $1 \le n \le 20$.
- Cost matrix values c[i][j] are positive integers or 0 if i=j.

31. **Longest Common Subsequence (LCS)**

Problem Statement:

In the field of DNA sequencing, finding common patterns between two genetic sequences is crucial for biological analysis and research. Implement a program to find the **Longest Common Subsequence (LCS)** between two given strings representing DNA sequences.

Input Format:

- Two strings X and Y, where:
    - $1 \leq |X|, |Y| \leq 1000$(length of strings)
    - The strings contain uppercase English letters (A-Z).

Output Format:

- An integer LLL representing the length of the LCS.
- The LCS itself, as a sequence of characters.

Constraints:

- Strings should only contain uppercase letters.
- If multiple LCS are possible, output any one of them.

32. **Sum of Subset Problem Using Backtracking**

Problem Statement:

A charity organization wants to distribute funds to needy families but must ensure the total amount matches the available funds exactly. Given a list of possible fund contributions, implement a backtracking algorithm to find all subsets that sum up to the exact target amount.

Input Format:

- An integer n representing the number of possible contributions.
- A list of n integers A[i] , where 1≤A[i]≤10^6
- A target sum S, where 1≤S≤10^6

Output Format:

- A list of all subsets of A that sum to S.
- If no such subset exists, output "No solution."

Constraints:

- The array A must not contain duplicates.
- The array length n should not exceed 20 to ensure backtracking is computationally feasible.

Total Hours: 48 hrs.

Mode of Evaluation

CIE			PE (If mentioned in curriculum)	Total
PS1 10	PS2 20	PS3 20		
50			50	100

Course Code: BCSE0455	Course Name: Web Technologies	L	T	P	C
Course Offered in: CSE/CS/IT/CSE(AI)/CSE(AIML)/CSE(IOT)/CSE(AI)/CSE(DS)/CSE-R/M.Tech int		0	0	6	3

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

Course Objectives: The objective of this subject is to provide a comprehensive understanding of website development and various aspects of web technology. By the end of this course, students will have gained proficiency in various technologies and will be able to create well-designed and functional websites.

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.	K2
CO2	Construct responsive webpages by using Bootstrap.	K3
CO3	Understand and apply the concepts of JavaScript and ES6 to build user interactive web pages.	K2
CO4	Analyze the concepts of XML and JSON.	K3
CO5	Develope dynamic web pages using PHP as a server-side scripting language.	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	PSO 3
CO1	3	3	3	2	2	1	1	1	1	2	2	3	3	3
CO2	3	3	3	2	2	1	1	1	1	1	2	3	3	3
CO3	3	3	3	2	2	1	1	1	1	1	1	2	2	2
CO4	3	3	3	2	1	2	1	1	1	2	1	3	3	3
CO5	3	3	3	2	1	2	1	1	1	2	1	2	2	2

Course Contents / Syllabus

Module 1	Introduction to HTML & CSS	16 hours

HTML5:

HTML Basics, Tables, List, Working with Links, Image Handling, Frames, HTML Forms for User Input and New Form Elements

CSS3 & its implementation in real world: 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", Modernizer, HTML5 Shims, SASS, and Other CSS Preprocessors, CSS Grid Systems, CSS Frameworks.

Module 2	Responsive Websites with Bootstrap	16 hours

Responsive Websites: Setting The Viewport, Responsive Images, Responsive Text Size, Media Queries, Responsive Web Page (Full).
Bootstrap: 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	16 hours

JavaScript and ES6: 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 in JS and Spread/Rest Operator: 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

Basics of Typescript and ES6:

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

Module 4	**Introduction to XML and JSON**	**16 hours**

XML: Introduction to XML, Uses of XML**:** Implementation of XML, simple XML, XML key components: Describing various XML Key Components.

DTD and Schemas: XML DTD and Schema. Well-formed XML, Using XML Application: Implementing Well-formed XML, XML with application.

XSL and XSLT: Introduction to XSL, XML transformed with simple example, XSL elements, transforming with XSLT: Implementing XSL and XSLT.

JSON: Introduction, Object, Array, Comments, Compare, Server, PHP JSON

Module 5	**Introduction to PHP**	**16 hours**

Basics of PHP: 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 in PHP: 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. Working with files and directories

Session& Cookies: Session & Cookies: Introduction to Session Control, Session Functionality, Cookie, Setting Cookies with PHP.

MySql: Introduction to MySql Database and its Connectivity with PHP

Total Lecture Hours	**80 hours**

Textbook:

S.No.	**Book Title**	**Author**
1.	"HTML, XHTML, and CSS Bible, 5ed", Wiley India (2010).	Steven M. Schafer
2.	Beginning CSS: Cascading Style Sheets for Web Design 3rd Edition, Wiley India(2011)	Ian Pouncey and Richard York

Reference Books:

S.No.	**Book Title**	**Author**
1.	The Principles of Beautiful Web Design, SitePoint 4th edition(2020)	Jason Beaird & James George
2.	Ethan Marcotte, Responsive Web Design, A Book Apart 2nd Edition(2014)	Ethan Marcotte
3.	HTML and CSS: Design and Build Websites, Wiley India Ist Edition(2011)	Jon Duckett

NPTEL/ Youtube/ Faculty Video 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

Mode of Evaluation

CIE							ESE	Total
ST1	**ST2**	**ST3**	**TA1** **5**	**TA2** **5**	**TA3**	**Attendance** **5**		
60			**15**				**75**	**150**

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: BCSCC0452	**LAB Course Name: Problem Solving Approaches**	**L**	**T**	**P**	**C**
Course Offered in:		**0**	**0**	**2**	**1**

Pre-requisite: Programming Language C/C++ or Java or Python

Course Objectives:

Problem-solving in computer programming involves a structured approach to identifying, analyzing, and resolving coding challenges. The process typically includes thoroughly understanding the problem, decomposing it into smaller, manageable parts, designing an appropriate algorithm, implementing the solution through code, and performing testing and debugging to ensure correctness and efficiency

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
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	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	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**	**PSO 3**	**PSO 4**
CO1	3	3	3	2	2	1	2	2	-	-	2	3	3	2	2
CO2	3	3	2	2	2	-	2	-	-	-	2	2	2	2	2
CO3	3	3	2	2	3	1	2	2	-	-	3	3	3	2	2

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

Problem Statements need to be discussed in lab session: Control Statements

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:

   - 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

3. Write a method to generate a secure code which the sum of all possible palindrome numbers between given two numbers.

For Example:

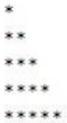
Input: 10, 80

Output: 308

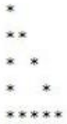
Explanation: All palindrome numbers between 10 & 80 are: 11,22,33,44,55,66,77

Password= 11+22+33+44+55+66+77 = 308

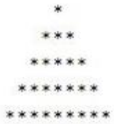
4. Draw **the following Patterns for N=5**



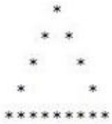
Right Triangle Star Pattern



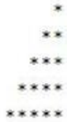
Hollow Right Triangle Star Pattern



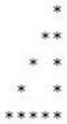
Pyramid Star Pattern



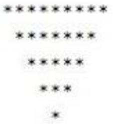
Hollow Pyramid Star Pattern



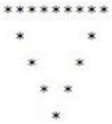
Mirrored Right Triangle Star Pattern



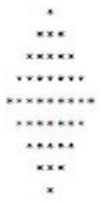
Hollow Mirrored Right Triangle Star Pattern



Inverted Pyramid Star Pattern

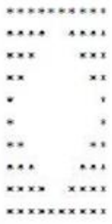


Hollow Inverted Pyramid Star Pattern



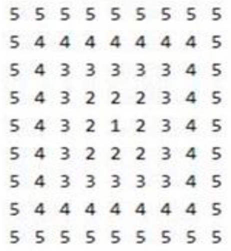
```
    *
   ***
  *****
 *******
*********
 *******
  *****
   ***
    *
```

Diamond Star Pattern



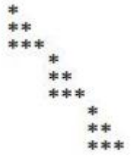
```
**********
****  ****
***    ***
**      **
*        *
*        *
**      **
***    ***
****  ****
**********
```

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



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

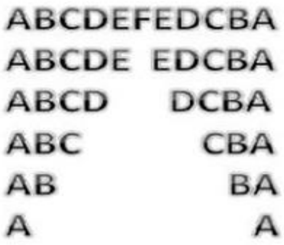
For N=3 print above pattern

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

Right Arrow Star Pattern

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

Left Arrow Star Pattern



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

Problem Statements need to be discussed in lab session: Recursive Approach (Basic)

1. 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.

2. 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.

3. **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.

4. **Find the LCM of Two Numbers Using Recursion:**
   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.

Problem Statements need to be discussed in lab session: Bit Manipulation

1. 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.

2. 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

3. 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.

4. 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.

5. 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.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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.

11. 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.

12. 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.

Problem Statements need to be discussed in lab session: Arrays (Try to use sliding window, prefix sum, cadence, recursion, bit manipulation, two pointer approaches)

1. 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

2. 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])
- Maximum Sum After Modification: 10(achieved from [8, -1, 2, 1], where the value 4 is doubled to 8).

3. 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.

4. 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

5. 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.

6. 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

7. 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]

8. 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)

9. 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".

10. 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.

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

11. 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

12. 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.

13. 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|).

Example 1:	**Example 2:**
Input: S = "149811", K = 3 **Output:** 111	**Input**: S = "1002991", K = 3 **Output:** 21

14. 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).

15. 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"

**Competitive coding list will be shared with the students.*

Total Hours: 30 hrs.

Mode of Evaluation

CIE			PE (If mentioned in curriculum)	Total
PS1 10	PS2 20	PS3 20		
50				50

B. TECH THIRD YEAR	
Subject Code: BCSE0411	**L T P** 3-0-0
Subject Name: Python Web Development with Django	**Credits** 3
Pre- requisites: Students should have good knowledge of Python Programming and Python coding experience.	

Course Contents/Syllabus

Unit-1	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.	8 hours
Unit-2	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.	8 hours
Unit-3	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.	8 hours
Unit-4	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.	8 hours
Unit-5	Creating a functional website in Django, Four Important Pillars to Deploy, registering on Heroku and GitHub, Push project from Local System to GitHub, Working with Django Heroku, Working with Static Root, Handling WSGI with gunicorn, Setting up Database & adding users.	8 hours

Course Outcomes – After completion of this course students will be able to:

CO1	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
CO2	Demonstrate web application framework i.e. Django to design and implement typical dynamic web pages and interactive web based applications.	K3, K6
CO3	Implementing and analyzing the concept of Integrating Accounts & Authentication on Django.	K3, K4
CO4	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
CO5	Analyzing and creating a functional website in Django and deploy Django Web	K3, K6

Application on Cloud.

Text Books:

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. 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.
4. Harry Percival, "Test-Driven Development with Python: Obey the Testing Goat: Using Django, Selenium, and JavaScript", 2nd Edition 2019, Kindle Edition.

Links: NPTEL/You Tube/Web Link

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

https://youtu.be/F5mRW0jo-U4
https://youtu.be/yD0_1DPmfKM?list=PLQVvvaa0QuDe9nqlirjacLkBYdgc2inh3
https://youtu.be/rHux0gMZ3Eg
https://youtu.be/jBzwzrDvZ18 https://youtu.be/RiMRJMbLZmg

https://youtu.be/8DF1zJA7cfc
https://youtu.be/CTrVDi3tt8o https://youtu.be/FzGTpnI5tpo
https://youtu.be/z4lfVsb_7MA https://youtu.be/WuyKxdLcw3w

https://youtu.be/UxTwFMZ4r5k https://youtu.be/2Oe55iXjZQI
https://youtu.be/zV8GOI5Zd6E https://youtu.be/uf2tdzh7Bq4
https://youtu.be/RzkVbz7Ie44

https://youtu.be/kBwhtEIXGII https://youtu.be/Q_YOYNiSVDY
https://youtu.be/_3AKAdHUY1M
https://youtu.be/6DI_7Zja8Zc https://youtu.be/UkokhawLKDU

NIET Greater Noida

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

Course Code: BCSCY0412	Course Name: Cyber Threat Intelligence	L	T	P	C
		3	0	0	3

Pre-requisite: Basic computer literacy, Fundamental networking, Introduction to cybersecurity, Problem-solving and Logical analysis and pattern recognition.

Course Objectives:

Understand Threat Landscapes and emerging risks to master intelligence threat analysis skills and enhance defensive strategies to improve Decision-Making for Future Trends .

Course Outcome: After completion of the course, the student will be able to		Bloom's Knowledge Level (KL)
CO1	Define Cyber Threat Intelligence (CTI) and its role in proactive cybersecurity and apply CTI analysis to a real-world threat scenario.	K1,K2
CO2	Understand and apply the intrusions model to demonstrate threat sharing and frameworks.	K2, K3
CO3	Categorize and evaluate threat intelligence sources, select optimal collection methods, and process raw data into actionable intelligence.	K3, K4
CO4	Differentiate between IOCs (Indicators of Compromise) and IOAs (Indicators of Attack) and Analyze adversary TTPs (Tactics, Techniques, Procedures) using frameworks .	K4, K5
CO5	Integrate CTI into security operations (SOC/IR/Threat Hunting), evaluate intelligence-sharing platforms and measure threat intel ROI (Return on Investment).	K4 , 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	PO12	PSO1	PSO2	PSO3
CO1	2	2	3	2	3	2	-	3	1	2	1	2	-	2	1
CO2	2	3	3	3	3	2	-	3	1	2	1	2	2	3	2
CO3	2	2	3	3	3	1	-	3	2	1	1	1	3	3	3
CO4	3	2	3	3	3	1	-	2	2	1	2	1	-	3	3
CO5	3	3	3	2	3	1	-	3	2	1	2	1	-	2	3

Course Contents / Syllabus

Module 1	**Introduction to Cyber Threat Intelligence (CTI)**	**10 hours**

Definition and importance of CTI, Differences between tactical, operational, and strategic intelligence, The intelligence lifecycle (Planning, Collection, Processing, Analysis, Dissemination, Feedback), Key stakeholders (SOC teams, executives, law enforcement)

Module 2	**Threat Intelligence Frameworks & Models**	**10 hours**

MITRE ATT&CK Framework (Tactics, Techniques, Procedures - TTPs), The Diamond Model of Intrusion Analysis (Adversary, Infrastructure, Capability, Victim), Cyber Kill Chain (Lockheed Martin's 7-stage model), STIX/TAXII (Structured Threat Information eXpression & Trusted Automated eXchange of Intelligence)

Module 3	**Collection & Processing of Threat Data**	**10 hours**

Sources of threat intelligence (Open-Source, Closed/Private, Technical, Human), Data collection methods (Logs, Threat Feeds, Dark Web Monitoring, Honeypots), Processing raw data into actionable intelligence, Tools for automation (MISP, ThreatConnect, Recorded Future)

Module 4	**Threat Analysis & Attribution**	**10 hours**

Analyzing IOCs (Indicators of Compromise) and IOAs (Indicators of Attack), Behavioral analysis (TTPs of threat actors) Threat actor profiling (APT groups, cybercriminals, hacktivists), Case studies (e.g., SolarWinds, WannaCry, Emotet).		
Module 5	**Operationalizing Threat Intelligence**	**8 hours**
Integrating CTI into SOC, IR, and threat hunting, Sharing intelligence (ISACs, ISAOs, and vendor platforms), Measuring effectiveness (ROI of threat intelligence), Future trends (AI in CTI, automation, deception technologies).		
	Total Lecture Hours	**48 hours**

Textbook:

S.No 1.	**Book Title : Cyber Threat Intelligence**	**Auhor : Martin Lee**

Reference Books:

S.No 2.	**Book Title : Threat Intelligence: From Data to Action**	**Author : Recorded Future (Edited by Robert M. Lee & others)**

NPTEL/ Youtube/ Faculty Video Link:

Youtube	https://www.youtube.com/watch?v=BzXICnDoFSU&ab_channel=Archer
Youtube	https://www.youtube.com/watch?v=kCOa5Pebdg8&ab_channel=SKILLOGIC
Youtube	https://www.youtube.com/watch?v=p7by_uWzdEg&ab_channel=PrabhNair

Mode of Evaluation

CIE							ESE	Total
ST1	ST2	ST3	TA1 5	TA2 5	TA3 5	Attendance 5		
30			20				100	150

B. TECH THIRD YEAR	
Subject Code: BCSAI0411	**L T P** 3-0-0
Subject Name: Data Analytics	**Credits:** 3
Pre- requisites: Basic Knowledge of Statistics and Probability.	

Course Contents/Syllabus		
Unit-1	**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.	8 hours
Unit-2	**Data Handling:** 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.	8 hours
Unit-3	**Data Pre-processing:** 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.	8 hours
Unit-4	**Exploratory Data Analysis:** 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.	8 hours
Unit-5	**Data Visualization:** 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	8 hours

List of Practical		
Sr. No.	**Program Title**	**CO Mapping**
1	• Installation of MySQL, Anaconda, and Tableau • To perform data import/export (.CSV, .XLS, .TXT) operations using data frames in R/Python • To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization • To perform dimensionality reduction operation using PCA Houses Data Set • To perform statistical operations (Mean, Median, Mode and Standard deviation) using	CO1
2	**<u>Tableau – getting started</u>** • User interface • Methodology for working with the interface • Connecting to different types of data sources (Excel, csv, Access, MySQL, Tableau Server) • Editing Data Connections and Data Sources; Live mode vs. Extract mode • Date interpreter / Pivot **<u>Joining multiple datasets</u>** • Union / Join • Cross database joins Data Blending – integrating different data source	CO2
3	**<u>Basic functionalities</u>** • Filtering • Sorting • Grouping • Hierarchies • Creating sets • Pivot tables Types of dates – Continuous vs. Discreet • **<u>Calculations</u>** • Syntax • Table calculations • LOD expressions • Aggregate Date, Logic, String, Number, Type calculations **<u>Built-in chart types/visualisations:</u>** • Line chart • Dot chart • Bar chart • Other types of visualisation (bullet graph, Heat map, Tree map, etc.).	CO3

	Combo charts – dual axis	
4	**Custom chart types:** • KPI matrix • Waterfall • Gantt • Dot plot • Pareto Analytics' options: trend lines, forecasting, clustering	CO4
5	**CREATE AND FORMAT REPORTS USING THE TABLEAU DESKTOP** • Describe the use of Page Backgrounds and Templates • Create visualizations to display the data • Apply drill through and drill down • Create and manage slicers with the use of filters • Explore visual interactions • Review Bookmarks • Publish the report to the Tableau online **Dashboards and stories** • Building dashboards • Dashboard objects • Dashboard formatting Dashboard extensions Story points	CO5

Course Outcomes – After completion of this course students will be able to:

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	Analyse data using exploratory data analysis.	K4
CO5	Illustrate various visualization methods for different types of data sets and application scenarios.	K3

Text Books:

1. Glenn J. Myatt, Making sense of Data: A practical Guide to Exploratory Data Analysis and Data Mining, John Wiley Publishers, 2007.
2. Data Analysis and Data Mining, 2nd Edition, John Wiley & Sons Publication, 2014

Reference Books:

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