Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CA117	**Title of the Course**	Data Structure with C	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	0	2	4
Pre-Requisite	CA110	**Co-Requisite**	None				
Course Objectives	• To provide foundational knowledge of data structures and arrays for effective data organization and manipulation. • To introduce the creation, implementation, and applications of linked lists in various computational scenarios. • To understand the concepts and differences between static and dynamic implementations of stacks and queues. • To familiarize students with the fundamental terminology and structure of tree data types. • To equip students with the basic principles and techniques of sorting and searching algorithms for efficient data processing.						

Course Outcomes	
CO1	Understand how basic data structures are represented in memory and apply basic concepts of arrays in problem-solving.
CO2	Explain and implement various types of linked lists and their operations effectively.
CO3	Apply the concepts of stacks and queues using both arrays and linked lists in real-time applications.
CO4	Analyze and apply fundamental knowledge of tree and graph data structures for hierarchical and networked data representation.
CO5	Implement and compare different searching and sorting algorithms to solve computational problems efficiently.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction**	Introduction to Data Structure and Algorithm, Characteristics of Algorithms, Efficient use of memory, Elementary Data Organization, Structure operations, Time and space complexity of algorithms and asymptotic notations. Array Definition and Representation, Single and Multidimensional Arrays, Address calculation, Operations on arrays, Application of arrays, String in C, String operation, Array as Parameters.	8	CO1
2	**Linked list**	Introduction to a linked list, Dynamic memory allocation, Representation and Implementation of Singly Linked List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and Deletion Algorithms, doubly linked list, Circular Linked List.	8	CO2
3	**Stacks & Queues**	Introduction to Stack, Implementation of stacks using Array and Linked List, Operations on Stacks: Push, Pop & Peak, Application of stack: Postfix and Prefix conversions, Evaluation of expressions using stack, Recursion. Introduction to Queue, Array and Linked representation and implementation of queues, Types of Queues, Operations on Queue: Create, Add, Delete, Full and Empty.	8	CO3
4	**Trees & Graph Theory**	Basic terminology, Binary Trees, Binary tree representation and Traversal, Algebraic Expressions, Complete Binary Tree, Threaded Binary trees, Binary Search Tree (BST), Height balanced tree and various Rotations. Huffman's Tree, Heaps, Application of Tree, Graph Theory: Terminology & Representations, Traversal- BFS and DFS, Dijkstra's algorithm for shortest path, Prim's and Kruskal's Algorithm for Minimal Spanning tree	8	CO4

5	**Searching & Sorting**	Searching: Introduction to Searching, Linear Search, Binary Search, Comparison and analysis. Sorting: Introduction to Sorting, Insertion Sort, Selection Sort, Bubble Sort, Quick Sort, Two Way Merge Sort and Heap Sort. Hashing and Collision.	8	CO5

PRACTICAL

S. No.	Title of Experiments	List of Experiments	Contact Hrs.	Mapped CO
1	**Array**	• Write a program to find the Maximum and Minimum value in an array. • Write C- program to count even and odd numbers in 1-D and 2-D array. • Write a program to concatenate two strings with and without using library function.	2	CO1
2	**Linked List**	• Write a C program that uses functions to perform the following operations on a singly linked list: Creation, Insertion, Deletion and Traversing. • Write a C program that uses functions to perform the following operations on a doubly linked list: Creation, Insertion, Deletion and Traversing.	2	CO2
3	**Stack and Queue**	• Write a program to show the Array implementation of Stack and perform Push and Pop operations. • Write a program to perform the Evaluation of a Postfix expression. • Write a program to perform the Array implementation, Operations on Array: Insertion and Deletion in Simple, Circular and Priority Queue	2	CO3
4	**Tree and Graph**	• Write a program to perform the Implementation of Binary Tree and also perform Insertion, Deletion and Traversal operations. • Write a program to perform Inorder, Preorder, and Post order Traversals. • Write a C program to represent a graph using an adjacency matrix and perform Breadth-First Search (BFS) traversal.	2	CO4
5	**Searching and sorting**	• Write a program to perform the Searching of element in array using Linear Search. • Write a program to perform the Searching of element in array using Binary Search. • Write a program to perform the Sorting of elements in array using Bubble Sort.	2	CO5

Reference Books:

- ✓ Reema Thareja "Data Structures Using c" Oxford University Press, New Delhi.
- ✓ M. Tenenbaum, “Data Structures using C & C++”, Prentice-Hall of India Pvt. Ltd., New Delhi.

e-Learning Source:

- ✓ https://archive.nptel.ac.in/courses/106/103/106103069/
- ✓ https://nptel.ac.in/courses/106105085

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO- PSO ⟹ / CO ⇩	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2			1	2		2					2	1				
CO2	2	2	2		1	1		1					2	1				
CO3	1	2	3	2		2	1	2					3	1				
CO4	1	3	2	1		2		1					2	1				
CO5	1	2	3	3		1	2	2					2	1				

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CA118	**Title of the Course**	Principles of Operating System	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	0	2	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To understand various operating system types, Architecture design of OS and their services. • To study process management concepts and various scheduling algorithm. • To understand process synchronization concepts and deadlock handling mechanism. • To learn various memory management schemes. • To study various disk scheduling algorithms and Process Management in UNIX						

Course Outcomes	
CO1	Know different OS types and basic component of OS Architecture.
CO2	Analyze issues in process management and evaluations of various scheduling algorithms.
CO3	Understand process synchronization problem and provide solution for critical section problem and deadlock management.
CO4	Analyze and implement various memory management techniques.
CO5	Understand various disk scheduling algorithms and Process Management in Unix.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction**	Definition and types of Operating systems: Batch Systems, Multiprogramming, Time Sharing, Parallel, Distributed and Real-Time Systems. Operating System Structure, Operating System Components and Services, System Calls, System Programs, Virtual Machines, Booting, Address Spaces.	8	CO1
2	**Process Management**	Process Concept: Definition, Process States, State Transitions, Process Control Block, Threads, Multithreading, Benefits of Threads, Types of Threads. Process Scheduling: Definition, Scheduling Objectives, Preemptive and Non-preemptive scheduling, Scheduling Algorithms (FCFS, SJF, Priority and RR), Multilevel Scheduling, Performance evaluation of scheduling algorithms.	8	CO2
3	**Process Synchronization And Deadlocks**	Process Synchronization: Introduction, Inter-process Communication, Race Condition, The Critical-Section Problem, Semaphores, Monitors, Classical Problems of Synchronization. Deadlocks: Characterization, Deadlock Prevention, Avoidance and Detection, Safe State, Banker's Algorithm, Recovery from Deadlock.	8	CO3
4	**Memory Management**	Logical and Physical Address Space, Swapping, Contiguous Allocation, Partitioning, Paging, Segmentation, Virtual Memory, Demand Paging and its performance, Page Replacement Algorithms, Thrashing.	8	CO4
5	**Disk Scheduling and Process Management in UNIX**	File Concept, Access methods, Directory Structure, Disk scheduling, Disk Scheduling Algorithms. UNIX Overview, Utilities, Shell and Kernel, Processes in UNIX, Background and Foreground Processes, creating a new process, Parent and Child Process, Zombie Process, Orphan Process, Connecting Processes with Pipes, Process Related Commands, Changing Process Priority.	8	CO5

PRACTICAL

S. No.	Title of Experiments	List of Experiments	Contact Hrs.	Mapped CO
1	**Unix Commands**	• Miscellaneous Command, File Management Command, Communication Command, Storage Command, System Status Command.	2	CO1

2	**Shell Programming**	• Shell Script to accept two numbers and perform all arithmetic operations on it. Menu Based Shell Script. • Shell Script to calculate the Gross Salary Shell Script through case statement. • Shell Script to find the largest among numbers using positional parameters.	2	CO2
3	**System Programming**	• Use the fork() to create the Process. • Use the fork() to create the Child Process.	2	CO3
4	**Loops**	• Shell Script to illustrate While, Until and For Loop. • Write a shell script to find the factorial of a given number. • Write a shell script to check whether the given number is prime or not. • Write a shell script to print the Fibonacci series.	2	CO4
5	**Strings**	• Shell Script to perform String operations.	2	CO5

Reference Books:

- ✓ Abraham Siberschatz and Peter Galvin "Operating System Concepts", Wiley.
- ✓ Milan Milankovic, "Operating Systems, Concept and Design", McGraw Hill.
- ✓ Harvey M Deital, "Operating System", Addison Wesley.
- ✓ Tannenbaum, "Operating System", TMH.

e-Learning Source:

- ✓ https://nptel.ac.in/courses/106106144
- ✓ https://nptel.ac.in/courses/106105214
- ✓ https://www3.cs.stonybrook.edu/~amione/CSE114_Course/materials/resources/unix_lab.html
- ✓ https://unixlabnyuad.github.io/

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO- PSO ⟹ / CO ⇩	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1			1	1		2					3	1				
CO2	1	3	1	2	1			1					2	3				
CO3	2	1	2	3	1	1		2					3	1				
CO4	1	3	2	2		2	1	1					2	3				
CO5	2	1	1		1	2		1					2	2				

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CA119	**Title of the Course**	Fundamentals of Machine Learning with Python	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	0	2	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• Primarily know the basic structure of python programming language. • Learn the concept of Conditional and Looping Statements, Data Structures, Functions, etc. • Understand the concept of Object oriented programming language. • Perform the operations on File handling and Exceptional handling. • Learn the basic concept of Machine learning and also, python libraries used for implementation of Machine learning.						

Course Outcomes	
CO1	Understand the basic concept of Machine learning and can write programs on the python libraries.
CO2	Student will able to write basic programming structure of Python using elements of Python.
CO3	Ability to write and implement programs on Control, Looping Statements and can use data structure of Python.
CO4	Ability to write programs with the help of functions and also used modules and file handling.
CO5	Ability to implement the OOPs concept and also configure the Exceptional handling implementation.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction to Machine Learning**	**Introduction to Machine Learning:** Machine Learning, Types of Machine Learning, Applications of Machine Learning; **Preparing to Model:** Introduction, Machine Learning Activities, Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Pre-Processing; **Regression:** Linear Regression and Logistic Regression; **Reinforcement Learning:** Introduction to Reinforcement Learning, Learning Task, Example of Reinforcement Learning.	10	CO1
2	**Introduction to Python**	**Introduction to Python:** Introduction, IDE, Installation Process, Python Indentation, Garbage Collection, Memory Management, PVM, Comments, Precedence and Association, Structure of Python Program; **Elements of Python:** Variables (Identifiers), Datatypes, Operators, Keywords. Python Input and Output functions. eval function.	6	CO2
3	**Control, Looping Statements and Data Structure**	**Conditional Statements:** if, if-else, if-elif-else, nested if expression; **Looping Statements:** range(), for loop, while loop, Nested loop statement**; Loop Control Statements:** break, continue, and pass. Match Case Statement; **Data Structure:** String: Types, Indexing, Slicing, Methods, Formatting, Traversing, List: Indexing, Slicing, Methods, Traversing, Comprehension. Tuple Traversing & Methods, Set Traversing & Methods and Dictionary Comprehension, Traversing and Methods.	8	CO3
4	**Function, Modules and File Handling**	**Function:** Definition, Calling, Local and Global Scope, Types of arguments, Packing and Unpacking Sequence, Recursion. Higher Order Functions, Short Circuit Concept, Lambda Expression; **Modules:** Built-In Modules: math, calendar, Import and Export Modules, User Defined Modules; **File Handling:** File Types; Operations on Files– Create, Open, Read, Write, Close Files; File Names and Paths; Format Operator	8	CO4
5	**OOPs, Exception Handling and Python Libraries**	**Object Oriented Programming:** Classes and Objects; Creating Classes and Objects; Constructor Method; Inheritance: Types, Encapsulation: Types, Polymorphism: Types, Method resolution order (MRO). Decorator, Destructor, Iterator. **Exception Handling:** Exception handling, Types of exceptions. Assertion, Special Methods. **Python Libraries:** Numerical Calculation: Numpy**;** File Operation: Pandas; Data Visualization: Matplotlib;	8	CO5

PRACTICAL				
S. No.	**Title of Experiments**	**List of Experiments**	**Contact Hrs.**	**Mapped CO**
1	**Basic Machine Learning**	• Write a program to create the matrix with the help of numpy and then convert into dataframe using pandas. • Write a python program to import and export data using Pandas library functions. • Write a program to demonstrate various Data Visualization Techniques.	4	CO1
2	**Basic Python - I**	• Write a program to display the welcome message on the screen with the help of user input. • Write a program to calculate the area of circle based on the radius entered by the user. • Write a program, using user-defined function to find the area of rectangle, square, circle and triangle by accepting suitable input parameters from user.	4	CO2
	Basic Python - II	• Write a program to convert the given temperature from Fahrenheit to Celsius and vice versa depending upon user's choice. • Write a program to print those numbers who are perfect square and perfect cube between a given range.		
3	**Control Statements**	• Write a program to input the age by user, check and print, if the user is eligible for voting or not. • Write a program to enter the year by user and check whether the given year is leap year or not using nested if statement.	4	CO3
	Looping Statements	• Write a program to count the number of even and odd numbers from N numbers. • Write a program to determine if a given number is Armstrong or not.		
	Data Structure	• Write a program that accepts a string and convert the upper case letters into lower case and lower case letters into upper case. • Write a program to print the maximum element in a list. • Write a program to find the sum of all items in a dictionary.		
4	**Function**	• Write a function to calculate the factorial of a given number. • Write a function to generate a list of prime numbers up to a given number using the Sieve of Eratosthenes algorithm.	4	CO4
	Modules	• Write a program to build a user defined module named Calculator and add all operations associated with the Calculator, and use the Calculator modules as library and perform the operations.		
	File Handling	• Write a program to implement the use of tell() and seek() method. • Write a program to count the alphabets, numbers and spaces of the string in a given file.		
5	**OOPs**	• Write a program to create the class, object and accessing class variables and class methods using constructor. • Write a program to implement inheritance in Python. • Write a program to perform the operator overloading in Python.	4	CO5
	Exception Handling	• Write a program to perform the ZeroDivisionError using try….except statement. • Write a program to calculate the sum of numbers in the list using try except statement such that if the list is empty, it will be handled by except statement.		

Reference Books:

✓ Martin C. Brown, "Python: The Complete Reference", McGraw Hill Education(India) Private Limited, Fifth Edition, 2019

✓ Manaranjan Pradhan, U Dinesh Kumar, "Machine Learning using Python", Wiley India Pvt Ltd., 2019

✓ R. Nageswara Rao, "Machine Learning in Data Science Using Python", Dreamtech Press.

e-Learning Source:

✓ https://onlinecourses.swayam2.ac.in/cec22_cs20/preview

✓ https://onlinecourses.nptel.ac.in/noc23_cs18/preview

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																		
PO- PSO ⟹ / CO ⇩	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2	1		2	1	2										
CO2	1	2	3		1	2	1	3										
CO3	1	1	3	2		2	1	3										
CO4	1	1	3	1		2	1	3										
CO5	1	1	2	2		3		2										

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CA120	**Title of the Course**	Data Communication and Computer Networks	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	**3**	**0**	**0**	**3**
Pre-Requisite	None	**Co-Requisite**	None				
Course Objectives	• Build an understanding of the fundamental concepts of Data communication. • Familiarize the student with the basic taxonomy and terminology of signals. • To learn about Modulation and Data Encoding methods. • To study Multiplexing Techniques and different switching techniques. • Get knowledge about the Network and its application. • Study about the different Network Topologies. • Introduce the student to OSI Model, preparing the student for entry Advanced courses in computer networking. • To understand the concepts of TCP/IP protocol suite. • Build an understanding of the various data link layer protocol and its applications. • Understanding of the various inter-networking devices. • To study the IEEE 802 Project.						

Course Outcomes	
CO1	Understand the basic data communication network System. Identify the different types of signals. Able to understand Microwave Transmission System. Distinguish between the concepts and principles behind various data transmission
CO2	Able to understand about the Data Modulation and Data Encoding methods. Able to understand Multiplexing Techniques. Able to understand the Switching techniques.
CO3	Understand the basic idea of network. Able to understand virtual circuit network. Familiar with the layers of the OSI model. Identify the different types of network topologies and protocols.
CO4	Understand about the TCP/IP protocol suite. Able to understand various types of Flow control techniques. Distinguish between the concepts behind various protocols
CO5	Able to identify and correct use of various types of communication channels. Able to demonstrate knowledge and understanding of relevant data communications standards.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Data Communication**	Introduction, Communication Systems, Types of Data: Analog and Digital, Types of Signals: Analog and Digital (Periodic, Non Periodic, Even, Odd signals), Communication Channel and its Characteristics, Transmission Modes, Synchronous and Asynchronous Transmission, Bit Rate and Baud.	8	CO1
2	**Data Modulation and Data Encoding**	Concept of Modulation, Fundamentals of Data Encoding. Introduction to Multiplexing: Frequency Division Multiplexing, Time Division Multiplexing. Switching techniques: Circuit, Message and Packet Switching.	8	CO2
3	**Networking**	An Overview, Network Goals, Application of Networks. Network Structure Services: Network Topologies**:** Bus, Ring, Star Topologies. **OSI Model**: Introduction to ISO-OSI Reference Model and its Layers, Network Architectures. Introduction to LLC and MAC sub layer, Transmission Control Protocol, User Datagram Protocol, HTTP.	8	CO3
4	**ITCP/IP Suite**	Introduction to TCP/IP Protocol, Brief Overview of TELNET, FTP, TFTP, SMTP, SNMP, DNS. Flow control: Sliding Window Protocol, Stop and Wait ARQ, Go Back N, Selective Repeat ARQ, FDDI, HDLC	8	CO4
5	**IEEE Standards & LAN**	IEEE Standard 802 for LAN, IEEE Standard 802.3: CSMA/CD LAN and Ethernet LAN, IEEE Standard 802.4: Token BUS LAN, IEEE Standard 802.5: Token Ring LAN, Repeaters, Bridges, Router, Gateways, Switching and Hubs, LAN Operating System, Transmission Media, Baseband vs Broadband, Implementation using Co-Axial, Twisted Pair, Fibre Optic Cables, Wireless Technology, Introduction to MAN and WAN.	8	CO5

Reference Books:
✓ B. Forouzan, “Data Communication and Networking”, Tata McGraw Hill.
✓ W. Stallings, “Data and Communication”, Prentice Hall of India.
✓ Lin and Chlatmac, “Wireless and Mobile Network Architecture”, John Wiley and Sons.
e-Learning Source:
✓ https://www.tutorialspoint.com/computer_network_basics/index.asp
✓ https://nptel.ac.in/courses/106105183

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO- PSO ⇒ / CO ⇓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	2	2	1	1		1		2					1	1				
CO2	3	1	2			1	1	2					1	2				
CO3	2	2	1	1		2		1					1	1				
CO4	3	2	1			1		2					2	2				
CO5	1	2	1	1	1	2	1						3	2				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CA121	**Title of the Course**	Discrete Mathematical Structure	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	0	0	3
Pre-Requisite	None	**Co-Requisite**	None				
Course Objectives	• To study the concepts of complexity of algorithms and understand the analysis of algorithms based on input size. • To learn advanced data structure and their fundamentals for application development. • To learn use of greedy and dynamic programming techniques and their application in the field of computer science to solve problems. • To learn algorithms for graph theory problem like spanning tree problem, single source shortest path and advance features of graph application in field of computer science. • To learn string matching algorithms and, P, NP problem in computer science domain.						

Course Outcomes	
CO1	Understand the algorithms and notation, including order notation, and how to analyze the complexity of the algorithms.
CO2	Understand the concept of hashing and sorting.
CO3	Compare, contrast, and apply the key algorithmic design paradigms: divide and conquer, greedy method, dynamic programming techniques.
CO4	Understand the concepts of Graph algorithms to solve problem using Greedy method as well as dynamic programming techniques
CO5	To understand the concepts of Randomized, and exact vs. approximate. Implement, empirically compare, and apply fundamental algorithms and string matching, P, NP and NP complete real-world problems.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Algorithm Analysis	Asymptotic Notations, Analyze the Asymptotic Performance of Algorithms, Growth of Functions. Complexity of Algorithms: Space and Time Complexity, Analyze Worst-Case, Average and Best-Case Running Times of Algorithms, Compare the Asymptotic Behaviors of Polynomials, Exponential, and logarithmic functions. Recurrences: Substitution Method, Recursion Tree Method, Master's Theorem.	8	CO1
2	Divide and Conquer	Introduction, Problem Solving using Divide and Conquer Algorithm: Binary Search, Merge Sort. Sorting and Order Statistics: Heap Sort, Quick Sort, Sorting in Linear Time: Counting sort. Hash Table: Hash Function, Need for a Good Hash Function, Collision Resolution Techniques, Chaining Method, Linear Probing, Quadratic Probing, Double Hashing.	8	CO2
3	Greedy Method	Introduction of Greedy Method, Elements of Greedy Strategy, General Characteristics of Greedy Algorithms, Problem Solving using Greedy Algorithm: Activity Selection Problem. Dynamic Programming: Introduction of Dynamic Programming, Principle of Optimality, Problem Solving using Dynamic Programming, 0/1 Knapsack Problem, Matrix Chain Multiplication.	8	CO3
4	Elementary Graph Algorithms	Representations of Graphs, Breadth First Search, Depth First Search, Topological Sort: Introduction to Topological Sorting Algorithm, Spanning tree, Minimum Spanning Trees: Kruskal and Prim's Algorithms, Single Source Shortest Paths: Dijkstra's Algorithm, Bellman-Ford Algorithm.	8	CO4
5	String-Matching	Introduction to String-Matching Problem, Knuth Morris Pratt String Matching Algorithm and its Complexity Analysis. Intractable Problems, Basic Concepts, Non Deterministic Algorithms, NP Completeness, Fundamentals of NP-Hard and NP-Complete Problems.	8	CO5

Reference Books:

- ✓ Coreman, Rivest, Lisserson, "Algorithms", PHI.
- ✓ Horwitz and Sahani, "Fundamental of Computer Algorithm", Galgotia.
- ✓ Brassard Brately, "Fundamental of Algorithms", PHI.

e-Learning Source:
✓ https://nptel.ac.in/courses/106105225
✓ https://www.tutorialspoint.com/analysis_of_algorithm/index.asp

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO- PSO ⟹ / CO ⇩	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	1	2		1		1						1	1				
CO2	3	1				2							3	3				
CO3		2	3	1	1	2	2						2	1				
CO4	3	2	2	1		1	1						3	3				
CO5	2	1	2	1		2	1						2	3				

1-Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CA122	**Title of the Course**	Indian Constitution and Cyber Law	**L**	**T**	**P**	**C**
Year	I	**Semester**	II	3	0	2	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To be able to learn the basic knowledge and importance of Constitution. • To be able to learn the Article 19(1) A, Article 21 and Article 51A. • To be able to learn the fundamental rights and data protection rights from the Constitution. • To be able to learn about the Cybercrime and such cyber laws that defined in the Constitution.						

Course Outcomes	
CO1	Understand the basic framework and values of Constitution such as purpose, importance of law and concepts that are related to the constitution.
CO2	Understand the Fundamental rights, fundamental duties with the help of Articles defined in the Constitution.
CO3	Understand the importance of Cyber law in accordance with the Cybercrime.
CO4	Understand several cybercrimes and articles and laws provided by the Constitution.
CO5	Understand the fundamental responsibilities that support the ethics and article related to data protection.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Indian Constitution – Basic Framework and Values**	**Definition and Purpose of a Constitution:** Why every country needs a Constitution. **Salient Features:** Written Constitution, Parliamentary Democracy, and Federal Structure with a Unitary bias, Independent Judiciary, Secularism, Rule of Law. **Preamble of the Constitution:** Explanation of keywords: Justice, Liberty, Equality, Fraternity, and Preamble as the spirit of the Constitution. **Separation of Powers:** Basic Understanding of Legislature (law-making), Executive (Implementation), Judiciary (Interpretation)	8	CO1
2	**Fundamental Rights, Duties, and Digital Citizenship**	**Fundamental Rights: Article 19(1) (a):** Freedom of Speech and Expression, Its use and misuse on social media and internet platforms, Reasonable restrictions: hate speech, fake news, Sedition. **Article 21:** Right to Privacy (Justice K.S. Puttaswamy v. Union of India, 2017). **Directive Principles of State Policy** (brief overview). **Fundamental Duties under Article 51A:** Promote harmony, develop scientific temper, protect public property, Duties of digital citizens: preventing cyberbullying, ethical use of technology	8	CO2
3	**Cyber Law in India – Legal Foundation and Constitutional Link**	**Origin and Need of Cyber Law in India:** Growing digital use and cyber threats. **Information Technology Act, 2000**: Objective and scope of the Act, Applicability to digital communication, e-commerce, e-governance. **Key Definitions**: Computer, Computer System, Data, Access, Electronic Record, Digital Signature & Electronic Signature. **Legal Basis under Constitution**: **Article 246** and **Seventh Schedule**: Power of Parliament to make laws on cyber matters (Union List). **Authorities under IT Act**: Controller of Certifying Authorities, Adjudicating Officers, Telecom Disputes Settlement and Appellate Tribunal (TDSAT)	8	CO3
4	**Cyber Crimes and Constitutional Protection**	**Types of Cyber Crimes**: **Against Individuals**: Cyberstalking, cyberbullying, identity theft, defamation. **Against Property**: Hacking, data theft, ransomware attacks. **Against Government**: Cyber terrorism, attacks on government portals. **Relevant Sections** from: **Information Technology Act, 2000**: Sections 43, 66, 66A 67, etc. **Cybercrime Investigation Process**: Role of police, cyber cells, judiciary. **Constitutional Remedies**: **Article 32**: Right to move the Supreme Court, **Article 226**: Writs before High Courts, Use of PILs and Legal Aid in cybercrime cases	8	CO4

5	**Cyber Ethics, Data Protection, and Fundamental Responsibilities**	**Cyber Ethics**: Respect for others online, No plagiarism, no misinformation, respect for digital rights, IT Rules 2021. **The Digital Personal Data Protection Act, 2023**: Definitions: Data Principal, Data Fiduciary, Consent, and Personal Data. **Artificial Intelligence and Privacy**: AI ethics, Impact of surveillance, data misuse, tracking apps	8	CO5

Reference Books:

- ✓ M.P. Jain – Indian Constitutional Law (simplified edition)
- ✓ Pavan Duggal – Cyber Law
- ✓ Information Technology Act, 2000 (Bare Act)
- ✓ Justice K.S. Puttaswamy v. Union of India – Supreme Court Privacy Judgment

e-Learning Source:

- ✓ UGC e-Pathshala & NCERT Civics resources

Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO- PSO ⇒ / CO ⇓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1					2													
CO2					3													
CO3		2			1													
CO4		2			2													
CO5		3			3													

1- **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**