

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



Affiliated to

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



Evaluation Scheme & Syllabus

For

**Bachelor of Technology
Computer Science and Engineering (Internet of Things)
Second Year**

(Effective from the Session: 2024-25)

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

Bachelor of Technology

Computer Science and Engineering (Internet of Things)

Evaluation Scheme

SEMESTER-III

S.No.	Subject Codes	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
3 WEEKS COMPULSORY INDUCTION PROGRAM														
1	BCSE0306	Discrete Structures	Mandatory	3	1	0	30	20	50		100		150	4
2	BCSIOT0301	Sensor and Its Applications	Mandatory	3	1	0	30	20	50		100		150	4
3	BCSE0301	Data Structures and Algorithm- I	Mandatory	3	0	0	30	20	50		100		150	3
4	BCSIOT0302	Logic Design and Microcontroller	Mandatory	3	0	0	30	20	50		100		150	3
5	BCSIOT0303	Introduction to IoT	Mandatory	3	0	0	30	20	50		100		150	3
6	BCSE0352	Object Oriented Techniques using JAVA	Mandatory	0	0	6				50		100	150	3
7	BCSIOT0352	Logic Design and Microcontroller Lab	Mandatory	0	0	2				25		25	50	1
8	BCSIOT0353	IoT Lab using Arduino and Node MCU Platform	Mandatory	0	0	4				50		50	100	2
9	BCSE0359	Internship Assessment-I	Mandatory	0	0	2				50			50	1
10	BNC0302/ BNC0301	Environmental Science/ Artificial Intelligence and Cyber Ethics	Compulsory Audit	2	0	0	30	20	50		50		100	NA
		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL											1100	24

*** List of MOOCs Based Recommended Courses for Second year (Semester-III) 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	BMC0024	Internet of Things 101	Infosys Wingspan (Infosys Springboard)	7h	0.5

PLEASE NOTE: -

- **A 3-4 weeks Internship shall be conducted during summer break after semester-II and will be assessed during 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 in 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 (Internet of Things)Evaluation Scheme

SEMESTER-IV

S. No	Subject Code	Subject	Types of Subjects	Periods			Evaluation Schemes				End Semester		Total	Credit
				L	T	P	CT	TA	Total	PS	TE	PE		
1	BAS0402	Engineering Mathematics IV	Mandatory	3	1	0	30	20	50		100		150	4
2	BASL0401	Technical Communication	Mandatory	2	1	0	30	20	50		50		100	3
3	BCSE0401	Data Structures and Algorithm-II	Mandatory	3	0	0	30	20	50		100		150	3
4	BCSE0403	Operating Systems	Mandatory	2	0	0	30	20	50		50		100	2
5	BCSIOT0401	Mobile Application Development	Mandatory	3	0	0	30	20	50		100		150	3
6	BCSE0451	Data Structures and Algorithm-II Lab	Mandatory	0	0	4				50		50	100	2
7	BCSE0453	Operating Systems Lab	Mandatory	0	0	4				50		50	100	2
8	BCSE0452	Database Management Systems	Mandatory	0	0	6				50		100	150	3
9	BASL0451	Technical Communication Lab	Mandatory	0	0	2				25		25	50	1
10	BCSE0459	Mini Project	Mandatory	0	0	2				50			50	1
11	BNC0401/ BNC0402	Artificial Intelligence and Cyber Ethics/ Environmental Science	Compulsory Audit	2	0	0	30	20	50		50		100	NA
		*Massive Open Online Courses (For B.Tech. Hons. Degree)	*MOOCs											
		TOTAL											1100	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	BMC0025	IOT Automation with ESP8266 with Projects	Infosys Wingspan (Infosys Springboard)	7h 21 m	0.5
2	BMC0022	Mobile Apps Development - Advanced Applications	Infosys Wingspan (Infosys Springboard)	14h 23m	1

PLEASE NOTE: -

- **A 3-4 weeks Internship shall be conducted during summer break after semester-IV and will be assessed during Semester-V**
- **Compulsory Audit (CA) Courses (Non-Credit - BNC0401/BNC0402)**
 - All Compulsory Audit Courses (a qualifying exam) do not require any credit.
 - The Total and obtained marks are not added in 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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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 to 18 =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

Subject Name: Discrete Structures
L-T-P [3-1-0]
Subject Code: BCSE0306
Applicable in Department: All Branches

Pre-requisite of Subject: Some basic knowledge of algebra and logic is usually sufficient to begin studying discrete mathematics for computer science. Familiarity with sets, functions, and basic Boolean algebra is also helpful.

Course Objective: The objective of discrete structure is to enable students to formulate problems precisely, solve the problems, apply formal proofs techniques and hence enhance one's logical thinking and problem-solving skills.

Course Outcomes (CO)

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

Bloom's Knowledge Level(KL)

CO 1	Apply the basic principles of sets, relations & functions and mathematical induction in computer science & engineering related problems.	K3
CO2	Describe the algebraic structures and it's properties to solve complex problems.	K2
CO3	Describe lattices and it's type to simplify digital circuits.	K2
CO4	Infer the validity of statements and construct proofs using predicate logic formulas.	K4
CO5	Design and use non-linear data structure like graphs to solve real world problems.	K4

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical / Assignment/ Lab Nos	CO Mapping
1 Set Theory & Relations	Module 1.1: Set Theory	Set Theory: Definition of sets, countable and uncountable sets, Set operations, Partition of set, Cardinality, Venn Diagrams, proofs of some general identities on sets, Applications of set Theory	Lecture Notes, PPT, Online Videos & R2	8 L	NA	CO1
	Module 1.2: Relations	Relation: Definition, types of relation, composition of relations, Equivalence relation, Partial ordering	Lecture Notes, PPT,			

		relation, Applications of Relations	Online Videos & R2			
2 Algebraic Structures	Module 2.1: Algebraic Structures	Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, Properties of groups, Subgroup, cyclic group, Permutation group, Cosets, Normal subgroup, Homomorphism and isomorphism of Groups, Applications of Algebraic Structure	Lecture Notes, PPT, Online Videos & R2	8 L	NA	CO2
3 Posets, Hasse Diagram and Lattices	Module 3.1: Posets, Hasse Diagram and Lattices:	Introduction, ordered set, Hasse diagrams of partially ordered set, isomorphic ordered set, well ordered set, properties of lattices, types of lattices, Applications of Lattice	Lecture Notes, PPT, Online Videos & R2	8 L	NA	CO3
4 Propositional & Predicate Logic	Module 4.1: Propositional Logic	Propositions and compound Propositions, Basic logical operations, truth tables, tautologies, Contradictions, CNF, DNF Algebra of Proposition, logical implications, logical equivalence, predicates and quantifiers, Rules of Inference, Application of Propositional Logics.	Lecture Notes, PPT, Online Videos & R1	8 L	NA	CO4
	Module 4.2: Predicate Logic	First order predicate, Well-formed formula of Predicate, Quantifiers, Inference Theory of Predicate Logic, Application of Predicate Logics.	Lecture Notes, PPT, Online Videos & R2			
5 Graphs	Module 5.1: Graphs	Definition and terminology, Representation of Graphs, Paths connectivity, Walks, Paths, Cycles, Bipartite, Regular, Planar and connected graphs, Components, Euler graphs, Euler's theorem, Hamiltonian path and circuits, Graph coloring, chromatic number, isomorphism and homomorphism of graphs. Application of Graphs	Lecture Notes, PPT, Online Videos & R2	8 L	NA	CO5
Total				40 Hours		
Textbooks						
Sr. No.	Book Details					
1.	Swapanm Kumar Sarkar, “A Textbook of Discrete Mathematics”, S. Chand Publication, 9 th Edition, 2021					

2.	T Veerarajan, "Discrete Mathematics, with Graph Theory and Combinatorics" TMH Publication, 4 th Edition, 2021
Reference Books	
Sr. No.	Book Details
1.	B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, Prentice Hall, 6th Edition, 2020.
2.	Liptschutz, Seymour, "Discrete Mathematics", TMH, 4th Edition, 2021.
3.	Kenneth H. Rosen, Kamala Krithivasan, "Discrete Mathematics and its Applications", TMH, 8th Edition, 2021
Links	
Unit 1	https://www.youtube.com/watch?v=hGtOLG3SsjI&list=PLwdnzlV3ogoVxVxCTII45pDVM1aoYoMHf&index=9 https://www.youtube.com/watch?v=rGcTcGFx9_s&list=PLwdnzlV3ogoVxVxCTII45pDVM1aoYoMHf&index=10 https://www.youtube.com/watch?v=BIKq9Xo_5A&list=PL0862D1A947252D20&index=13
Unit 2	https://www.youtube.com/watch?v=dQ4wU0k7JKI&list=PL0862D1A947252D20&index=35 https://www.youtube.com/watch?v=CjmWE-f3vEc&list=PLwdnzlV3ogoVxVxCTII45pDVM1aoYoMHf&index=41
Unit 3	https://www.youtube.com/watch?v=qPtGlrb_sXg&list=PL0862D1A947252D20&index=40
Unit 4	https://www.youtube.com/watch?v=xlUFkMKSB3Y&list=PL0862D1A947252D20&index=1 https://www.youtube.com/watch?v=DmCltf8ypks&list=PL0862D1A947252D20&index=3
Unit 5	https://www.youtube.com/watch?v=E40r8DWgG40&list=PLEAYkSg4uSQ2fXcfrTGZdPuTmv98bnFY5

Subject Name: Sensors and its Applications						L-T-P [3-1-0]
Subject Code: BCSIoT0301						Applicable in Department: IoT
Pre-requisite of Subject: Basic IoT and Electronics						
Course Objective: This course provides an understanding of sensors for measuring displacement, force, pressure, temperature, position, acceleration, vibration, flow, and level. It covers the use of virtual instrumentation in automation, data acquisition methods, and the application of smart and advanced sensors in industrial automation. Identification of appropriate data acquisition methods. The applications of smart and advanced sensors for industrial automation.						
Course Outcomes (CO)						
Course outcome: After completion of this course students will be able to:						Bloom's Knowledge Level(KL)
CO 1	Use the sensors for measurement of displacement, force, and pressure.					K3
CO2	Identify the commonly used sensors in industry for measurement of temperature, position, accelerometer, vibration sensor, flow, and level.					K2
CO3	Use virtual instrumentation in automation industries.					K3
CO4	Identify appropriate data acquisition methods for smart systems.					K2
CO5	Implement various real time products using smart sensors.					K3
Syllabus						
Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment / Lab Nos	CO Mapping
1	Sensors & Transducers	Sensors & Transducers: Definition, Classification of sensors, Measurement of displacement using Potentiometer,	PPT, Test,	8 L	Assignment	CO1

		LVDT(Linear Variable Differential Transformer) & Optical Encoder, Measurement of force using strain gauge, Measurement of pressure using LVDT based diaphragm & piezoelectric sensor, Introduction to sensors most widely used in computer and mobile phones: Temperature, Pressure, Humidity, Toxic Gas, pH sensor, sound sensor, magnetic field sensor, Motion (Infra-red) sensor, barometer, and Gyroscope.	Quiz			
2	Measurement of physical parameters	Measurement of temperature using Thermistors, Thermocouple & (Resistance Temperature Detector) RTD, Concept of thermal imaging, Measurement of position using Hall effect sensors, Proximity sensors: Inductive & Capacitive, Use of proximity sensor as accelerometer and vibration sensor, Working Principles of Flow Sensors: Ultrasonic & Laser, Level Sensors: Ultrasonic & Capacitive	PPT, Test, Quiz	8 L	Assignment	CO2
3	Virtual Instrumentation	Virtual Instrumentation: Graphical programming techniques, Data types, Advantage of Virtual Instrumentation techniques, Concept of WHILE & FOR loops, Arrays, Clusters & graphs, Structures: Case, Sequence & Formula nodes, Need of software based instruments for industrial automation.	PPT, Test, Quiz	8 L	Assignment	CO3
4	Data Acquisition Methods	Data Acquisition Methods: Basic block diagram, Analog and Digital IO, Counters, Timers, Types of ADC: successive approximation and sigma-delta, Types of DAC: Weighted Resistor and R-2RLadder type, Use of Data Sockets for Networked Communication.	PPT, Test, Quiz	8 L	Assignment	CO4
5	Advanced Sensors	Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing & self-	PPT, Test, Quiz	8 L	Assignment	CO5

		communicating, Selection of Sensors for Practical Applications, Application of smart sensors: Automatic robot control & automobile engine control. Use cases of Smart Sensors: iroute, Marine Traffic Tracker				
Total				40 Hours		
Textbooks						
Sr No	Book Details					
1	Sabrie Soloman,” Sensors Handbook”, Second Edition Jan 2010.					
2	A.K. Sawhney,” Sensors and Instrumentation” Dhanpat Rai & Co. 2014					
3	Michael Miller, “The Internet of Things” Pearson. 1st Edition March 2015					
Reference Books						
Sr No	Book Details					
1	Mr. M.sivasubramanian ,” Introduction To Sensors And Transducers” Xpress Publications, 2021.					
2	Clarence W De Silva,” Sensor Systems Fundamentals And Applications”,2016.					
Links						
Unit 1	https://www.youtube.com/watch?v=zxYeJW9v6OU&list=PLwymdQ84KI-w5DwDzqO_4hWsB2Jc4_eBy					
Unit 2	https://www.youtube.com/watch?v=EQ4D9J---aQ					
Unit 3	https://www.youtube.com/watch?v=ZCqRCmGJxB4					
Unit 4	https://www.youtube.com/watch?v=HicZcgdGxZY&list=PLwjK_ikyK4LLCnW-df-53d-6yYrGb9zZc					
Unit 5	https://www.youtube.com/watch?v=vlwemaauvwM					

Subject Name: Data Structures and Algorithms-I				L-T-P [3-0-0]		
Subject Code: BCSE0301			Applicable in Department: CSE/IT/CS/AI/AIML/IOT/ DS/CYS			
Pre-requisite of Subject: C, Python						
Course Objective: The objective of the course is to learn the basic concepts of algorithm analysis, along with implementation of linear data structures.						
Course Outcomes (CO)						
Course outcome: After completion of this course students will be able to:						Bloom's Knowledge Level(KL)
CO 1	Understand the concept of algorithm analysis and its importance for problem solving.					K2
CO2	Implementation of Arrays for searching, sorting and hashing to foster critical thinking.					K3
CO3	Compare and contrast linked list with arrays and implementation of linked list with its applications.					K4
CO4	Understand static and dynamic implementation of stacks, while mastering principle of recursion for effective problem-solving.					K3
CO5	Implementation and analysis of divide & conquer algorithms and greedy approach for efficient problem-solving across diverse contexts.					K3
Syllabus						
Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1 Introduction to Data Structure and Algorithms	Module 1.1: Foundation of Algorithms Analysis and Design	Algorithms, Analyzing 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).	Lectures, Code Walkthroughs, Hand-on Programming, Problem Solving, Collaborative Learning, competitive coding Projects, Assessments. Lectures, Problem Solving, Collaborative Learning, Assessments	8L+6P	Program to compare the time complexities of various algorithms by plotting the graph	CO1

	Module 1.2: Fundamentals of D.S.	Data types: Primitive and non-primitive, Introduction to Data structure, Types of Data Structures- Linear & Non-Linear Data Structures.				
2 Design and Analysis of Algorithms: Arrays , searching and sorting, Hashing	Module 2.1: Arrays	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.	Lectures, Code Walkthroughs, Hand-on Programming, Problem Solving, Collaborative Learning, competitive coding, Projects, Assessments	8L+12P	Implementation of Arrays, Row Major Order, and Column Major Order, Representation of sparse matrix, Linear search, Binary search.	CO2
	Module 2.2: Searching and Sorting	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.				
	Module 2.3: Hashing	Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques, hashing for direct files.				
3 Design and Analysis of Algorithms: Linked lists Data Structure	Module 3.1: Linked List	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	Lectures, Code Walkthroughs, Hand-on Programming, Problem Solving, Collaborative Learning, competitive coding, Projects, Assessments.	8L+12P	Operations on a Linked List: Insertion, Deletion, Traversal, Reversal, Searching	CO3
4 Design and Analysis of Algorithms based: Stacks Data Structure and	Module 4.1: Stacks Module 4.2: Recursion	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.	Lectures, Code Walkthroughs, Hand-on Programming, Problem Solving, Collaborative Learning, Projects, Assessments.	8L+12P	Operations on stacks and question. Recursion Application	CO4

Recursion	Module 4.3: Queue	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				
5 Design and Analysis of Algorithms: Queues Data Structure	Module 5.1: Divide and Conquer and Greedy Methods	Divide and Conquer concepts with Examples Such as Quick sort, Merge sort, Convex Hull. Greedy Methods with Examples Such as Activity Selection, Task Scheduling, Fractional Knapsack Problem.	Lectures, Code Walkthroughs, Hand-on Programming, Problem Solving, Collaborative Learning, Projects, Assessments.	8L+6P	Divide and conquer methods and greedy methods	CO5
Total No. of Lecture + Practical Labs			(40L+48P) = 88 Hours			
Textbooks						
Sr. No.	Book Details					
1	Michael T. Goodrich, Roberto Tamassia, "Data Structures and Algorithms in Python: An Indian Adaptation", 1st Edition, 2021.					
2	Horowitz and Sahani, “Fundamentals of Data Structures”, Computer Science Press, 1 st Edition, 1993.					
3	Lipschutz, “Data Structures” Schaum’s Outline Series, Tata McGraw-hill Education (India) Pvt. Ltd, 2nd Edition, 2017					
Reference Books						
Sr. No.	Book Details					

1	Reema Thareja, “Data Structure Using C”, Oxford University Press, 2 nd Edition, 2014.
2	AK Sharma, “Data Structure Using C”, Pearson Education India, 2 nd Edition, 2011.
3	P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication, 1 st Edition, 2004.
Links	
Unit 1	https://youtu.be/u5AXxR4GnRY
Unit 2	https://www.youtube.com/watch?v=LQx9E2--p5c&pp=ygUMYXJyYXlIG5wdGVs
Unit 3	https://www.youtube.com/watch?v=K7VIKIUdo20&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=VV9v41Flq0&pp=ygUZZGI2aWRlIGFuZCBib25xdWVyICBucHRlbA%3D%3D
	https://www.youtube.com/watch?v=ARvQcqJ_-NY&list=PLfFeAJ-vQopt_S5XlayyvDFL_mi2pGJE3

Lab Experiments		
Course Objective: Learn to implement linear data structures.		
Course Outcomes (CO)		
Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Implementing Single and Multi-dimensional array with their applications like searching and Sorting techniques.	K3
CO2	Implement Link list, Stack and Queues with their applications	K3
CO3	Implementation and analysis of various operation like searching sorting and hashing.	K4
List of Practicals		
Sr. No	Program Title	CO Mapping
1	Construct a program to compare the time complexities of selection, bubble and insertion sort by plotting the graph	CO1

2	Construct a program to compare the time complexities of various algorithms by varying size “n”.	CO1
3	Construct a Code to find the maximum element in an array.	CO2
4	Construct a Code to calculate the sum of all elements in an array.	CO2
5	Construct a Code to reverse the elements of an array.	CO2
6	Construct a Code to check if an array is sorted in ascending order.	CO2
7	Construct a Code to count the occurrence of a specific element in an array.	CO2
8	Construct a Code creation and traversal of 2D Array in row major and column major order.	CO2
9	Construct a code to print the transpose of a given matrix using function	CO2
10	Program to find if a given matrix is Sparse or Not and print Sparse Matrix	CO2
11	Construct a code to represent a sparse matrix in triplet form.	CO2
12	Construct a code to Implement Linear Search	CO2
13	Construct a code to implement Binary Search	CO2
14	Construct a program to Implement Selection Sort	CO2
15	Construct a program to Implement Bubble Sort	CO2
16	Construct a program to Implement Insertion Sort	CO2
17	Construct a program to Implement Shell Sort	CO2
18	Construct a program to Implement Counting Sort	CO2
19	Create a single linked list and perform basic operations (insertion, deletion, traversal).	CO3
20	Create a double linked list and perform basic operations (insertion, deletion, traversal).	CO3
21	Create a circular linked list and perform basic operations (insertion, deletion, traversal).	CO3
22	Create a circular double linked list and perform basic operations (insertion, deletion, traversal).	CO3
23	Reverse a single linked list.	CO3
24	Check if a linked list is palindrome.	CO3
25	Reverse a double linked list.	CO3
26	Find the middle element of a single linked list.	CO3

27	Find the middle element of a double linked list.	CO3
28	Merge two sorted single linked lists.	CO3
29	Detect and remove a loop in a circular linked list.	CO3
30	Construct a code to add two polynomials using linked list	CO3
31	Construct a program to Implement stack using array	CO3
32	Construct a program to Implement stack using a linked list	CO4
33	Construct a code to Infix to postfix conversion using a stack	CO4
34	Construct a code for Balanced parentheses checker using a stack	CO4
35	Implement Reverse a string using a stack.	CO4
36	Implement Binary Search using Recursion.	CO4
37	Construct a python program to print Fibonacci Series using Recursion.	CO4
38	Construct a code to implement Tower of Hanoi.	CO5
39	Construct a program to Implement queue using array.	CO5
40	Construct a code for Implementing a circular queue.	CO5
41	Construct a program to Implement queue using stack	CO5
42	Construct a program to Implement priority queue	CO5
43	Construct a program to Implement double ended queue	CO5
44	Construct a program to Implement Merge Sort with recursion	CO5
45	Construct a program to Implement Quick Sort with recursion	CO5
46	Construct a program to Implement Merge Sort using iteration	CO5
47	Construct a program to Implement Quick Sort using iteration	CO5
48	Construct a program to Implement fractional knapsack	CO5
49	Construct a program to Implement Activity selection problem	CO5
50	Construct a program to Implement Job scheduling problem	CO5

*Competitive coding list will be shared with the students.



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

Subject Name: Logic Design and Microcontroller **L-T-P [3-0-0]**

Subject Code: BCSIoT0302 **Applicable in Department: IoT**

Pre-requisite of Subject: Basic Electronics

Course Objective: Students will learn to design combinational and sequential circuits, understand logic systems, and optimize logic circuits. They will study the architecture of the 8085 Microprocessor and ATMEGA 328P microcontroller, including assembly-level programming for both.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Apply optimization techniques to implement logic functions using combinational logic.	K3
CO2	Understand the basic building blocks of Sequential logic circuits.	K2
CO3	Use the knowledge of 8085 Microprocessor for writing assembly-level programming.	K3
CO4	Describe the fundamentals of ATmega 328P and embedded systems.	K2
CO5	Analyse ATmega 328P and embedded systems to write assembly-level programming.	K4

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	Number System and Combinational Logic	Number systems, Basic Theorems of Boolean Algebra, Digital Logic Gates, EX-OR gates, Universal Gates, Prime Implicants and Essential Prime Implicants, Karnaugh Map Method - Up to Five Variables, Don't Care Map Entries. Combinational Logic Circuits: Adders, BCD	White Board Smart Board Lab Sessions	8 L	Experiment No 1-4	CO1

		Adder, Subtractors, Comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Code converters.				
2	Sequential Logic Circuits	Basic Building Blocks of Sequential circuits like SR Latch, Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation and Characteristics Table of all Flip Flops, Conversion from one type of Flip-Flop to another. Introduction to Shift Registers & Counters.	White Board Smart Board Board Lab Sessions	8 L	Experiment No 6-7	CO2
3	Introduction to 8085 Microprocessor	The architecture of 8085 Microprocessor, Address / Data Bus multiplexing and demultiplexing. Status and Control signal generation, Instruction set of 8085 Microprocessor, Classification of instructions, addressing, Modes, Assembly language programming of 8085, Interrupts of 8085 microprocessor: Classification of interrupts.	White Board Smart Board Board Lab Sessions	8 L	Experiment No 8-10	CO3
4	Introduction to ATMEGA 328P Microcontroller	The architecture of ATmega 328P Microcontroller, AVR CUP Core, ATmega 328P register summary GPIO: Output pin-muxing, Internal Pull up Resistor, PORT Register Descriptions Assembly Instructions.	White Board Smart Board Board Lab Sessions	6 L	Experiment No 11-13	CO4
5	ATMEGA 328P Microcontroller Ports and Assembly Instructions	Timer Ports: Introduction, PWM, Input capture, Timer Register Descriptions Analog input ports: Analog Comparator, Register Descriptions. Interrupt Processing: ISR, Pertinent Register Descriptions, Instructions. Serial communication: Introduction, UART, USART, Pertinent Register Descriptions	White Board Smart Board Board Lab Sessions	6 L	Experiment No 14-20	CO5
Total				36 Hours		

Textbooks	
Sr No	Book Details
1	Morris Mano ,“Digital Design, 3rd Edition” Prentice Hall India. 6th Edition 2018
2	Ramesh Gaonkar, “Microprocessor Architecture, Programming, and Applications with the 8085”, Penram International Publication (India) Pvt. Ltd, 6th Edition 2014
3	David Russel,” Introduction to Embedded Systems Using ANSI C and the Arduino Development Environment, Springer, 2022
Reference Books	
Sr No	Book Details
1	R.P. Jain, “Modern digital Electronics”, Tata McGraw Hill, 4th edition, 2009.
2	K M Bhurchandi, A K Ray, “Advanced Microprocessor And Peripherals”, Tata McGraw Hill, 3rd edition, 2017.
3	Muhammad Ali Mazidi, Sepehr Naimi, Sarmad Naimi, “The AVR microcontroller and embedded systems: using Assembly and C”, MicroDigitalEd; First Edition (August 4, 2017)
Links	
Unit 1	https://onlinecourses.swayam2.ac.in/ini24_ma02/preview
Unit 2	https://onlinecourses.swayam2.ac.in/ini24_ma02/preview
Unit 3	https://onlinecourses.swayam2.ac.in/ini24_ma02/preview

Subject Name: Introduction to IoT **L-T-P [3-0-0]**

Subject Code: BCSIoT0303 **Applicable in Department: IoT**

Pre-requisite of Subject: Basic Electronics and C programming

Course Objective: This course emphasizes the study of the introduction of IoT technology, Components, architecture, network communications and applications protocols. The course also aims at understanding various hardware for IoT, programming concepts using Arduino and Raspberry Pi, and studying about applications of IoT.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Define the vision, definition, conceptual framework, and architecture of IoT and M2M Communication.	K1
CO2	Use Sensors, actuators, and microcontrollers used in IoT implementation.	K3
CO3	Execute and verify programs with the help of Arduino, Node MCU, and Raspberry Pi.	K3
CO4	Integrate the hardware with network and basic knowledge about network protocols and data dissemination	K4
CO5	Analyze applications like Smart metering systems, Smart streetlights, home automation, and smart city applications.	K4

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment / Lab Nos	CO Mapping
1	Introduction of IoT and Design Principles	Introduction to IoT concepts and principles, Overview of Conceptual Framework and Architectural Framework of IoT, M2M Communication, IoT/M2M systems layers, and design standardization, Data enrichment	White Board Smart Board Lab Sessions	10L+6P	Experiment 1 to 3	CO1

		and consolidation, Data aggregation & Dissemination, Introduction to Integrated Developed Environments, Tools, and Programming.				
2	Hardware Components	Sensors, different types of Sensors, Transducer, Actuators, Radio Frequency Identification (RFID) Technology. Overview of IOT supported Hardware Computational platforms such as Arduino, NetArduino, Raspberry Pi, Node MCU, and ARM cortex and its Architecture.	White Board Smart Board Lab Sessions	10L+10P	Experiment 4 to 6	CO2
3	Programming Arduino and Raspberry Pi	Arduino platform boards anatomy, Arduino IDE coding, using emulator, using libraries, arithmetic addition in Arduino IDE, programming the Arduino for IoT. Programming with Node MCU, Introduction to Raspberry Pi Board. Interfacing and programming the various sensors, IOs, etc. with different platforms	White Board Smart Board Lab Sessions	4L+12P	Experiment 7 to 10	CO3
4	Network & Communication Aspects in IoT	Application Protocols: Layered Architecture of IoT Protocols, Communication Technologies, Low range protocols: BLE, ZigBee. Long-range protocols: LoRa and its programming. Wireless sensor networks, Wireless medium access issues, Sensor deployment & Node discovery, Data aggregation & Dissemination.	White Board Smart Board Lab Sessions	6L+10P	Experiment 11 to 13	CO4
5	IoT Applications	Smart metering, e-health, Smart city automation, Automotive applications, home automation, communicating data with H/W units, mobiles, and tablets, Designing smart streetlights in smart cities, and Ideation of Mini Project.	White Board Smart Board Lab Sessions	6L+10P	Experiment 14 to 15	CO5
Total				(36L+ 48P) = 84 Hours		

Textbooks	
Sr No	Book Details
1	Michael Miller, “The Internet of Things” Pearson. 1st Edition March 2015
2	Raj Kamal “INTERNET OF THINGS”, McGraw-Hill, 2nd Edition, May 2022
3	Jeeva Jose “Internet of Things”, Khanna Publications. 1st Edition Jan 2018
Reference Books	
Sr No	Book Details
1	Simon Monk “Programming arduino next steps”, 2 nd Edition, Mc Graw-Hill Education 2018
2	Vijay Madiseti and Arshdeep Bahga “Internet of Things (A Hands-on-Approach)”, 1stEdition, VPT, 2015.
3	Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, A press Publications, 2013.
Links	
Unit 1	Arduino IDE https://youtu.be/avDJarxPJd0?si=ki52HVuiTI_oajwJ
Unit 2	Blynk App https://youtu.be/DEaDy4ki9E8?si=txSfH_rYveA2BYZ9
Unit 3	Thingspeak cloud https://youtu.be/764bRMvGZR4?si=mqOdvZc1epDTacBO



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

Subject Name: Object Oriented Techniques using Java

L-T-P [0-0-6]

Subject Code: BCSE0352

Applicable in Department: CSE/IT/AI/AIML/DS/CYS/CS

Pre-requisites of the Subject: 1. Student must know at least the basics of computer skills, and should be able to start a command line shell.
 2. Knowledge of basic programming concepts.

Course Objective- 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 Outcomes (CO)

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

**Bloom's
Knowledge
Level (KL)**

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

Syllabus

Unit No.	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1 Basics of Java	Module 1.1: Object Oriented Programming	Introduction and Pillars of OOP with real life example, jvm architecture and its components	T1, R1, Smart Board/PPT/ Online	3 (1+2)	Setting class path variables, Compilation of java file and	CO 1

Programming			Programs		execute its byte code.	
	Module 1.2: Modelling Concepts	Introduction, Class Diagram and Object Diagram, UML concepts: Association, Composition, aggregation, realization, and Generalization.		3(1+2)	Designing object and class diagram with UML concepts.	
	Module 1.3: Control Statements	Decision Making, Looping and Branching, Argument Passing Mechanism: Command Line Argument, Console Input.		4(1+3)	Implementation of java programs on control statements.	
	Module 1.4: 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.		8 (2+6)	Implementation of Java Basics, Class, Object, abstract class interface, garbage collection.	
2	Module 2.1: Inheritance	Overview and Types of Inheritance in Java, Access Modifiers, Constructors and super constructor in Inheritance.	T1, R1, Smart Board/PPT/ Online Programs	4 (1+3)	Implementation of inheritance concept.	CO2
	Module 2.2: Polymorphism	Introduction and Types of Polymorphism, Overloading and Overriding		4 (1+3)	Implementation of polymorphism concept.	
	Module 2.3: Lambda expression	Introduction and Working with Lambda Variables.		2(1+1)	Programs based on Lambda expression.	
	Module 2.4: Arrays	Introduction to Arrays and its Types.		4(1+3)	Programs based on array concept.	
3	Module 3.1: Packages	Introduction to Packages and its Types, Access Protection in Packages, Import and Execution of Packages.	T1, R1, Smart Board/PPT/ Online Programs	3 (1+2)	Implementation of java package, Exception handling, Assertion, Localization and String handling	CO3
	Module 3.2: Exception Handling, Assertions and Localizations	Exceptions vs. Errors, Handling of Exception. Finally, Throws and Throw keyword, Multiple Catch Block, Nested Try and Finally Block, Tokenizer. Assertions and Localizations Concepts and its working.		5 (2+3)		

String Handling	Module 3.3: String Handling	String Types, Operations, Immutable String, Method of String class, String Buffer and String Builder class.		5 (2+3)		
4 Concurrency in Java and I/O Stream	Module 4.1: Threads	Overview of Threads, Creating Threads, Thread Life-Cycle, Thread Priorities, Daemon Thread, Runnable Class, Synchronizing Threads etc.	T2, R2, Smart Board/PPT/ Online Programs	4(2+2)	Implementation of Multi-threading, Annotation, Character and Byte Stream classes java.io package.	CO4
	Module 4.2: I/O Stream	Common I/O Stream Operations, Interaction with I/O Streams Classes.		3(1+2)		
	Module 4.3: Annotations	Introduction, Custom Annotations and Applying Annotations.		3(1+2)		
5 GUI Programming, Generics and Collections	Module 5.1: GUI Programming	Swing, AWT, Components and Containers, Layout Managers and User-Defined Layout and Event Handling.	T2, R2, R3 Smart Board/PPT/ Online Programs	4(2+2)	Implementation of AWT & Swing components, Layout Manager classes, Generic & Collection, and Wrapper classes	CO5
	Module 5.2: Generics	Introduction to Generic Classes, Initializing a Generic Object, Generic Cell Driver Class, Generic Methods, Use enumerated type.		5(1+4)		
	Module 5.3: Collections	Introduction to Collections, Using Method References, Using Wrapper Class, Using Lists, Sets, Maps and Queues, Collection using Generics, Iterators		6(2+4)		
Total				(23T+47P) = 70 Hours		

List of Practicals		
Sr. No.	Program Title	CO Mapping
1	Understanding Text Editors to Write Programs, Compile and run first java file and Byte Code and class file	CO1
2	Sketch a class and object diagram by describing the sales order system of a restaurant.	CO1
3	Sketch a class diagram by describing the circle and rectangle class.	CO1
4	Sketch a class diagram for a college platform including, classroom, playground, chair, table, smart board, teaching staff etc.	CO1
5	Sketch a class diagram containing class called Employee, which models an employee with an ID, name and salary. Add method raisesalary(percent) that increases the salary by the given percentage.	CO1
6	Program to display the default value of all Primitive data types	CO1

7	Implement the code using main() method to calculate and print the Total and Average Marks scored by a student from the input given through the command line arguments and assume that four command line arguments name, marks1, marks2, marks3 will be passed to the main() method in the below class with name TotalAndAvgMarks .	CO1
8	Write code which uses if-then-else statement to check if a given account balance is greater or lesser than the minimum balance. Write a class BalanceCheck with public method checkBalance that takes one parameter balance of type double. Use if-then-else statement and print Balance is low if balance is less than 1000. Otherwise, print Sufficient balance.	CO1
9	A class NumberPalindrome with a public method isNumberPalindrome that takes one parameter number of type int. Write a code to check whether the given number is palindrome or not. For example Cmd Args : 333 333 is a palindrome	CO1
10	Write a class FibonacciSeries with a main method. The method receives one command line argument. Write a program to display fibonacci series i.e. 0 1 1 2 3 5 8 13 21	CO1
11	Write a Java Program to find the Factorial of a given number.	CO1
12	Java Program to create a class, methods and invoke them inside main method.	CO1
13	<ul style="list-style-type: none"> Write a Java program to illustrate the abstract class concept. Create an abstract class Shape, which contains an empty method numberOfSides(). Define three classes named Trapezoid, Triangle and Hexagon extends the class Shape, such that each one of the classes contains only the method numberOfSides(), that contains the number of sides in the given geometrical figure. Write a class AbstractExample with the main() method, declare an object to the class Shape, create instances of each class and call numberOfSides() methods of each class. 	CO1
14	Java program to illustrate the static field in the class.	CO1
15	Java Program to illustrate static class.	CO1
16	Write a java program to access the class members using super keyword	CO1
17	Java program to access the class members using this keyword	CO1
18	Implement an interface named MountainParts that has a constant named TERRAIN that will store the String value "off_road". The interface will define two methods that accept a String argument name newValue and two that will return the current value of an instance field. The methods are to be named: getSuspension, setSuspension, getType, setType.	CO1
19	Java program to demonstrate nested interface inside a interface.	CO1
20	Java program to demonstrate nested interface inside a class.	CO1
21	Java program to explicit implementation of garbage collection by using finalize() method	CO1

22	JAVA program to implement Single Inheritance	CO2
23	JAVA program to implement multi-level Inheritance	CO2
24	JAVA program to implement constructor and constructor overloading.	CO2
25	JAVA program implement method overloading.	CO2
26	JAVA program to implement method overriding.	CO2
27	Java program to implement lambda expression without parameter.	CO2
28	Java program to implement lambda expression with single parameter.	CO2
29	Java program to implement lambda expression with multi parameter.	CO2
30	Java program to implement lambda expression that iterate list of objects	CO2
31	Java program to define lambda expressions as method parameters	CO2
32	<p>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.</p> <p>Assumptions:</p> <ul style="list-style-type: none"> • arr is never null • arg1 and arg2 may be same 	CO2
33	JAVA program to show the multiplication of two matrices using arrays.	CO2
34	Java Program to search an element using Linear Search	CO2
35	Java program to search an element using Binary Search	CO2
36	Java Program to sort element using Insertion Sort	CO2
37	Java Program to sort element using Selection Sort – Largest element Method	CO2
38	java program to Sort elements using Bubble Sort	CO2
39	Java program to create user defined package.	CO3
40	Java Program to create a sub- classing of package	CO3
41	<p>Implement the following:</p> <ul style="list-style-type: none"> • Import package.*; • import package.classname; • Using fully qualified name. 	CO3

42	Implement and demonstrate package names collision in java	CO3
43	Java program to handle and Arithmetic Exception Divided by zero	CO3
44	Java Program to implement User Defined Exception in Java	CO3
45	Java program to illustrate finally block	CO3
46	Java program to illustrate Multiple catch blocks	CO3
47	Java program for creation of illustrating throw in exception handling.	CO3
48	Implement the concept of Assertion in Java Programming Language	CO3
49	Implement the concept of Localization in Java Programming Language.	CO3
50	Java program to print the output by appending all the capital letters in the input string.	CO3
51	Java program that prints the duplicate characters from the string with its count.	CO3
52	Java program to check if two strings are anagrams of each other	CO3
53	Java Program to count the total number of characters in a string	CO3
54	Java Program to count the total number of punctuation characters exists in a String	CO3
55	Java Program to count the total number of vowels and consonants in a string	CO3
56	Java Program to show .equals method and == in java	CO3
57	Given a string, return a new string made of n copies of the first 2 chars of the original string where n is the length of the string. The string may be any length. If there are fewer than 2 chars, use whatever is there. If input is "Wipped" then output should be "WiWiWiWiWi".	CO3
58	Given two strings, a and b, create a bigger string made of the first char of a, the first char of b, the second char of a, the second char of b, and so on. Any leftover chars go at the end of the result. If the inputs are "Hello" and "World", then the output is "HWeolrlld".	CO3
59	JAVA program to show the usage of string builder.	CO3
60	JAVA program to show the usage of string buffer.	CO3
61	Creating and Running a Thread	CO4
62	Implementing Runnable Interface	CO4
63	Synchronizing Threads with lock	CO4
64	Synchronizing Threads without lock	CO4

65	JAVA program to implement even and odd threads by using Thread class .	CO4
66	JAVA program to implement even and odd threads by using Runnable interface.	CO4
67	JAVA program to synchronize the threads by using Synchronize statements and Synchronize block.	CO4
68	Demonstrate the concept of type annotations in the JAVA programming language.	CO4
69	Demonstrate the concept of user-defined annotations in the JAVA programming language.	CO4
70	JAVA program to implement that read a character stream from input file and print it into output file.	CO4
71	JAVA program to implement that merge the content of two files (file1.txt, file2.txt) into file3.txt.	CO4
72	Write a Java program that reads the contents of one file and copies them to another file.	CO4
73	Write a Java program that reads a text file and counts the number of words in it.	CO4
74	Write a Java program that reads a text file and counts the frequency of each word in it.	CO4
75	Write a Java program that reads a text file and adds line numbers to each line. The program should create a new file with the line numbers added to the beginning of each line.	CO4
76	Write a Java program that reads two binary files and compares them byte by byte to determine if they are identical. Display a message indicating whether the files are the same or different.	CO4
77	Program to create a frame with three button in AWT and swing	CO5
78	Program to display message with radio buttons in swing	CO5
79	Program to display "All The Best" in 5 different colors on screen. (Using AWT/Swing)	CO5
80	Program to implement event handling in a button "OK"	CO5
81	Java Program to implement BorderLayout	CO5
82	Java Program to implement GridLayout	CO5
83	Java Program to implement BoxLayout	CO5
84	Java Program to implement CardLayout	CO5
85	Java program to implement Generic class	CO5
86	Java program to illustrate Generic methods	CO5
87	Java program to implement wildcard in generics	CO5
88	Java program to implement of methods of HashSet	CO5

89	Java Program to implement methods available in HashMap class	CO5
90	Program to add, retrieve, and remove element from ArrayList	CO5
91	Create a method which can accept a collection of country names and add it to ArrayList with generic defined as String and return the List.	CO5
92	Create a method which can create a HashSet containing values 1-10. The Set should be declared with the generic type Integer. The method should return the Set.	CO5
93	Java program to implement autoboxing	CO5
94	Java program to implement unboxing	CO5
95	Develop a java class with a method <i>storeEvenNumbers(int N)</i> using ArrayList to store even numbers from 2 to N, where N is a integer which is passed as a parameter to the method <i>storeEvenNumbers()</i> . The method should return the ArrayList (A1) created.	CO5
96	Create a method that accepts the names of five countries and loads them to an array list and returns the list.	CO5
97	Create a method which can accept a collection of country names and add it to ArrayList with generic defined as String and return the List.	CO5

Textbooks

Sr. No.	Book Details
1	Herbert Schildt," Java: A Beginner's Guide", McGraw-Hill Education 2nd edition
2	E Balagurusamy, "Programming with Java A Primer", TMH, 4th edition.


Reference Books

Sr. No.	Book Details
1	Cay S. Horstmann, "Core Java Volume I – Fundamentals", Prentice Hall
2	Joshua Bloch," Effective Java", Addison Wesley
3	Herbert Schildt," Java - The Complete Reference", McGraw Hill Education 12th edition

Links

Unit 1	https://www.youtube.com/watch?v=r59xYe3Vyks&list=PLS1QuIW01RIbfTjQvTdj8Y6yyq4R7g-AI
Unit 2	https://www.youtube.com/watch?v=ZHLdVRXluC8&list=PLS1QuIW01RIbfTjQvTdj8Y6yyq4R7g-AI&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

 <p>NIET Greater Noida <small>Autonomous Institute</small></p>	<p align="center">NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY GREATER NOIDA-201306 (An Autonomous Institute) School of Computer Science in Emerging Technologies</p>
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Subject Name: Logic Design and Microcontroller Lab	L-T-P [0-0-2]
Subject Code: BCSIoT0352	Applicable in Department: IoT
Pre-requisite of Subject: Basic Electronics	

Course Objective: Students will learn to design combinational and sequential circuits, understand logic systems, and optimize logic circuits. They will study the architecture of the 8085 Microprocessor and ATMEGA 328P microcontroller, including assembly-level programming for both.

Lab Experiments

Course Objective: To design combinational and sequential circuits and verify their outcomes. Students will design and implement programs and complete operations and interfacing using an 8085 microprocessor and ATmega 328P microcontroller.

Course Outcomes (CO)

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

Bloom's Knowledge Level(KL)

CO 1	Implement and verify combinational and sequential circuits.	K3
CO2	Design programs to perform operations and interfacing using 8085 microprocessor and ATmega328P microcontroller.	K6

List of Practical's

Sr No	Program Title	CO Mapping
1	Implementation of XOR and XNOR gates using Universal Gates.	CO1
2	Implementation of 4:1 multiplexer and 1:4 demultiplexer/Decoder using logic gates (AND gate-7408, NOT gate-7404 and OR gate-7432) and verify their truth table.	CO1
3	Implementation of Two Boolean functions using Multiplexer/Encoder and Demultiplexer/Decoder	CO1
4	Implementation of a 4-bit parallel adder using 7483 IC and verify the output for the given inputs. (i) A = 1011, B = 1001 (ii) A=0011, B = 0010	CO1
5	Verification of truth tables of RS, JK, T, and D flip-flops using (7400) & NOR gates (7402).	CO1
6	Design 4-bit synchronous and asynchronous counter using JK flipflops (7476) and AND gates (7408) and verify their truth table.	CO1
7	Verification of Shift Registers SISO, SIPO, PISO, PIPO using JK flipflops (7476)	CO1
8	Write a program using 8085 Microprocessor for Decimal and hexadecimal addition, and subtraction of the following two Numbers. i. 20 & 33, 57 & 87	CO2

	ii. ABH & 27H, 2AH & C2H	
9	To perform multiplication of the following two 8-bit numbers using 8085. i. 65H & 22H ii. A3H & 35H	CO2
10	To perform the division of i. A 16-bit no by an 8-bit number using 8085. ii. An 8-bit number by an 8-bit number using 8085	CO2
11	Hardware setup for ATmega328P Programming	CO2
12	Software setup, Installation of Microchip Studio	CO2
13	Project Setup, Hardware, and software for ATmega328P Programming using Microchip Studio	CO2
14	Blink Running LED using ATmega 328P	CO2
15	Use Buttons as input using ATmega 328P	CO2
16	Apply external Interrupts in ATmega 328P	CO2
17	Application of serial UART using Atmega 328P	CO2
18	Setup a Timer base using ATmega 328P	CO2
19	Interfacing and control of Servo motor using Timer 1 in Atmega 328P	CO2
20	Interfacing of Temperature Sensor LM 35 with ATmega 328P	CO2



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Subject Name: IoT Lab using Arduino and Node MCU Platform

L-T-P [0-0-4]

Subject Code: BCSIoT0353		Applicable in Department: IoT
Pre-requisite of Subject: Basic Electronics and C programming		
Course Objective: This course emphasizes the study of the introduction of IoT technology, Components, architecture, network communications and applications protocols. The course also aims at understanding various hardware for IoT, programming concepts using Arduino and Raspberry Pi, and studying about applications of IoT.		
Lab Experiments		
Course Objective: To familiarize the students with the basics of the Internet of Things, sensors, development boards, actuators, hardware, and protocols.		
Course Outcomes (CO)		
Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Describe the functionality of computing, sensing, and actuating components of the Internet of Things.	K2
CO2	Develop IoT applications using Arduino IDE.	K6
CO3	Design, develop, and deploy real-time mini projects of IoT Applications.	K6
List of Practical's		
Sr No	Program Title	CO Mapping
1	Installation of Arduino IDE and introduction to tools, assembly, and libraries.	CO 1
2	Getting Programming board Info and configuring boot loader settings using Arduino IDE.	CO 1
3	Study and design IoT reference architecture for IoT-based applications like Smart home	CO 1
4	Study Hardware Architecture and Pin Out of Arduino UNO Board. Compare Arduino Uno Arduino Nano and Arduino Mega. Identification of their use case according to a given scenario.	CO 1
5	Study Hardware Architecture and Pin Out of Node MCU and ESP8266. Identification of their use case according to the given snapshot.	CO 1
6	a. Study Pin out Architecture of Sensors and actuators b. DHT 11 Sensor	CO 1

	<ul style="list-style-type: none"> c. MQ 135 Sensor d. MQ 7 Sensor e. MQ 3 Sensor f. Ultrasonic Sensor HC-04 g. Rain Sensor h. Soil moisture Sensor i. PIR Sensor j. LDR Sensor k. Line Sensor l. Colour Sensor m. Servo Motor n. Relay 	
7	<ul style="list-style-type: none"> a. Working with structures using Arduino IDE b. Working with Variables using Arduino IDE c. Working with Flow control using Arduino IDE d. Working with Digital i/o using Arduino IDE e. Working with Analog i/o using Arduino IDE f. Working with the Time function using Arduino IDE g. Working with Math functions using Arduino IDE h. Working with Random functions using Arduino IDE i. Working with Serial communication using Arduino IDE j. Working with loops and control statements using Arduino IDE k. Working with PinMode function using Arduino IDE l. Working with analog Read, analog Write, digital Read, digital Write using Arduino IDE, Blinking LED Program using Arduino Uno 	CO 2
8	<p>Write a program using Arduino Uno to generate a random number between 0 to 25. Use 4 LEDs (Red, Green, Blue, and Yellow) and design LED patterns as</p> <ul style="list-style-type: none"> (i) if the random number is less than 5 then only the Red LED should glow. (ii) if the random number is between 5-10 then only Blue LED should glow. (iii) if the random number is between 11-20 then only Yellow LED should glow. (iv) if the random number is greater than 20 then only Green LED should glow." 	CO 2

	<p>"Write a program using Arduino uno for addition of digits of a user-defined number. Example: number is 257 then output should be 14."</p> <p>Write a program to take LED color as input from the user and glow that LED using Arduino Uno.</p>	
9	<ul style="list-style-type: none"> a. Interfacing of DHT 11 Sensor with Arduino Uno. Implement an LED mechanism for notifying rise in temperature. b. Interfacing of MQ 135/MQ7 Sensor with Arduino Uno. Implement alarm mechanism for notifying rise in amount of hazardous gases in the air. c. Interfacing of MQ 3 Sensor with Arduino Uno. Implement alarm mechanism for checking amount of alcohol in the air. 	CO 2
10	<ul style="list-style-type: none"> a. Interfacing of Ultrasonic Sensor HC-04 with Arduino Uno. b. Interfacing of Rain Sensor with Arduino Uno. Implement a buzzer mechanism as the sensor identifies rain. c. Interfacing of Soil Moisture Sensor with Arduino Uno. d. Interfacing of PIR Sensor with Arduino Uno. e. Interfacing of LDR Sensor with Arduino Uno. f. Interfacing of LCD with Arduino Uno g. Interfacing of I2C LCD with Arduino Uno 	CO 2
11	<ul style="list-style-type: none"> a. Interfacing Bluetooth Module with Arduino Uno b. Connecting Node MCU with Wi-Fi hotspots using Arduino IDE c. Interfacing of DHT 11 Sensor with Node MCU d. Interfacing of MQ 135 Sensor with Node MCU e. Interfacing of MQ 7 Sensor with Node MCU f. Interfacing of MQ 3 Sensor with Node MCU 	CO 2
12	<ul style="list-style-type: none"> a. Interfacing of Ultrasonic Sensor HC-04 with Node MCU b. Interfacing of Rain Sensor with Node MCU c. Interfacing of Soil moisture Sensor with NodeMCU d. Interfacing of PIR Sensor with Node MCU e. Interfacing of LDR Sensor with Node MCU 	CO 2
13	<ul style="list-style-type: none"> a. Sending Data to Thingspeak Cloud Server using Node MCU b. Detection of LPG Gas using MQ6 and Node MCU. Notify Thingspeak server that "LPG gas Leakage has been detected". 	CO 2
14	Controlling LED with Node MCU using Blynk cloud App.	CO 2
15	<p>Development of Mini Project</p> <p>Sample Projects:</p> <p>Introduction to IoT Projects.xlsx</p>	CO 3

Subject Name: Environmental Science **L-T-P [2-0-0]**

Subject Code: BNC0402 **Applicable in Department: All Branches**

Pre-requisite of Subject: Environmental science is an interdisciplinary field that requires a solid foundation in various subjects to fully understand the complex interactions within the environment. Building a strong foundation in subjects like physics, chemistry, biology, maths, geography, economics will equip students with the knowledge and skills necessary to tackle complex environmental challenges and contribute to sustainable solutions.

Course Objective: To help the students in realizing the inter-relationship between man and environment and help the students in acquiring basic knowledge about environment.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Understand the basic principles of ecology and environment. Ecosystem: Basic concepts, components of ecosystem, food chains and food webs. Ecological pyramids	K1,K1
CO2	Understand the different types of natural recourses like food, forest, Minerals and energy and their conservation	K1,K2
CO3	Understand the importance of biodiversity, Threats of biodiversity and different methods of biodiversity conservation.	K1,K2
CO4	Understand the different types of pollution, pollutants, their sources, effects and their control methods.	K1,K2
CO5	Understand the basic concepts of sustainable development, Environmental Impact Assessment (EIA) and different acts related to environment	K1,K2

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	Basic Principle of Ecology	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,	Smart board, PPTS, Reference Books,	4 L	NA	CO1

		gaseous and sedimentary cycles. Carbon, Nitrogen, Phosphorus and Sulphur Cycles. Basic concepts of sustainable development, SDGs, Ecosystem services, UN Decade for Eco restoration				
2	Natural Resources and Associated Problems	<p>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, salinity.</p> <p>Land resources: Land as a resource, land degradation, man induced landslides. Equitable use of resources for sustainable lifestyles.</p> <p>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.</p>	Smart board, PPTS, Reference Books,	4 L	NA	CO2
3	Biodiversity Succession and Non-Renewable Energy Resources	<p>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. Succession: Concepts of succession, Types of Succession. Trends in succession. Climax and stability.</p>	Smart board, PPTS, Reference Books	4 L	NA	CO3
4	Pollution and Solid Waste Management	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,	Smart board, PPTS, Reference Books	4 L	NA	CO4

		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, Climate change, global warming, acid rain, ozone layer depletion.				
5	Role of Community and Environmental Protection Acts	Role of community, women and NGOs in environmental protection, Bio indicators and their role, Natural hazards, Chemical accidents and disasters risk management, Environmental Impact Assessment (EIA), Salient features of following Acts: a. Environmental Protection Act, 1986, Wildlife (Protection) Act, 1972.b. Water (Prevention and control of pollution) Act, 1974.c. Air (Prevention and control of pollution) Act, 1981. Forest (Conservation) Act, 1980.d. Wetlands (Conservation and Management) Rules, 2017; e. Chemical safety and Disaster Management law.F. District Environmental Action Plan. Climate action plans.	Smart board, PPTS, Reference Books	4 L	NA	CO5
Total			20 Hours			

Textbooks	
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Sr No	Book Details
1	Brady, N.C. 1990. The nature and properties of Soils, Tenth Edition. Mac Millan Publishing Co., New York.
2	Botkin, D.B and Kodler E.A., 2000, Environmental Studies : The earth as a living planet. John Wiley and Sons Inc. Environmental studies and Environmental engineering –By Dr. H.H
3	Environmental Studies By Dr B.S.Chauhan

Reference Books	
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Sr No	Book Details
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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
3	Environmental studies- R, Rajagopalan -Oxford Pubtiation20051
Links	
Unit 1	Ecosystems and Biomes Classroom Learning Video - YouTube
Unit 2	Environmental Science EVS Unit 3 Natural Resources Land Resources AEC semester 1/2 DU SOL NCWEB P -1 (youtube.com)
Unit 3	'Biodiversity & its Conservation' In Just 24 Minutes 🙌🙌 Ultimate Revision Series Neet 2022 (youtube.com)
Unit 4	Air Pollution What Causes Air Pollution? The Dr Binocs Show Kids Learning Videos Peekaboo Kidz (youtube.com)
Unit 5	Environmental Pollution - Environment and Ecology for UPSC IAS Part 2 (youtube.com)



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

Subject Name: Engineering Mathematics-IV **L-T-P [3-1-0]**

Subject Code: BAS0402 **Applicable in Department: CSE/CS/IT/IOT/ECE/CSE-R/ M.Tech.(Int.)**

Pre-requisites of the Subject: Knowledge of Mathematics I and II of B. Tech or equivalent.

Course Objective: The objective of this course is to familiarize the students with statistical techniques. It aims to present the students with standard concepts and tools at an intermediate to superior level that will provide them well towards undertaking a variety of problems in the discipline.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level (KL)
CO 1	Understand the concept of correlation, moments, skewness and kurtosis and curve fitting.	K1, K2
CO 2	Apply the concept of hypothesis testing and statistical quality control to create control charts.	K1, K3
CO 3	Remember the concept of probability to evaluate probability distributions.	K1
CO 4	Understand the concept of Mathematical Expectations and Probability Distribution.	K2
CO 5	Solve the problems of Time & Work, Pipe & Cistern, Time, Speed & Distance, Boat & Stream, Analogy.	K3

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment / Lab Nos	CO Mapping
1	Statistical Techniques-I	Introduction: Measures of central tendency: Mean, Median, Mode, Moment, Skewness, Kurtosis, Curve Fitting, Method of least squares, Fitting of straight	Class room Teaching, Smart Board, PPT, M-	8 L	Assignment 1	CO1

		lines, Fitting of second degree parabola, Exponential curves, Correlation and Rank correlation, Linear regression, nonlinear regression and multiple linear regression	tutor.			
2	Statistical Techniques-II	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).	Class room Teaching, Smart Board, PPT, M-tutor.	8 L	Assignment 2	CO2
3	Probability and Random Variable	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).	Class room Teaching, Smart Board, PPT, M-tutor.	8 L	Assignment 3	CO3
4	Expectations and Probability Distribution	Operation on One Random Variable – Expectations: Introduction, Expected Value of a Random Variable, Mean, Variance, Moment Generating Function, Binomial, Poisson, Normal, Exponential distribution.	Class room Teaching, Smart Board, PPT, M-tutor.	8 L	Assignment 4	CO4
5	Aptitude-IV	Time & Work, Pipe & Cistern, Time, Speed & Distance, Boat & Stream, Sitting arrangement, Analogy.	Class room Teaching, Smart Board, PPT, M-tutor.	8 L	Assignment 5	CO5
Total			40 Hours			

Textbooks	
Sr No	Book Details
1	P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003(Reprint).
2	S. Ross: A First Course in Probability, 6th Ed., Pearson Education India, 2002.
3	W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.

4	HaitaoGuo, Ramesh A. Gopinath, C.S. Burrus, IVAN W AUTOR SELESNICK, JAN E AUTOR ODEGARD, SidneyBurrus.
Reference Books	
Sr No	Book Details
1	B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
2	T.Veerarajan : Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi.
3	R.K. Jain and S.R.K. Iyenger: Advance Engineering Mathematics; Narosa Publishing House, New Delhi.
4	J.N. Kapur: Mathematical Statistics; S. Chand & Sons Company Limited, New Delhi.
5	D.N.Elhance,V. Elhance& B.M. Aggarwal: Fundamentals of Statistics; Kitab Mahal Distributers, New Delhi.
Links	
Unit 1	https://archive.nptel.ac.in/courses/110/107/110107114/ https://archive.nptel.ac.in/courses/111/105/111105042/
Unit 2	https://archive.nptel.ac.in/courses/103/106/103106120/
Unit 3	https://archive.nptel.ac.in/courses/117/105/117105085/
Unit 4	https://archive.nptel.ac.in/courses/111/104/111104032/
Unit 5	https://www.youtube.com/watch?v=KZ_M5RWaP6A https://www.youtube.com/watch?v=WP4jsNRgfa4 https://www.youtube.com/watch?v=jPaQDKbahU8 https://www.youtube.com/watch?v=FwiWJLicakg

Subject Name: Technical Communication **L-T-P [2-1-0]**

Subject Code: BASL0401 **Applicable in Department: All Branches**

Pre-requisite of Subject: B2 (CEFR level) in the Core Skills test; B1/B2 in the Speaking and Writing tests

Course Objective: To develop communication and critical thinking skills necessary for succeeding in the diverse and ever-changing workplace of the twenty first century and help the students communicate effectively, creatively, accurately, and appropriately.

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Comprehend the principles and functions of technical communication.	K2
CO2	Write for a specific audience and purpose to fulfil the provided brief.	K5
CO3	Identify and produce different kinds of technical documents.	K2, K3
CO4	Apply effective speaking skills to efficiently carry out official discourses.	K3
CO5	Demonstrate understanding of communication through digital media.	K5

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment / Lab Nos	CO Mapping
1	Introduction to Technical Communication	<ul style="list-style-type: none"> Definition, Process, Types, Levels, Flow and Barriers to Technical Communication with emphasis on cultural differences and gender sensitivity. Gender-neutral language. 	Interactive & Flipped classroom	6 L	Assignment 1	CO1

		<ul style="list-style-type: none"> • Need for and Importance of Technical Communication - Significance of audience in technical communication • Tone- Formality and Informality 	method			
2	Technical Writing 1	<ul style="list-style-type: none"> • Technical writing and technical vocabulary • Business letters/emails <ul style="list-style-type: none"> a) Types and format, Content Organization b) Cultural Variety, Tone, and Intention c) Bad news message, good news message d) Advertisements, Editorial press releases • Notices, agenda, and minutes of meeting • Job application, CV, and Resume' 	Interactive & Flipped classroom method	10 L	Assignment 2	CO2
3	Technical Writing 2	<ul style="list-style-type: none"> • Technical reports – types & formats • Structure of a report (short & long) • Ethical Writing – Copy Editing, Referencing and Plagiarism • Technical Proposal - structure and types • Technical/ Scientific paper writing 	PPT, Activities	7 L	Assignment 3	CO3
4	Public Speaking	<ul style="list-style-type: none"> • Components of effective speak • Seminar and conference presentation • Conducting/ participating in meetings • Appearing for a job interview 	Interactive sessions, activities, mock interviews	8 L	Assignment 4	CO4
5	Virtual/Remote Communication	<ul style="list-style-type: none"> • Understanding remote work – using different online platforms 	Interactive sessions, activities			

		<ul style="list-style-type: none"> • Virtual etiquette- email ids, usernames • Developing online written correspondence- blogs, WhatsApp, LinkedIn. What not to write on social media. • Participating in online Conferences/seminars/meetings • Mobile Etiquette 		8 L	Assignment 5	CO5
Total			39 Hours			

Textbooks	
Sr No	Book Details
1.	Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, 4th Edition, Oxford University Press, 2023, New Delhi.
Reference Books	
Sr No	Book Details
1	Technical Communication: A Practical Guide by William S. Pfeiffer and Kaye A. Adkins, Pearson, 2020, UK.
2	The Essentials of Technical Communication by Elizabeth Tebeaux and Sam Dragga, Oxford University Press, 2021, UK.
3	Technical Communication Today by Richard Johnson-Sheehan, Pearson, 2020, UK
4	Strategic Communication in Technical Professions" by Susan K. Miller-Cochran and Jason Tham, Routledge, 2020, UK.
5	Technical Writing for Engineers & Scientists by Michelle V. Z. Holmes, McGraw Hill, 2020, US.
6	Speaking: Second Language Acquisition, from Theory to Practice by William Littlewood, Cambridge University Press, 2022, UK.
7	The Writing Revolution: A Guide to Advancing Thinking Through Writing in All Subjects and Grades by Judith C. Hochman and Natalie Wexler, Jossey-Bass, 2022, USA.

Subject Name: Data Structure and Algorithms-II **L-T-P [3-0-0]**

Subject Code: BCSE0401 **Applicable in Department: CSE/IT/CS/AI/AIML/IOT/DS/CYS**

Pre-requisite of Subject: C, Python

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

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Apply tree structures effectively demonstrating proficiency in tree operations and algorithms.	K3
CO2	Analyse the graph data structure and implement various operations for problem solving.	K4
CO3	Implementation and analysis of dynamic programming for efficient problem-solving across diverse contexts.	K4
CO4	Apply efficient backtracking and branch & bound techniques across diverse problem-solving scenarios.	K3
CO5	Understand advanced data structures, their implementation and application for efficient data manipulation and retrieval.	K2

Syllabus

Unit No	Module	Topics Covered	Pedagogy	Lecture Required L=T+P	Practical/Assi gnment/Lab	CO Mapping
1 Design and Analysis of Algorithms : Trees	Module 1.1: Trees	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	Lectures, Code Walkthroughs, hands-on programming, Problem Solving,	8L+10P	.	CO1

		Traversal, Operation of Insertion, Deletion, Searching & Modification of data in Binary Search tree, Binary Heaps, Threaded Binary trees, Traversing Threaded Binary trees, AVL Tree.	Collaborative Learning, competitive coding Projects, and Assessments.			
	Module 1.2: Application of Trees	Priority Queue, Heap Sort, Huffman codes.				
2 Design and Analysis of Algorithms : Graphs	Module 2.1: 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,	Lectures, Code Walkthroughs, hands-on programming, Problem Solving, Collaborative Learning, competitive coding, Projects, and Assessments.	8L+10P	Depth First Search and Breadth First Search. Connected Component, Spanning Trees, Minimum Cost Spanning Trees: Prim's and Kruskal's algorithm. Directed-Acyclic Graph, Transitive Closure, and Shortest Path algorithms: Dijkstra	CO2
	Module 2.2: 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.				
3 Dynamic Programming	Module 3.1: Dynamic Programming	Dynamic Programming concepts 0/1 Knapsack, Longest Common Sub Sequence, Matrix Chain Multiplication, Resource Allocation Problem.	Lectures, Code Walkthroughs, hands-on programming, Problem Solving, Collaborative	8L+8P		CO3

			Learning, competitive coding, Projects, and Assessments.			
4 Backtracking, Branch and Bound	Module 4.1: Backtracking	Backtracking, Branch, and Bound with Examples Such as Travelling Salesman Problem, Graph Colouring, n-Queen Problem, Hamiltonian Cycles, and Sum of Subsets.	Lectures, Code Walkthroughs, hands-on programming, Problem Solving, Collaborative Learning, Projects, Assessments.	8L+10P		CO4
5 Advanced-Data Structures	Module 5.1: Advanced-Data Structures	Red-Black Trees, B – Trees, B+ Trees, Binomial Heaps, Fibonacci Heaps, Tries.	Lectures, Code Walkthroughs, hands-on programming, Problem Solving, Collaborative Learning, Projects, Assessments.	8L+10P		CO5

Total No. of Lecture + Practical Labs

(40L+48P) = 88 Hours

Textbooks

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

Reference Books

Sr. No.	Book Details
1	Reema Thareja, “Data Structure Using C”, Oxford University Press, 2 nd Edition, 2014.

2	AK Sharma, “Data Structure Using C”, Pearson Education India, 2 nd Edition, 2011.
3	P. S. Deshpandey, “C and Data structure”, Wiley Dreamtech Publication, 1 st Edition, 2004.
Links	
Unit 1	https://www.youtube.com/watch?v=tORLeHHTazM&pp=ygUMdHJlZXMgIG5wdGVs
Unit 2	https://www.youtube.com/watch?v=9zpSs845wf8&pp=ygUcZ3JhcGggIGRhdGEgc3RydWN0dXJlICBucHRlIA%3D%3D
Unit 3	https://www.youtube.com/watch?v=5dRGRueKU3M&pp=ygUUZHluYW1pYyBwcm9ncmFtbWluZyA%3D
Unit 4	https://www.youtube.com/watch?v=DKCbsiDBN6c&list=PL-Y5_GYVx275I87vW3LUzEJ-g7TDgn0Ts https://www.youtube.com/watch?v=3RBNPc0_Q6g&pp=ygUuYmFja3RyYWNraW5nIGFuZCBicmFuY2ggYW5kIGJvdW5kIHByb2dyYW1taW5nIA%3D%3D
Unit 5	https://www.youtube.com/watch?v=8h80p_rYv1Y&list=PLv9sD0fPjvSHqIOLtIvHJWjkdH0ldzmXT

Subject Name: Operating Systems **L-T-P [3-0-0]**

Subject Code: BCSE0403 **Applicable in Department: CSE/IT/CS/AI/AIML/DS/CYS/IOT**

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

Course Objective: The objective of this course is to provide an understanding of the basic and modern concepts of operating system and deliver the skills needed to develop and customize Linux shell programming

Course Outcomes (CO)

Course outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO 1	Understand various operating systems architecture with utilizing the command line interface (CLI) within a Linux environment.	K2
CO2	Understand and implement the various CPU scheduling algorithms.	K4
CO3	Analyse deadlock, concurrency, and synchronization into the system architecture.	K4
CO4	Identify and implement the memory management techniques and algorithms.	K3
CO5	Analyse file management system and implement distributed and virtual machine configurations on modern operating systems.	K4

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1 Fundamentals & Shell scripting	Module 1.1: Fundamentals of Operating Systems	Overview of Operating Systems, Operating system architecture, Types of Operating System: Batch OS, Multiprogramming OS, Multitasking OS, Multiprocessor OS, Real time OS, System call and kernel	Lectures, PPTs, Notes and Smart Interactive Panel	4L+8P	Experiment/ Program 1.1 to 1.4	CO1

	Module 1.2: Shell Scripting in Linux	Introduction to Linux Operating System, Basic Command Line Interface (CLI) Operations in Linux, Shell Scripting Basics: Variables, Control Structures, Functions				
2 Process Management	Module 2.1: Process Management	Process Performance Criteria, 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), Processes and Threads, Linux Process Management: ps, top, kill, nice	Lectures, PPTs, Notes and Smart Interactive Panel	8L+ 12P	Experiment/ Program 1.1 to 1.4	CO2
3 Concurrency and Deadlock Management	Module 3.1: Concurrency and Deadlock Management	Concurrency: Race Condition, Critical Section, Inter Process Communication, Classical problem: Producer consumer, Dining Philosopher, Reader writer, Sleeping barber Process Synchronization: Lock variable, Peterson's Solution, Strict alternation, Lamport Bakery Solution, Test and set lock, and semaphore- counting, binary and monitor, Deadlock: Deadlock characterization, Prevention, Deadlock Avoidance: Bankers Algorithms, Deadlock detection, Recovery from Deadlock	Lectures, PPTs, Notes and Smart Interactive Panel	8L+8P	Experiment/ Program 1.1 to 1.4	CO3
4 Memory Management	Module 4.1: 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	Lectures, PPTs, Notes and Smart Interactive Panel	8L+10P	Experiment/ Program 1.1 to 1.4	CO4

		Concepts, Demand Paging, Performance of Demand Paging, Page Replacement Algorithms: FIFO, LRU, Optimal and LFU, Belady's Anomaly, Thrashing				
5	Module 5.1: File Management	File Management: Access Mechanism, File Allocation Method, Free Space Management: -Bit Vector, Linked List, DISK: Disk Architecture, HDD vs SDD, Disk Scheduling	Lectures, PPTs, Notes and Smart Interactive Panel	4L+10P	Experiment/ Program 1.1 to 1.4	CO5
File Management & Modern Operating System	Module 5.2: Modern Operating System	Modern Operating System: -Overview of modern operating system, Shared Memory concepts, Distributed system, Parallel system & its architecture, Virtual machines – hypervisor, Introduction to GPUs Case Study: Large File Storage in a Distributed Manner				

Total

(32L+48P) = 80 Hours

Textbooks

Sr No	Book Details
1	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne" Operating System Concepts Essentials" , Willey Publication,8 th Edition,2017.
2	Marks G. Sobell "A practical guide to Linux: Commands, Editors and Shell Programming", CreateSpace Independent Publishing Platform, 4 th Edition,2017.
3	Jason Cannon "LINUX for beginners", 1stEdition,2014

Reference Books

Sr. No.	Book Details
1	William Stallings "Operating Systems: Internals and Design Principles", Pearson Education , 9 th Edition, 2019.
2	Charles Patrick Crowley, "Operating System: A Design-oriented Approach" , McGraw Hill Education ,2017,
3	<u>Ganesh Naik</u> "Learning Linux Shell Scripting", Packt Publishing ,2 nd Edition 2018.

Links	
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&index=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)
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)
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=cVFyK1f5IDw https://www.youtube.com/watch?v=Z0Vkrn9faoM&list=PLbMVogVj5nJRa3VKt_eyZdJ_DitCz1cvQ&index=4 https://www.youtube.com/watch?v=BtDcroOTSA

Subject Name: Mobile Application Development						L-T-P [3-0-0]
Subject Code: BCSIoT0401					Applicable in Department: IoT	
Pre-requisite of Subject: Overview of programming language: JAVA and XML						
Course Objective: This course introduces students to programming technologies, design and development related to mobile applications using android/ flutter. Course also aims at mobile application development frameworks; mobile architecture, design and engineering issues, techniques, methodologies for mobile application development.						
Course Outcomes (CO)						
Course outcome: After completion of this course students will be able to:						Bloom's Knowledge Level(KL)
CO 1	Study android architecture, development environment, tools, UI components and multimedia framework.					K1
CO2	Construct basic Android applications using Android Studio, including creating AVDs and managing different Android API levels.					K3
CO3	Implement notifications, SMS handling, and interaction with server-side applications using Google Maps, GPS, and Wi-Fi in mobile applications.					K3
CO4	Analyze and utilize Flutter widgets and layouts to design effective user interfaces and handle state management.					K4
CO5	Create mobile applications incorporating gestures, animations, and database connections using SQLite and Cloud Firestore.					K6
Syllabus						
Unit No	Module Name	Topic covered	Pedagogy *Lab Cum Class (LCC)	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1	Introduction to Mobile Application and Android Studio	Mobile applications, History of mobile application, types of mobile applications, Introduction to	LCC Mode Smart Board		Lab Experiments (1.1-1.4)	CO 1

	UI Components	<p>Android, Android ecosystem, Android SDK and Installing and running applications on Android Studio, Creating AVDs, Android API levels (versions & version names), Android Development Tools.</p> <p>Fundamental UI design, layout and view types, Editable and non-editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers, Resources, Activities, Intents, First Interactive UI, Working with Text view Elements, Create and Start Activities</p>		2L+4P	Lab Experiments (1.5-1.8)	
2	<p>Mobile Architecture</p> <p>Database, Testing, Publishing</p>	<p>Mobile Hardware Architecture, SoC architecture; Mobile Software Architecture, Basic Building blocks – Protocols, Activities, Services, Broadcast Receivers & Content providers, Event Handling – Handling clicks or changes of various UI components.</p> <p>Introduction to SQLite database, creating and opening a database, creating tables, inserting and retrieving data, Registering Content Providers, using content Providers (insert, delete, retrieve, and update), Testing and debugging Android Applications, Testing and publishing of Mobile Applications.</p>	<p>LCC Mode</p> <p>Smart Board</p>	2L+4P	<p>Lab Experiments (2.1-2.4)</p> <p>Lab Experiments (2.5-2.8)</p>	CO 2
3	Android User Interface	<p>Measurements – Device and pixel density independent measuring units Notifications – Creating and Displaying notifications, Displaying</p>	<p>LCC Mode</p> <p>Smart Board</p>	2L+4P	Lab Experiments (3.1-3.4)	CO 3

	Interfacing Application	<p>Toasts, Handling SMS, Sending SMS.</p> <p>Interaction with server-side applications – Using Google Maps, GPS, and Wi-Fi, Integration with social media applications, Interfacing sensor data with mobile applications, accessing applications hosted in a cloud computing environment, Bluetooth, Animation</p>			Lab Experiments (3.5-3.8)	
4	<p>Introduction to Flutter and Dart</p> <p>UI Components</p>	<p>Flutter, Features, History, Installation, Architecture of Flutter Applications, Flutter Architecture, Create your first application hello word, introduction to dart, oops, datatype, variables, control flow, functions</p> <p>Stateful vs Stateless Widgets, Container class, Scaffold class, Bottom NavigationBar, ClipRRect Widget, Drawer Widget, ClipRect Widget, Opacity Widget, AppBar Widget Carousel Slider, Staggered Grid View, Circular & Linear Progress Indicators, Alert Dialog, box in Flutter, Dialogs, Icon Class in Flutter, Expanded Class in Flutter, Analog Clock in Flutter, Handling videos, Expansion Tile Card, Tabs, Horizontal List, Working with Charts Convex Bottombar, Slidable.</p>	<p>LCC Mode</p> <p>Smart Board</p>	2L+4P	<p>Lab Experiments (4.1-4.4)</p> <p>Lab Experiments (4.5-4.8)</p>	CO 4

5	Animation	Gesture, types of gestures, Events, Animation, start value, end value, adding gesture, animation in flutter, Start value, end value, State Management.	LCC Mode Smart Board		Lab experiments (5.1-5.4) Lab experiments (5.5-5.8)	CO 5
	Database	Database Connection, SQLite, Cloud Firestore, creating android, iOS application, Application testing		2L+4P		
Total				60 Hours		
Textbooks						
Sr No	Book Details					
1	Android Studio Flamingo Essentials - Java Edition. (2023)					
2	Clean Architecture for Android. BPB Publications. (2022).					
3	Beginning App Development with Flutter. Apress, 2019					
Reference Books						
Sr No	Book Details					
1	Professional Mobile Application Development. (2012), Scott Gowell, Jeff McWherter					
2	Android Application Development. O'Reilly Media, Incorporated. (2009) Android Application Development. O'Reilly Media, Incorporated. (2009), Rick Rogers, John Lombardo, Zigurd Medniecks, Blake Meike					
3	Flutter for Beginners. Packt Publishing Ltd, 2021, Thomas Bailey, Alessandro Biessek, Trevor Wills					
4	Flutter. John Wiley & Sons. (2020), Barry Burd					
Links						
Unit 1	https://archive.nptel.ac.in/courses/106/106/106106156/					
Unit 2	https://onlinecourses.swayam2.ac.in/nou21_ge41/preview					
List of Practical's						

Sr No	Program Title	CO Mapping
1.1	Write Case study on the hardware and software architecture of personal smart phone.	CO1
1.2	Write Case study on Android OS and iOS.	CO1
1.3	Install and configure android studio, android development tools (ADT) plug-in and android virtual device.	CO1
1.4	Develop a basic program to display Hello World on screen.	CO1
1.5	Develop a program of linear layout and absolute layout.	CO1
1.6	Develop a program to implement Text View and Edit Text.	CO1
1.7	Develop a program to implement Auto Complete Text View.	CO1
1.8	Develop a program to implement Custom Toast Alert.	CO1
2.1	Develop a program to show frame, table, and relative layout.	CO 2
2.2	Develop a program to implement button, image button, and toggle button.	CO 2
2.3	Develop an application that uses GUI components, Font and Colours.	CO 2
2.4	Develop a program to implement Radio Button and Radio Group.	CO 2
2.5	Develop a program to implement Progress bar.	CO 2
2.6	Develop a program to implement login window using UI controls.	CO 2
2.7	Design an android application for menu based UI.	CO 2
2.8	Create a login page for student registration.	CO 2
3.1	Develop a program to implement list view, grid, image, and scroll view.	CO 3
3.2	Develop a program to send SMS.	CO 3
3.3	Develop a program to send email.	CO 3
3.4	Develop a program to receive SMS.	CO 3
3.5	Develop a program to receive email.	CO 3
3.6	Develop a program to show animation.	CO 3
3.7	Create a native calculator application.	CO 3

3.8	Create a user registration application that stores the user details in a database table.	CO 3
4.1	Develop a flutter program to display Hello World on screen.	CO 4
4.2	Develop a flutter program to show frame, table, and relative layout.	CO 4
4.3	Develop a flutter program to implement button, image button, and toggle button.	CO 4
4.4	Construct a program to implement and show date, time, and date time picker.	CO 4
4.5	Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.	CO 4
4.6	Develop a program to send SMS.	CO 4
4.7	Develop a program to send email.	CO 4
4.8	Write a program to show Bluetooth interfacing connectivity in android.	CO 4
5.1	Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.	CO 5
5.2	Create a screen that has input boxes for Username, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button.	CO 5
5.3	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.	CO 5
5.4	Develop a Mobile application for college student communication.	CO 5
5.5	Develop a native application that uses GPS location information.	CO 5
5.6	Develop a Mobile application for notification of daily tasks.	CO 5
5.7	Develop a Mobile application for fake callers.	CO 5
5.8	Sending sensor data from IoT-enabled smart devices and publishing on mobile applications.	CO 5

Subject Name: Data Structure and Algorithms -II Lab		L-T-P [0-0-4]
Subject Code: BCSE0451		Applicable in Department: CSE/IT/CS/AI/AIML/IOT/DS/CYS
Pre-requisite of Subject: C, Python		
Lab Experiments		
Course Objective: Learn to implement non-linear data structures.		
Course Outcomes (CO)		
Course Outcome: After completion of this course students will be able to:		Bloom's Knowledge Level(KL)
CO1	Implementation of tree data structures for basic operations like insertion, deletion, searching and traversal	K3
CO2	Implementation of algorithms based on graph data structures for solving real world problems.	K3
CO3	Implementing Dynamic Programming, Backtracking, Branch and Bound algorithms to solve complex data efficiently and effectively.	K3
List of Practical's		
Sr. No.	Program Title	CO Mapping
1	Write a program to implement an in-order traversal of a binary tree and print the nodes.	CO1
2	Write a program to implement a pre-order traversal of a binary tree and print the nodes.	CO1
3	Write a program to implement a post-order traversal of a binary tree and print the nodes.	CO1
4	Write a program to count number of nodes in a binary tree	CO1
5	Write a program to find the height of the tree	CO1

6	Write a program to check if the Binary tree is balanced or not.	CO1
7	Write a Program to search a number in Binary Search Tree (BST)	CO1
8	Write a program to insert a node in a Binary Search Tree (BST).	CO1
9	Write a program to delete a node from a Binary Search Tree (BST).	CO1
10	Write a program to implement a max-heap and perform heap sort on an array of integers.	CO1
11	Write a Program to implement human coding algorithm	CO1
12	Write a program to implement priority queue using max heap.	CO1
13	Write a program to create a graph using an adjacency matrix.	CO2
14	Write a program to create a graph using an adjacency list.	CO2
15	Write a program to perform Depth-First Search (DFS) on a graph.	CO2
16	Write a program to perform Breadth-First Search (BFS) on a graph.	CO2
17	Write a program to check if there is a path between two nodes in a graph using DFS.	CO2
18	Write a program to find all the vertices reachable from a given vertex in a graph using BFS.	CO2
19	Write a program to detect a cycle in an undirected graph using DFS.	CO2
20	Write a program to detect a cycle in a directed graph using DFS.	CO2
21	Write a program to find the degree of each vertex in an undirected graph.	CO2
22	Write a program to count the number of connected components in an undirected graph.	CO2
23	Write a program to implement Dijkstra Algorithm.	CO2
24	Write a program to implement Prims Algorithm.	CO2
25	Write a program to implement Kruskal Algorithm.	CO2
26	Write a program to implement Floyd Warshall's all pair shortest path algorithm.	CO3
27	Write a program to implement Bellman ford Algorithm.	CO3
28	Write a program to implement Longest common subsequence (LCS).	CO3
29	Write a program to implement sum of subset problem using backtracking.	CO3
30	Write a program to implement insertion and search operations in a Trie.	CO3



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

Subject Name: Database Management Systems	L-T-P [0-0-6]
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Subject Code: BCSE0452	Applicable in Department: CSE/IT/CS/AI/AIML/ IOT/DS/CYS
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Pre-requisite of Subject: - It is recommended to have fundamental computer knowledge that includes concepts of computer architecture, storage and hardware. Knowledge of data structures and algorithms and programming will be an added benefit.

Course Objective: - 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 Outcomes (CO)

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

**Bloom's
Knowledge
Level(KL)**

CO 1	Understand and 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 and justify the complex queries in database with different applications.	K5
CO4	Understand and execute the concept of PL/SQL, transaction and concurrency control.	K3
CO5	Evaluate and implement Relational and Non-Relational database on different tools for real-world applications.	K5

Syllabus

Unit No	Module Name	Topic covered	Pedagogy	Lecture Required (L+P)	Practical/ Assignment/ Lab Nos	CO Mapping
1 Introduction of Database & Conceptual	Module 1.1: Introduction about the DBMS	Basic Concept: - Introduction of SDLC, Data, Information, Database, DBMS, History of Database, Database system Vs File system, Data models & Types of Data Models Relational Database term: - Relation, Tuple, Attribute and Domain, Codd Rules	Chalk & Duster/ Lectures, PPTs, Notes and Smart Interactive	8L+8P	Experiment/ Program 1.1 to 1.8	CO1

Designing			Panel			
	Module1.2: Design & Implement the ER Diagram	Data Modelling using the Entity Relationship Model: ER model concepts, Degree of relationship, Notation for ER diagram, mapping constraints reduction of an ER diagrams to tables. Extended Entity Relationship Diagram & reduction of EER				
	Module 1.3: Introduction on SQL, Implement the DDL, DML, DCL & TCL	Introduction on SQL & Types of SQL commands: -DDL, DML, DCL, TCL				
	Module 1.4: Introduction on Relational Algebra	Basic of Relation Algebra & Operations, Query Optimization				
2 Basic of SQL & Normalizati on	Module2.1: Implementati on the Keys	Keys & Types of Keys: - Super key, Candidate Key, Primary Key, Alternative Key Composite Primary key, Foreign Key, unique and Composite Unique key	Chalk & Duster/ Lectures, PPTs, Notes and Smart Interactive Panel	7L+10P	Experiment/ Program 2.1 to 2.11	CO2
	Module 2.2: Implementati on of Data Constraint	Data Constraint: -Null, Not Null, Default and check Constraint				

	Module 2.3: Use of Aggregate Function Implementation of Aggregate function & clause	Uses of String Functions in SQL Uses of mathematical functions in SQL Uses of Advanced Functions in SQL Use of Clause: Where, Group by, Having and Order by				
	Module 2.4: Understand & implement the normalization and different types of functions in SQL.	Functional Dependencies, Normalization & Types of Normalization, Candidate Key, Minimal Cover of FD's				
3 Introduction of Complex Queries	Module3.1: Operator & Predicates	Operator & Predicates: - Like, Between, Aliases, distinct, limit, Implementation of Logical operator: - And, Or, Not	Chalk & Duster/ Lectures, PPTs, Notes and Smart Interactive Panel	7L+10P	Experiment/ Program 3.1 to 3.9	CO3
	Module3.2: Set Theory Operator	Set Theory Operator: - Union, Intersect, Minus.				
	Module3.3: Binary Operator	Binary Operator: - 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				
	Module 3.4: Nested Query	Nested Query or Sub Query: -IN, NOT IN, Exists, Not Exists, All and Any				

	Module 3.5: Understand & Implement on the database connectivity	Database connectivity with Java/Python and other Programming Languages				
4 Introduction of PL/SQL and Transaction & Concurrency control concept	Module 4.1: Introduction on index, Views and Array	Managing Indexes, Synonyms and Sequences, Managing Views, Managing Data in Different Time Zones, Array Function & Operators,	Chalk & Duster/ Lectures, PPTs, Notes and Smart Interactive Panel	6L+8P	Experiment/ Program 4.1 to 4.10	CO4
	Module 4.2: Implementation of PL/SQL	Introduction of PL/SQL Implementation of PL/SQL Function, Procedure, Trigger, Cursor				
	Module 4.3: Implementation of Transition management & concurrency control	Transaction system: - Life cycle of transaction, ACID Properties Schedule & Types of Schedule, Recoverability Concurrency Control Techniques: Concurrency Control, Locking Techniques for concurrency control, 2-phase Locking protocol Transaction & Data Control: -Grant, Revoke, commit & Rollback				
5 Introduction of NoSQL With MongoDB	Module 5.1: Understand NoSQL Concept and implement the CURD operations	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	Chalk & Duster/ Lectures, PPTs, Notes and Smart Interactive Panel	8L+12P	Experiment/ Program 5.1 to 5.10	CO5

	Module 5.2: Implement the MongoDB Cursor, relation and Aggregation in MongoDB.	Introduction and Features of MongoDB, MongoDB Operators, MongoDB Collection & Document, CRUD operations, MongoDB Shell & their commands,				
	Module 5.3: Understand the concept of cloud database.	Introduction of Cloud Database. MongoDB Cloud product : Stitch, Atlas & Cloud Manager.				
Total				(36L+48P) = 80 Hours		

Textbooks	
Sr. No.	Book Details
1	Abraham Silberschatz, Henry F. Korth, and S. Sudarshan, "Database Concepts", McGraw Hill ,7th Edition, 2020.
2	Elmasri, Navathe, "Fundamentals of Database Systems", Addison Wesley ,7th Edition, 2016.
3	Ivan Bayross, "SQL, PL/SQL – The Programming Language of Oracle", BPB Publication 5 th Edition ,2023.
4	Dan Sullivan, "NoSQL for Mere Mortals", Addison-Wesley Professional ,1st edition. 2015.
Reference Books	
Sr. No.	Book Details
1	Thomas Cannolly and Carolyn Begg, "Database Systems: A Practical Approach to Design, Implementation and Management", Pearson Education,3rd Edition, 2007.
2	Raghu Ramakrishan and Johannes Gehrke "Database Management Systems", McGraw-Hill, 3rdEdition, 2014.

3	NoSQL and SQL Data Modeling: Bringing Together Data, Semantics, and Software, Ted Hills, 1 st Edition, 2016.
4	Brad Dayley “NoSQL with MongoDB in 24 Hours”, Sams Publisher, 1st Edition, 2014.
Links	
Unit 1	DBMS L1 Inauguration & Introduction (youtube.com) DBMS L2 Introduction to Relational Model (youtube.com) DBMS L3 Introduction to SQL (youtube.com) DBMS L8C Entity Relationship Model (youtube.com) DBMS L8D Entity Relationship Model (Problem Solving and Discussion) (youtube.com)
Unit 2	DBMS L4A Joins, Set Operations and Aggregate Functions (youtube.com) DBMS L9A Relational Database Design - YouTube DBMS L9B Relational Database Design (youtube.com) DBMS L9C Relational Database Design (youtube.com) DBMS L9D Discussion on Normalization (youtube.com) DBMS L14A Query Optimization (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) DBMS L17A Recovery System - YouTube
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

List of Practicals		
Lab No.	Program Logic Building	CO Mapping
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.	CO1
3	Design an ER diagram for a travel agency that includes entities such as travellers, bookings, destinations, and itineraries. also implement the relationship and cardinalities between the entities with their relevant attribute.	CO1
4	Converting Company & Travel Agency ER Model to Relational Model (Represent entities and relationships in tabular form, represent attributes as columns, identifying keys).	CO1
5	Each students create at least one ER & EER diagram from real world problem and convert in tabular form with all needed constraint.	CO1
6	Implement DDL and DML commands	CO1
7	Implement DCL & TCL commands	CO1
8	<ul style="list-style-type: none"> i. Create Database, Rename Database, Delete Database in relational database tool. ii. Create table employee with attributes Emp_no<datatype><size> E_name<datatype><size> JOB <datatype><size> Address <datatype><size> Salary<datatype><Size> iii. Insert data into the table iv. Implementation of select command v. Implementation of update command vi. Implementation of alter command vii. Implementation of delete command viii. Implementation of rename command. ix. Implementation of rollback command x. Implementation of commit Command xi. Implementation of Truncate Command xii. Implementation of Drop Command 	CO1
9	Implementation of I/O Constraint: Primary Key, composite primary key, Foreign Key with on delete set null and on delete set null constraint	CO2
10	Implementation of constraint: Unique Key and Composite unique key and uses Unique key as foreign key.	CO2
11	Implementation of Business Constraint: Null, Not Null, Default, Check.	CO2

12	Implement and apply the different form of normalization approach on company /Travel Agency Database .	CO3
13	Reduction & Implementation in SQL for ER Diagram of Company Database: - i. Create table for EMPLOYEE, DEPARTMET, PROJECT, DEPENDENTS and WORK_ON with all needed keys and other constraints. ii. Populated all table with atleast Ten records in each table as per as applied constraints.	CO2
14	Practicing Queries using Like, Between, Aliases, distinct Operator & Predicate.	CO2
15	Implementation of Aggregate Functions.	CO2
16	Implementation of Scalar, Mathematical and Advanced functions.	CO2
17	Implementation of Queries using Where, Group by, Having and Order by Clause.	CO2
18	Implementation and uses of clause and operators on Company/ Travel Agency or other database. i. Find the name of employee whose name start with A. ii. Find the name of employee where 'hi' in any position. iii. Find the name of employee whose 'r' have in second position. iv. Find the details of employee whose salary is less than 70000. v. Find the name of employee whose name start with V and end with I. vi. Find the average salary of each department vii. Find the max salary of each department viii. Find the sum of salary of department that have more than three employees in ascending order. ix. Find the empid of Employee who work in more than 3 project. x. Find the empid who have more than one dependent. xi. K. Implement the concept of rollback and commit on Employee Table	CO2
19	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 Salary. v. List the employees who are either 'CLERK' or 'ANALYST' . vi. List the employees who joined on 1-MAY-81, 3-DEC-81, 17-DEC-81,19-JAN-80 . vii. List the employees who are working for the Deptno 10 or 20. viii. List the E-names those are starting with 'S' . ix. Display the name as well as the first five characters of name(s) starting with 'H' x. List all the emps except 'PRESIDENT' & 'MGR" in asc order of Salaries. xi. Display total salary spent for each job category. xii. Display lowest paid employee details under each manager. xiii. Display number of employees working in each department and their department name.	

	<ul style="list-style-type: none"> xiv. Display the details of employees sorting the salary in increasing order. xv. Show the record of employee earning salary greater than 16000 in each department. xvi. Add constraints to check, while entering the empno value (i.e) empno > 100. xvii. Define the field DEPTNO as unique. xviii. Create a primary key constraint for the column (EMPNO). 	
20	Implementation of Queries using set theory operators UNION, INTERSECT, MINUS.	CO3
21	Implementation of Queries using Inner Join:- Natural Join , Equi Join & Non Equi Join	CO3
22	Implementation of Queries using Outer Join :- Left Outer Join, Right Outer Join and Full Outer Join	CO3
23	Implementation of Queries nested Queries or Sub Queries: - IN, NOT IN, Exists, Not Exists, All and Any.	CO3
24	<p>Apply the set theory operators, join's and nested queries on company database (Case Study-1) Write the SQL Queries for the following statement</p> <ul style="list-style-type: none"> 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 any project. (f') 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. xiii. Retrieve the names of all employees whose supervisor's supervisor has '888665555' for Ssn. xiv. For each department that has more than 5 employees retrieve the dno and no. of its employees who are making more than 6,00,000 xv. Find the sum of salaries of all employees of 'ACCOUNTS' department as well as the MAX(SAL), MIN(SAL),AVG(SAL) in this department xvi. Show the resulting salary for employee working on IOT project is given a 10% raise 	CO3

25	<p>Requirement: A college consists of number of employees working in different departments. In this context, create two tables' employee and department. Employee consists of columns empno, empname, basic, hra, da, deductions, gross, net, date-of-birth. The calculation of hra, da are as per the rules of the college. Initially only empno, empname, basic have valid values. Other values are to be computed and updated later. Department containsdeptno, deptname, and description columns. Deptno is the primary key in department table and referential integrity constraint exists between employee and department tables. Perform the following operations on the database:</p> <ol style="list-style-type: none"> Create tables department and employee with required constraints. Initially only the few columns (essential) are to be added. Add the remaining columns separately by using appropriate SQL command 3. Basic column should not be null. The default value for date-of-birth is 1 Jan, 1990. When the employees called daily-wagers are to be added the constraint that salary should be greater than or equal to 5000 should be dropped. Display the information of the employees and departments with description of the fields. Display the average salary of all the departments. Display the average salary department wise. 9. Display the maximum salary of each department and also all departments put together. Commit the changes whenever required and rollback if necessary. Find the employees whose salary is between 5000 and 10000 but not exactly 7500. Find the employees whose name contains 'en'. 12.Create alias for columns and use them in queries. 13. List the employees according to ascending order of salary. 14. List the employees according to ascending order of salary in each department. Find the employees who are born on Feb 29. Find the departments where the salary of at-least one employee is more than 20000. Find the departments where the salary of all the employees is less than 20000. Add the column dept_location in department table. 	CO3
	Understand & implement the Database Connectivity with Java/Python etc. programming language	CO3
26	<p>Implementation and apply all the set theory operators, join and nested queries concept on Case study –1.</p> <ol style="list-style-type: none"> 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. 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. To retrieve the SSN of all employee who work as a supervisor not a manager. To retrieve the SSN of all employee who work as a supervisor and also manage the department. We want to retrieve a list of names of each female employee's dependents 	CO3

	<ul style="list-style-type: none"> vi. 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. vii. Retrieve the names of employees who have no dependents. viii. List the names of all employees with two or more dependents. ix. List the names of managers who have at least one dependent. x. Retrieve the names of all employees who do not have supervisors. xi. Retrieve the name of each employee who has a dependent with the same first name and is the same sex as the employee. 	
27	Create Desktop/Web application using the database connectivity.	CO3
28	Implementation of Array Function	CO4
29	Implementation of Array Operators	CO4
30	Implementation of Indexing, Views and sequence	CO4
31	<ul style="list-style-type: none"> i. Write a PL/SQL Program to Add Two Numbers ii. Write PL/SQL Program for Fibonacci Series iii. Write PL/SQL Program to Find Greatest of Three Numbers 	CO4
32	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.	CO4
33	Write a PL/SQL code block that will accept an account number from the user, check if the user's balance is less than the minimum balance, only then deduct Rs.100/- from the balance.	CO4
34	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:	CO4
35	Implementation of commit and rollback statement with amount transfer example.	CO4
36	Implementation array, indexing, transaction concept on Case study 1. <ul style="list-style-type: none"> i. Implementation of Array Functions & Operators ii. Implementation of Sequence <ul style="list-style-type: none"> -Creating Sequences -Modifying a Sequence Definition -Removing Sequences iii. Implementation of Views <ul style="list-style-type: none"> -Creating Simple and Complex Views -Modifying Views -Removing Views iv. Implementation of Indexes <ul style="list-style-type: none"> -Manual and Automatic Indexes 	CO4

	<ul style="list-style-type: none"> -Creating Indexes - Removing Indexes 	
37	<p>i. Write a PL/SQL block to calculate the incentive of an employee whose ID is 110.</p> <p>ii. Grant and revoke DCL command used on Employee table</p> <ul style="list-style-type: none"> -GRANT SELECT ON Employee TO emp_name; -Granting multiple privileges on Employee table -Granting all privileges on Employee table; -Granting privilege to a role in Employee table -Granting the WITH GRANT OPTION on Employee table. -Revoke all the permission applied on Employee table. <p>iii. Create the CUSTOMERS table having the following attributes:</p> <ul style="list-style-type: none"> - (ID, NAME, AGE, ADDRESS, SALARY) - Insert ten records in customer table. -In Customer table delete those records which have age = 25 and then COMMIT the changes in the database. -In Customer table delete those records which have age = 30 and then Rollback the changes in the database. - Create three savepoint for customer table in that the three deletions have taken place. - Apply the savepoint 2 with rollback on customer table and display the table record. - Apply the SET Transaction command. 	CO5
38	Study of Open Source NOSQL Database and installation of MongoDB	CO5
39	Create, drop, rename the database in MongoDB	CO5
40	Implementation the MongoDB Operators.	CO5
41	Implementation the CRUD Operation in MongoDB	CO5
42	Implementation of the MongoDB Shell commands	CO5
43	Implementation of MongoDB Cursor and their methods	CO5
44	Implementation of relation in MongoDB	CO5
45	Implementation of Aggregate in MongoDB	CO5
46	Deployment the data on different tools like HBASE, Riak and Cassandra	CO5
47	<p>Implementation of all CRUD operation, Cursor and aggregate etc. on real world problem.</p> <p>Connect to MongoDB (by using mongo shell)</p> <p>i. Create database with name (ems) - use ems;</p> <p>ii. Create collection with following fields: {"name", age", gender", "exp, subjects, "type"" qualification"},</p> <p>iii. Insert the Ten documents into "faculty" collection (Use insertMany())</p> <p>Write the following queries:</p> <ol style="list-style-type: none"> Get the details of all the faculty. Get the count of all faculty members. Get all the faculty members whose qualification is "Ph.D". Get all the faculty members whose experience is between 8 to 12 years. 	CO5

	<ul style="list-style-type: none"> v. Get all the faculty members who teach “MATHS” or “NETWORKING”. vi. Get all the faculty members who teach “MATHS” and whose age is more than 30 years and qualification must be “Ph.D”. vii. Get all the faculty members who are working part-time or who teach “JAVA”. viii. Add the following new faculty members: <pre>{ "name": "Ankita ", "age": 34, "gender": "F", "exp": 25, subjects: ["MATHS", "DE"], "type": "Full Time", "qualification": "Ph.D" }</pre> ix. Update the data of all faculty members by incrementing their age and exp by one year. x. Update the faculty “Sivani” with the following data: update qualification to “Ph.D” and type to “Full Time”. xi. Update all faculty members who are teaching “DBMS” such that they should now also teach “Java Programming”. xii. Delete all faculty members whose age is more than 55 years. xiii. Get only the name and qualification of all faculty members. xiv. Get the name, qualification and exp of all faculty members and display the same in ascending order of exp. xv. Sort the faculty details by their age (descending order) and get the details of the first five faculty members only. 	
48	<p>Implementation of case Study on different domain</p> <ol style="list-style-type: none"> 1. E-commerce Platform 2. Inventory Management 3. Railway System 4. Hospital Data Management 5. Voice-based Transport Enquiry System 6. SMS-based Remote Server Monitor system 7. Banking System 8. AI based 	CO1, CO2, CO3, CO4, CO5

Subject Name: Technical Communication Lab
L-T-P [0-0-2]
Subject Code: BASL0451
Applicable in Department: CSE/CSE (R)/IT/DS/IoT/AI/AIML/CS/BT/ECE/CYS/ME
Prerequisite of Subject: B2 (CEFR level) in the Core Skills test; B1/B2 in the Speaking and Writing tests

Lab Experiments

Course Objective: To develop communication and critical thinking skills necessary for succeeding in the diverse and ever-changing workplace of the twenty first century and help the students communicate effectively, creatively, accurately, and appropriately.

Course Outcomes (CO)

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

**Bloom's
Knowledge
Level(KL)**

CO 1

Comprehend the principles and functions of technical communication.

K2

CO2

Write for a specific audience and purpose to fulfil the provided brief.

K5

CO3

Identify and produce different kinds of technical documents.

K2, K3

CO4

Apply effective speaking skills to efficiently carry out official discourses.

K3

CO5

Demonstrate understanding of communication through digital media.

K5

List of Practical's

**Lab
No.**
Topic
Program Logic Building
CO Mapping

1	Case Study Analysis	The students will be able to develop their critical thinking and analytical skills.	CO1
2	Email Role Reversal: Writing and responding to emails in peer groups	The students will practice writing and responding to professional emails.	CO2
3	Infographics – Data Analysis and Interpretation Task	The students will develop their ability to decipher important information from charts, graphs, tables, and diagrams.	CO3
4	Document Redesign Challenge: Redesigning existing technical documents to improve readability	The students will develop their ability to write and edit professional documents.	CO3
5	Abstract Formulation and Referencing	The students will be able to write research papers with proper source citations.	CO3
6	Case Study presentations	The students will improve their analytical skills and by presenting improve their speaking skills.	CO4
7	Presentation on Project Report	The students will develop professional speaking skills.	CO4
8	Ted talk simulation – summarising a Ted Talk	The students improve their ability to condense speeches.	CO4
9 & 10	Mock Interviews	The students will practice and enhance their interview skills.	CO4
11 & 12	Webinar Presentations/Online Interviews	The students will improve their ability to make presentations in professional scenarios and perform well in online interviews.	CO5

Subject Name: Artificial Intelligence and Cyber Ethics						L-T-P [2-0-0]
Subject Code: BNC0301				Applicable in Department: All Branches		
Prerequisite of Subject: Basic understanding of computer systems and ethics.						
Course Objective: 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 (CO)						
Course Outcome: After completion of this course students will be able to:						Bloom’s Knowledge Level (KL)
CO 1	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
Syllabus						
Unit No	Module	Topics Covered	Pedagogy	Lecture Required (T=L+P)	Aligned Practical/Assi gnment/Lab	CO Mapping
1	An overview to AI Ethics	Definition of AI. Ethical principles in AI. Sources of AI data. Legal implications of AI security breaches, Privacy and AI regulations. Key Principles of	Lecture and Case studies	5 L	Assignment	CO1

		responsible AI, transparency and accountability, Dual-use dilemma, Human-centric design. Introduction to Cyber Laws and Ethics, Historical development of cyber laws, Legal frameworks.				
2	Fairness and Favoritism in Machine Learning	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.	Lecture and Case studies	6 L	Assignment	CO2
3	AI Ethics and Cybersecurity Principles	Importance of privacy and security in AI, AI specific security tools and software, privacy-preserving machine learning (PPML) and privacy-preserving data mining (PPDM) Ethical considerations in phases of AI development life cycle, Risk management: Risk assessment and incident response Regulatory compliance: GDPR, HIPAA Case studies: Implementation of AI ethics guidelines and best practices in engineering projects, Ethical decision-making processes and tools for engineers working with AI technologies	Lecture and Case studies	8 L	Assignment	CO3

4	Cybercrimes, IPR and Legal Measures	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	Lecture and Case studies	5 L	Assignment	CO4
5	AI Contribution to Social Evolution	Positive and negative political impacts of AI, Role of AI in social media and communication platforms, AI-generated content and deepfakes, Applications of AI in addressing global challenges, Key technical stakeholders in AI deployment: developers, researchers, policymakers, Technical Impacts on Employment and Workforce: Automation technologies: robotic process automation (RPA), autonomous systems	Lecture and Case studies	6 L	Assignment	CO5
Total				30 Hours		
Text Books						
Sr No	Book Details					

1	Introduction to Information Security and Cyber Laws, Simplified Chinese Edition by Surya Prakash Tripathi, Ritendra Goel, 1 January ,2014.
2	AI ETHICS: Paving the Path for Responsible Machine Learning, Shivanand Kumar, 2014.

Reference Books

Sr No	Book Details
1	AI ETHICS (The MIT Press Essential Knowledge series), by Mark Coeckelbergh, 2018
2	Computers, Internet and New Technology Laws by Karnika Seth – by Karnika

Links

Unit 1	https://www.youtube.com/watch?v=VqFqWlqOB1g
Unit 2	https://www.youtube.com/watch?v=hVJqHggF59A
Unit 3	https://www.youtube.com/watch?v=O5RX_T4Tg24
Unit 4	https://www.youtube.com/watch?v=RJZ0pxcZsSQ
Unit 5	https://www.youtube.com/watch?v=I9FOswjTSGg