Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**EE201**	**Title of the Course**	**Network Analysis**	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**3**	**0**	**2**	**4**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To acknowledge the students about basic laws and theorems. • To analyze the theoretical and practical values of given circuit. • To know about transient state and steady state. • To acknowledge the students about stability, two port network and graph theory						

Course Outcomes	
CO1	For a given network, would be able to apply the knowledge of mathematics, science, and engineering to the analysis and design of electrical circuits, Identify, formulate, and solve engineering problems in the area electrical circuits & systems.
CO2	For a given system with dc and ac circuits, describe the different network theorems, would be able to apply, solve and verify the solutions using modern tools for lifelong learning like MATLAB.
CO3	For given a system with two port networks described in standard form, would be able to characterize, modeling, analyze, and verify the network in terms of all network parameters.
CO4	For given a system with RL, RC, and RLC circuits, would be able to understand, perform, formulate, and solve the differential equations for RL, RC, and RLC circuits and analyze the characteristics of the system.
CO5	For given a system description, would be able to explore and apply to alternate system description, and implement using basic blocks for network transfer function in s-domain and Two port networks.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Concept and AC Network theorems**	**Concepts:** Kirchoff's law, Source transformation, loops analysis, node analysis, super mesh and super node. **AC Network theorems:** Superposition, Thevenin's, Norton's, Maximum power transfer theorem, Millman's and Tellegen's theorem.	8	CO1
2	**Transient and steady state analysis**	**Transient and steady state analysis:** R-L, R-C and RLC circuits, Initial value and final theorem Use of Laplace transform in circuit analysis, Lap lace transform of complex waveform.	8	CO2
3	**Network Synthesis**	Concept of poles and zeros, transfer function, Stability, Hurwitz Polynomial **Positive real function:** Definitions and properties, Synthesis of RC, LC and RL Networks using Cauer and Foster I and II forms	8	CO3
4	**Two port networks**	Two port parameters, Inter-Conversion of two port Parameters, Interconnections of Two port networks, Reciprocity and Symmetry, T-pie transformation.	8	CO4
5	**Introduction to graph theory**	**Definitions:** Branch, Graphs, Tree, Co- tree, Path and Loop, Incidence, Cut-set, Tie-set matrices for planer network. loop and nodal analysis.	8	CO5

PRACTICAL

S. No.	List of Experiments	Contact Hrs.	Mapped CO
1	To verify Superposition theorem for dc network	2	1
2	To verify Thevenin's theorem for dc network	2	1
3	To verify Tellegen's theorem for dc network	2	1
4	To verify Maximum power transfer theorem for dc network	2	1
5	To study transient response of RC series circuit	2	2,4
6	To study frequency response of RLC series circuit	2	2,4
7	To determine the h-parameter of a port resistive network	2	3
8	To determine the z-parameter of a port resistive network	2	3
9	To determine the ABCD-parameter of a port resistive network	2	3
10	To study transient response of RLC series circuit	2	2,4

Reference Books:

1. M.E. Van Valkenburg, Network Analysis, PHI Learning Private Limited, 3rd Edition, 2014.
2. J.A. Edminister, Electric Circuits, Schaum Series, PHI Learning Private Limited, 7th Edition, 2018.
3. W.H. Hayt and Jack. E. Kammerly, Engineering Circuit Analysis, Tata Mc Graw Hill, 8th Edition, 2013.
4. A. Hussain, Network and Systems, Khanna publications, 2nd Edition, 2019.

e-Learning Resources:

1. https://nptel.ac.in/courses/117106116

2.	https://archive.nptel.ac.in/courses/108/106/108106150/
3.	https://aplicaciones.uc3m.es/cpa/generaFicha?est=217&plan=442&asig=13841&idioma=2
4.	https://archive.nptel.ac.in/courses/108/106/108106075/

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

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

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**EE203**	**Title of the Course**	**Analog and Digital Electronics**	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**3**	**0**	**2**	**4**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To understand the concepts of various types of amplifier circuits. • To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems. • To understand the concepts of combinational logic circuits. • To learn the analysis of various sequential circuits.						

Course Outcomes	
CO1	Student will be able to illustrate working principle of different Analog electronics circuits and their application
CO2	Understand the fundamental concepts and techniques used in operational amplifier and its applications
CO3	Students will be able to use the concepts of Boolean Algebra for the analysis & design of various combinational & sequential logic circuits.
CO4	For a given Combinational circuit, student shall be able to understand its various building blocks and examine, analyze and evaluate various gates and circuits
CO5	Given concept of sequential logic would be able to select suitable design of various flip flops, shift registers, counters and PLDs

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction**	Concept of basic circuits like amplifier, oscillator, linear power supply, power amplifiers, Basic electronics circuits as base for power electronics circuits like rectifier, inverter, power supply.	8	1
2	**Operational Amplifiers**	Differential amplifier, internal structure of an operational amplifier, Inverting and non-inverting amplifier, integrator, active filters, Current source, Wein bridge and phase shift oscillators	8	2
3	**Logic Families**	Introduction to different logic families, DTL, TTL, MOS. TTL inverter – circuit description and operation, CMOS inverter – circuit description and operation, design of gates using TTL and CMOS circuits, Electrical characteristics of logic gates	8	1
4	**Combinational logic circuits**	Simplification of logic functions using K-map, Adders, Subtractors, BCD arithmetic, carry look ahead adder, Multiplexer, De-Multiplexer, Encoders, Decoders, comparators, Parity generators/checkers	8	3,4
5	**Sequential circuits and systems**	Latches, SR, J- K, T and D types flip-flops, shift registers, asynchronous counters, synchronous counters, ring counter, Johnson counter, sequence generator, Multivibrators, PLDs	8	5

PRACTICAL

S.No.	List of Experiments	Contact Hrs.	Mapped CO
1	Study of Clipping and Clamping circuits	2	1
2	Study of single stage RC coupled transistor amplifier.	2	1
3	Application of operational amplifier as Inverting, Non-Inverting and unity gain amplifier	2	2
4	Study of V-I characteristics of N-MOS and P-MOS .	2	3
5	Realization of OR, NOR, XOR, XNOR gates using NAND gates and verify its truth table.	2	3,4
6	Design and study of Half Adder and Full adder	2	4
7	Design and study of 1-bit Magnitude Comparator	2	4

8	Design and test (a)J-K Flip Flop using NAND gates (b) D and T Flip Flop using IC 7476 and IC 7404	2	5
9	Design MOD-16 counter using Master -slave FF (IC 7476) and logic gates. Verify it's with truth table.	2	5
10	Design of Serial in Parallel Out [SIPO] Shift Registers using IC7476	2	5

Reference Books:

1.A. Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 4th edition, 2016.

2.Ramakant A Gayakwad, Op- Amps and Linear Integrated Circuits, Prentice Hall of India, 4th edition, 2012.

3.P.R. Gray, R.G. Meyer and S. Lewis, "Analysis and Design of Analog Integrated Circuits", John Wiley & Sons, 5th edition, 2001.

4. Jacob Millman and Herbett Taub, "Pulse, Digital & Switching wave forms" Mc- Graw- Hill Education India, 4[3rd] edition, 2017.

5.Mano M Morris, "Digital Design" Person Education India, 6th edition, 2018.

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc21_ee75/preview

https://archive.nptel.ac.in/courses/108/105/108105158/

https://youtu.be/X7M3rUxUpOc

https://onlinecourses.nptel.ac.in/noc22_ee55/preview

https://youtu.be/oNh6V91zdPY

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

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

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

Integral University, Lucknow

Effective from Session:2025-26 (NEP)							
Course Code	CS204	**Title of the Course**	Data Structure Using C	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	0	2	4
Pre-Requisite	-	**Co-requisite**	-				
Course Objectives	• To comprehend the basics of Data Structure, their Managements and Operations such as array, string manipulations and various operations over different kinds of linked lists. • To learn stack & queue data structure and various applications based on the phenomenon of recursion, polish notations and polish conversions, priority Queue & its Programming implementation. • Understanding the tree data structure and its various types & applications to develop the efficient solutions and fine tune the complexity of solutions through its Programming implementation. • To study the various sorting and searching techniques and various algorithmic approaches, know hashing and collision resolving techniques & its Programming implementation. • To Understand and implement the hierarchical data structure such as Graph and its various traversal algorithms, concept of file organization and record handling						

Course Outcomes	
CO1	Recall and understand the basics of data structures, their programming implementations, and foundational concepts for developing better solutions using Array and Linked list.
CO2	Apply, analyze, and evaluate stack and queue data structures, understand the phenomenon of recursion, and implement various applications based on these principles.
CO3	Develop and assess solutions using tree data structures, applying recursive approaches to enhance the efficacy of the solution to the complex problems.
CO4	Apply, analyze, and evaluate different searching and sorting algorithms, assessing their performance to ensure optimized data handling.
CO5	Understand, create, and, implement solutions for graph based data structures & file organization techniques to develop efficient solutions using non-linear data structure approaches.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction to Data Structures**	**Basic Terminology:** Elementary Data Organization, Data Structure Operations. Algorithms, Analysis of Algorithms, Complexity of Algorithms, Time-Space Tradeoff. **Arrays:** Array Definition, Representation and Analysis, Single and Multi-Dimensional Arrays, Address Calculation, Application of Arrays, Character String Representation, Character String Operation, Sparse Matrices & Vectors. **Linked List:** Representation and Implementation of Singly Linked List, Traversing, Searching of Linked List, Insertion & Deletion to/from Linked List, Underflow & Overflow. Circular Linked List, Doubly Linked List, Two- way Header List, Polynomial Representation & Addition, Generalized Linked List, Garbage Collection and Compaction	9	1
2	**Stacks & Ques**	**Stack**: Array Representation and Implementation of Stack, Operations on Stacks: Push & Pop, Linked Representation of Stack, Application of Stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix Expression using Stack. Recursion: Recursive Definition and Processes, Recursion in C, Example of Recursion, Tower of Hanoi Problem. **Queues:** Array and Linked Representation and Implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty; Circular Queues, D-queues and Priority Queues**.**	9	2
3	**Trees**	Basic Terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary Trees, Traversing Binary Trees, Threaded Binary Trees, Traversing Threaded Binary Trees, Huffman Algorithm, Binary Search Tree (BST), Insertion and Deletion in BST, Path Length, AVL Trees, B-trees.	8	3
4	**Searching, Sorting and Hashing**	Sequential Search, Binary Search, Comparison and Analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation. **Sorting:** Insertion Sort, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort.	7	4
5	**Graphs**	**Graph:** Terminology & Representations, Graphs & Multi-Graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees. **File Handling:** Physical Storage Media File Organization, Organization of Records into Blocks, Sequential Files, Indexing and Hashing, Primary Indices, Secondary Indices	7	5

PRACTICAL			
S.No.	**List of Experiments**	**Contact Hrs.**	**Mapped CO**
1	To implement Array: Insertion, deletion and Pattern matching of a substring in an Arrays & searching an element in an Array using Iterative Binary Search	2	1
2	To implement Linked Lists: Creation, insertion deletion and searching in a singly linked list as well as in a doubly linked list.	2	1
3	To Implement Stack (using Array approach as well as Linked approach): Push & Pop operations, converting infix	2	2
	expression to its postfix form, and, Tower of Hanoi using Recursion.		
4	To Implement QUEUES (using Array approach as well as Linked approach): Insertion & Deletion in a Linear Queue, DQueue and Circular Queue.	2	2
5	To Implement Tree: Creation, Insertion, Deletion of nodes in a tree and Tree Traversal algorithms using Recursive and Non-Recursive approach.	2	3
6	To implement an AVL Tree.	2	3
7	To Implement Searching: Linear Search, Binary Search, and Hashing.	2	4
8	To Implement Sorting: Insertion Sort, Quick Sort, Merge Sort, Bubble Sort and Heap Sort.	2	4
9	To Implement Graph: Creation of Graph, Searching in Graph.	2	5
10	To Implement various Graph traversal algorithms.	2	5

Reference Books:

1. M. Tannenbaum. "Data Structure Using C/C+"
2. Horowitz And Sahani "Fundamental of Data Structure", Galgotia Publication
3. A Lipschutz "Data Structure", Schaum series.
4. Reema Thareja, "Data Structure Using C", Oxford University Press

e-Learning Source:

https://archive.nptel.ac.in/courses/106/102/106102064/

https://archive.nptel.ac.in/courses/106/105/106105085/

https://onlinecourses.swayam2.ac.in/cec24_cs17/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	PSO1	PSO2	PSO3
CO1	3	3	2	1	2	1						1	2	1
CO2	3	3	2	2	2	1						3	3	1
CO3	3	3	3	2	2	1						3	3	2
CO4	3	3	3	2	3	2						3	3	2
CO5	3	3	3	3	3	2						3	3	2

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

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CS270	**Title of the Course**	Object Oriented Concepts using JAVA	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	0	2	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• Introduce programming paradigms and establish a strong foundation in Java programming concepts. • Familiarize students with the Java environment, including program development, compilation, and execution. • Teach Object-Oriented Programming (OOP) principles such as classes, objects, inheritance, and polymorphism. • Develop skills in exception handling, multithreading, and file handling to build robust applications. • Enable students to work with arrays, strings, and Java I/O operations for efficient data manipulation.						

Course Outcomes	
CO1	Demonstrate an understanding of programming paradigms and fundamental Java programming concepts.
CO2	Implement Object-Oriented Programming feature of class design, object creation, constructors, access modifiers and Arrays.
CO3	Apply inheritance and polymorphism to create modular and reusable JAVA program
CO4	Perform file handling and input/output operations using Java's standard I/O streams and file handling classes.
CO5	Utilize exception handling techniques for efficient program execution & Develop multithreaded programs by implementing thread creation, synchronization, and inter-thread communication

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction**	Overview of Programming languages & Types, Object oriented programming paradigms – Features of Object-Oriented Programming, Introduction to Java: Features, JVM, and Bytecode, Java Program Structure, Compilation, and Execution. Lexical Tokens, Identifiers, Keywords, and Literals	8	1
2	**Encapsulation**	**Classes and Objects**: Creation, Object Life time & Garbage Collection, Access Control, Modifiers and Methods, Constructor & initialization blocks, Recursion and Static Members, Use of "this" reference. **Arrays:** Defining an Array, Initializing & Accessing Array, Multi –Dimensional Array	8	2
3	**Inheritance and Polymorphism**	**Inheritance**: Concept and Benefits, Types of Inheritance in Java, Inheriting Data Members and Methods, Role of Constructors in inheritance. **Polymorphism:** Method Overloading and Method Overriding (Overriding Super Class Methods), Use of "super".	8	3
4	**Abstraction**	Nested, Inner, Anonymous and Abstract classes, Interfaces, Abstract classes vs Interfaces, Package: Defining Package, Organizing Classes and Interfaces in Packages **I/O Classes**: Introduction to Java I/O (java.io Package), Streams, Buffers, and File Handling, Reading and Writing Files Using File I/O Operations **String Class:** Mutable & Immutable String, Creating Strings using StringBuffer class.	8	4
5	**Exception Handling & Multithreading**	**Exception Handling:** Exceptions & Errors, Types of Exception, Use of try, catch, finally, throw, throws, Checked and Un-Checked Exceptions. **Threads**: Needs of Multi-Threaded Programming, Thread Life-Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads.	8	5

PRACTICAL

S. No.	List of Experiments	Contact Hrs.	Mapped CO
1	Create a class named 'Student' with String variable 'name' and integer variable 'roll_no'. Assign the value of roll_no as '2' and that of name as "John" by creating an object of the class Student.	2	1
2	Print the average of three numbers entered by user by creating a class named 'Average' which has a method to calculate and print the average.	2	1
3	Twin Prime are the prime numbers whose difference is 2 such as (3, 5), (5, 7), (11, 13). Write a program to display all twin prime numbers from 1 to n. Where n is the last range that is to be inputted by the user. Methods to be created are: • prime () – method which will check whether the number is prime or not. • show () – which will print the twin prime numbers and will call the prime() method. • main() – which will call the show() method	2	2
4	Write a program to print the area and perimeter of a triangle by creating a class named 'Triangle' with a Parameterized constructor having the three sides as its parameters	2	2
5	Write a program to display the Fibonacci series from 1 to n using a recursive function. Where n is the last range that is to be inputted by the user.	2	2
6	Write a Java program to calculate the average value of array elements where array elements are {20,30,25,25,-16,60,-100}	2	2

7	Write a program to print the volume of a Cube, Cuboid, and Sphere by using the concept of Method Overloading. Create a class named 'Volume'.	2	3
8	Write a program to perform a single inheritance on two classes and also incorporating the concept of method overriding.	2	3
9	Write a Java program to perform employee payroll processing using packages. Create a package Employee. In the package create 2 files: **1. Emp.java**: Declare the variables name, empid, category, bpay, hra, da, npay, pf, grosspay, incometax, and allowance. Calculate the values in methods. **2. Emppay.java.**: Create an object e to call the methods to perform and print values. The salary is calculated according to the following rules: Salary = Basic pay+HRA+DA HRA = 30% of basic pay DA = 40% of basic pay	2	4
10	Write a Java program that implements a Library Management System with the following features: • Object-Oriented Programming (OOP): Create a Book class with attributes title and author, Implement a Library class that manages a collection of books. • File Handling: Implement methods in the Library class to save and load books using serialization. • Exception Handling: Handle exceptions in file operations using try-catch blocks. • Multithreading: Implement a background task using multithreading that runs parallel to user operations. • User Interaction: Provide a menu-driven interface where users can: o Add a book (by entering title and author). o View the list of books. o Save the book list to a file. o Load the book list from a file. o Exit the program.	2	5

Reference Books:

1. T.Budd"An Introduction to OOP" Pearson Education
2. Naughton, Schildt, "The Complete Reference JAVA2", TMH
3. Balagurusamy E, "Programming in JAVA", TMH
4. "Head First Java" by Kathe Sierra.

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc19_cs48/preview

https://nptel.ac.in/courses/106105191

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

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

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

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CS206	**Title of the Course**	Discrete Structure	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	0	0	3
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	Explain the basic components of computers, their interconnection and data representation techniques in computer systems. To assess the working of CPU and become familiar with computer arithmetic's. Understand the control unit design using a hardwired and micro programmed approach. To study the memory organization and articulate design issues in each element of memory hierarchy						

Course Outcomes	
CO1	Recall and understand set operations (union, intersection, complement, difference) using proper notation; interpret Venn diagrams and determine mappings as functions or relations.
CO2	Apply and analyze ordered sets, Hasse diagrams, and Boolean algebra properties, including logic gates and Karnaugh maps for effective simplification
CO3	Understand and evaluate logical propositions, first-order logic, truth tables, and logical equivalencies to develop valid logical arguments.
CO4	Apply and analyze recurrence relations, generating functions, and properties of graphs like bipartite and Euler graphs, determining chromatic numbers.
CO5	Identify and solve Recurrence Relations, Generating Functions, Bipartite, Regular, Connected Components in a Graph, Euler Graphs, Hamiltonian Path and Circuits, Chromatic Number

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1.	**Set Theory**	Definition of Sets, Countable and Uncountable Sets, Venn Diagrams, Proofs of Some General Identities on Sets Relation: Definition, Types of Relation, Composition of Relations, Pictorial Representation of Relation, Equivalence Relation, Partial Ordering Relation. Function: Definition, Type of Functions, One to One, Into and Onto Function, Inverse Function, of Functions, Recursively Defined Functions. Theorem Proving Techniques: Mathematical Induction Simple and Strong), Pigeonhole Principle, Prove by Contradiction.	9	1
2.	**Algebraic Structures**	Definition, Properties, Types: Semi Groups, Monoid, Groups, Abelian Group, Properties of Groups, Subgroup, Cyclic Groups, Cosets, Factor Group, Permutation Groups, Normal Subgroup, Homomorphism and Isomorphism of Groups, Example and Standard Results, Rings and Fields: Definition and Standard Results.	8	2
3.	**Posets, Hasse Diagram and Lattices**	Introduction, Ordered Set, Hasse Diagram of Partially, Ordered Set, Isomorphic Ordered Set, Well Ordered Set, Properties of Lattices, Bounded I and Complemented Lattices. Boolean Algebra: Basic Definitions, Sum of Products and Product of Sums, Form in Boolean Algebra, Logic Gates and Karnaugh Maps. Tree: Definition, Rooted Tree, Properties of Trees, Binary Search Tree, Tree Traversal.	9	3
4.	**Propositional Logic**	Proposition, First Order Logic, Basic Logical Operation, Truth Tables, Tautologies, Contradictions, Algebra of Proposition, Logical Implications, Logical Equivalence, Predicates, Universal And Existential Quantifiers.	7	4
5.	**Combinatorics & Graphs**	Recurrence Relation, Generating Function, Simple Graph, Multi Graph, Graph Terminology, Representation of Graphs, Bipartite, Regular, Planar and Connected Graphs, Connected Components in a Graph, Euler Graphs, Hamiltonian Path and Circuits, Graph Coloring, Chromatic Number, Isomorphism and Homomorphism of Graphs.	8	5

Reference Books:

1. Deo, Narsingh, "Graph Theory With application to Engineering and Computer.Science.", PHI.
2. Liptschutz, Seymour, "Discrete Mathematics", McGraw Hill.
3. Trembley, J.P & R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", McGraw Hill.
4. Kenneth H. Rosen, "Discrete Mathematics and its applications", McGraw Hill.
5. Krishnamurthy, V., "Combinatorics Theory & Application", East-West Press Pvt. Ltd., New Delhi.

e-Learning Source:

https://archive.nptel.ac.in/courses/106/105/106105192/

https://onlinecourses.nptel.ac.in/noc22_cs49/preview

https://archive.nptel.ac.in/courses/106/106/106106094/

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

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

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

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CS203	**Title of the Course**	Cyber Law and Information Security	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	2	0	0	3
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• Knowledge about cyber law, intellectual property and cybercrimes (internet security threats), trademarks and domain theft. • Knowledge on the disciplines of technology, E-business and law to allow them to minimize the occurrence and severity of information security incidents. • Knowledge about Information System and principles of Information Security (as confidentiality, integrity, and availability). • Knowledge of cryptography and techniques used to detect and prevent network intrusions.						

Course Outcomes	
CO1	Understand key terms and concepts in cyber law, intellectual property and cybercrimes (internet security threats), trademarks and domain theft.
CO2	Apply and analyze knowledge of technology, E-business, and law to minimize the occurrence and impact of information security incidents.
CO3	Understand and evaluate the principles of Information Security, including confidentiality, integrity, and availability, in relation to information systems.
CO4	Understand and apply cryptographic techniques and methods to detect and prevent network intrusions, ensuring secure data transmission.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Fundamentals of Cyber Law**	Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, CopyRight, Trademark law, Law related to semiconductor layout & design.	8	CO1
2	**E - Commerce**	Security Threats to E - Commerce, Virtual Organization, Business Transactions on Web, EGovernance and EDI, Concepts in Electronics payment systems, E-Cash, Credit/Debit Cards, E- Agreement, Legal recognition of electronic and digital records, E- Commerce Issues of privacy, Wireless Computing- Security challenges in Mobile devices. Digital Signatures - Technical issues, legal issues, Electronic Records, Digital Contracts, and Requirements of Digital Signature System.	7	CO2
3	**Investigation and Ethics**	Cyber Crime, Cyber jurisdiction, Cyber crime and evidence act, Treatment of different countries of cyber crime, Ethical issues in data and software privacy, Plagiarism, Pornography, Tampering computer documents, Data privacy and protection, Domain Name System, Software piracy, Issues in ethical hacking. Internet security threats: Hacking, Cracking, Sneaking, Viruses, Trojan horse, Malicious Code & logic bombs. Introduction to biometric security and its challenges, Finger prints, Cyber crime forensic: CASE STUDY in Cyber Crime.	9	CO3
4	**Information security**	Information Systems and its Importance, Role of Security in Internet and Web Services, Principles of Information Security, Classification of Threats and attacks, Security Challenges, Security Implication for organizations, Security services - Authentication, Confidentiality, Integrity, Availability and other terms in Information Security, Information Classification and their Roles. Introduction to Cryptography, Issues in Documents Security, Keys: Public Key, Private Key, Firewalls, Basic Concepts of Network Security, Perimeters of Network protection & Network attack, Need of Intrusion Monitoring and Detection.	9	CO4

Reference Books:

Harish Chander "Cyber Law and IT Protection" , PHI Publication, New Delhi

Merkov, Breithaupt," Information Security", Pearson Education

"Cyber Law in India" - Farooq Ahmad-Pioneer books.

K. K. Singh, Akansha Singh "Information Security and Cyber law", Umesh Publication, Delhi

e-Learning Source:

https://nptel.ac.in/courses/106106248

https://onlinecourses.swayam2.ac.in/cec24_cs14/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**	**PSO1**	**PSO2**	**PSO3**
CO1	1	2	1	2	1	3	1	1		1	1	2		2
CO2	3	1	2		2			2	2		2		2	
CO3	2	2		1	1	1	3	2	1	1	1	2	1	3
CO4	1		2		2			1					3	1

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

Integral University, Lucknow

Effective from Session:2025-26							
Course Code	**EE204**	**Title of the Course**	**Measurement & Instrumentation**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**III**	3	0	2	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To provide knowledge of the measurement system, measurement methods and errors, measurement of electrical quantities To provide knowledge of the three phase power measurement; working of thermocouple, electrostatic and rectifier type instruments; energy meter and instrument transformer To provide knowledge of the measurement of low, medium and high resistances, use of ac bridges and Q meter To provide knowledge of the use of ac potentiometer; measurement of speed, frequency and power factor To provide knowledge of the digital measurement of electrical quantities; CRO and its application						

Course Outcomes	
CO1	Given the related knowledge, would be able to adopt the methods of measurement, investigate the errors in measurement, analyze and rectify; perform and analyze analog measurement of electrical quantities; contribute in related development
CO2	Given the related knowledge, would be able to perform and analyze three phase power measurement; use thermocouple, electrostatic, rectifier type instruments, energy meter and instrument transformer for measurement; identify, analyze and rectify errors in energy meter and adopt remedies; adopt extension of instrument range using instrument transformer; contribute in related development
CO3	Given the related knowledge, would be able to perform and analyze measurement of low, medium and high resistances; perform and analyze measurement of inductance and capacitance using ac brides; adopt use of Q meter, contribute in related development
CO4	Given the related knowledge, would be able to to adopt use of ac potentiometer; perform and analyze measurement of speed, frequency and power factor; contribute in related development
CO5	Given the related knowledge, would be able to perform and analyze digital measurement of electrical quantities; adopt application of CRO, dual trace and dual beam oscilloscopes; contribute in related development

THEORY

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Philosophy of measurement**:	Philosophy of measurement: Methods of measurement, measurement system, classification of instrument system, characteristics of instrument and measurement system, error in Measurement and its analysis. Analog measurement of electrical quantities: PMMC type Instruments Moving Iron type Instruments, Electrodynamics type Instruments' three phase wattmeter, error and remedies in wattmeter.	8	CO1
2	**Power measurement**	Power measurements in three phase system, Thermocouple, electrostatic and rectified type ammeter and voltmeter, Energy meter, error and remedies in energy meter. Instrument Transformer and their application in the extension of instruments range.	8	CO2
3	**Measurement of parameter**	Measurement of parameter: Different methods of measurement of low, medium and high resistances, measurement of inductance and capacitance with the help of AC bridges, Q-meter.	8	CO3
4	**AC Potentiometer**	AC Potentiometer: Polar type and co-ordinate type AC potentiometer, application of AC Potentiometers in electrical measurement. Measurement of speed, frequency and power factor.	8	CO4
5	**Digital measurement**	Digital measurement of electrical quantities: concept of digital measurement, block diagram, study of digital voltmeter, frequency meter, Cathode ray oscilloscope: Basic CRO circuit (block diagram), cathode ray tube (CRT), and its components, application of CRO in measurement, Lissajous pattern, Dual trace and dual beam oscilloscopes.	8	CO5

PRACTICAL

Exp. No.	**Title of the Experiment**	**Content of Experiment**	**Contact Hrs.**	**Mapped CO**
1	Kelvin's Double Bridge	Measurement of Low Resistance by Kelvin's Double Bridge	2	1
2	Maxwell's Bridge	Measurement of Self- Inductance by Maxwell's Bridge	2	2

3	Hay's Bridge	Measurement of Self-Inductance by Hay's Bridge	2	2
4	Schering's Bridge	Measurement of Capacitance by Schering's Bridge	2	2
5	De Sauty's Bridge	Measurement of Capacitance by De Sauty's Bridge	2	2
6	Wein's bridge	Measurement of Frequency by Wein's Bridge	2	2
7	Voltmeter	Calibration of Voltmeter	2	3
8	Ammeter	Calibration of Ammeter	2	4

Reference Books:

1. E.W. Golding & F.C. Widdis, " Electrical measurement & Measuring" , A.W. Wheeler & Co. Pvt. L.td. India.
2. A.K. Sawhney, "Electrical & Electronics Measurement & Instrument", Dhanpat Rai & Son, India.
3. M.B. Stout, "Basic Electrical Measurement" Prentice Hall of India, India.
4. Forest K. Harries, "Electrical Measurement", Willey Eastern Pvt. Ltd. India.

e-Learning Source: https://nptel.ac.in/courses/108105153

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

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

Integral University, Lucknow

Effective from Session: 2025-2026							
Course Code	BM226	**Title of the Course**	Human Values & Professional Ethics	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**3**	**0**	**0**	**0**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To help students understand the importance of human values and ethics in professional and personal life. • To develop a sense of social and environmental responsibility. • To enhance decision-making capabilities based on moral values and professional ethics. • To create awareness about the ethical responsibilities of engineers towards society. • To equip students with tools to handle ethical dilemmas in the workplace effectively.						

Course Outcomes	
CO1	Develop an understanding of human values, morals, and ethics for professional and personal growth.
CO2	Analyze and apply ethical reasoning in decision-making for professional and social well-being.
CO3	Demonstrate awareness of environmental, social, and sustainability responsibilities in engineering practices.
CO4	Identify ethical dilemmas and implement professional ethics in engineering projects.
CO5	Develop skills for effective communication, teamwork, and leadership while adhering to ethical values.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to Human Values	Definition, Types of Values, Morals, Ethics, and Character, Need for Ethics in Engineering. Value Education, Self-Exploration. Natural Acceptance and Experiential Validation, Continuous Happiness and Prosperity, Right understanding, Understanding Happiness and Prosperity correctly.	6	CO1
2	Introduction to Ethical Concept	Definition of industrial ethics and values, Ethical rules of industrial worker. Values and Value Judgments. Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property and the Law. Ethics as Law.	6	CO2
3	Corporate Social Responsibility & Sustainability	The basis and scope of Professional Responsibility, Professions and Norms of Professional Conduct, Ethical Standards versus Profession, Culpable mistakes, the Autonomy of professions and codes of ethics. Employee status and Professionalism. Central Professional Role of Engineers in Society, Ethical Theories, Decision Making Frameworks, Conflicts of Interest Environmental and Social Responsibilities, Sustainability, Safety, and Risk Assessment	6	CO3
4	Ethical Dilemmas and Case Studies	Senses of 'Engineering Ethics', variety of moral issues, types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Valuing Time, Case Studies on Professional Ethics, Corporate Misconduct, Whistleblowing	6	CO4
5	Communication and A Glimpse of Life Stories on Leadership with Ethics	Effective Communication, Teamwork, Leadership, and Ethical Conduct. Environmental ethics, computer ethics, weapons development, engineers as managers consulting engineers, engineers as expert witnesses and advisors, moral leadership. Life story of Prophet Mohammad, Mahatma Gandhi, Swami Vivekanand, Marie Curie and Steve Jobs.	6	CO5

Reference Books:

- R. R. Gaur, R. Sangal, G. P. Bagaria, "A Foundation Course in Human Values and Professional Ethics," Excel Books, 2010.
- Govindarajan M., Natarajan S., Senthil Kumar V. S., "Engineering Ethics (Includes Human Values)," PHI Learning, 2013.
- Charles D. Fleddermann, "Engineering Ethics," Pearson Education, 4th Edition, 2012.
- Mike W. Martin, Roland Schinzinger, "Ethics in Engineering," McGraw Hill, 4th Edition, 2013.
- R.S. Naagarazan, "Professional Ethics and Human Values," New Age International, 2006.

e-Learning Source:

https://www.youtube.com/watch?v=XiN8iqJGb48&list=PLFW6lRTa1g83uYgRiZEy_F4pzedPNWpew

https://www.youtube.com/watch?v=vS31O3XfH_0&list=PLyVhmjhvTvDYR2K4FgFYuK2gfUibZG8YA

https://www.youtube.com/watch?v=8gpzLafYPcA

https://www.youtube.com/watch?v=xXyatU-l07w

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

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

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**EE211**	**Title of the Course**	**CONTROL SYSTEM**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**3**	**0**	**2**	**4**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To learn the concept of transfer function and mathematical modeling of systems. • To evaluate the transient and steady-state responses of first and second-order systems and analyze system performance using time-domain criteria and performance indices. • To determine system stability using Routh-Hurwitz criteria and asymptotic stability conditions and analyze frequency response characteristics and establish time-frequency domain correlations. • To construct and interpret root locus plots and Nyquist plots for stability analysis and evaluate system stability using gain margin, phase margin, and frequency response parameters. • To design compensators and develop control systems using root locus and Bode plot techniques. Introduce state-space representation.						

Course Outcomes	
CO1	Understand the fundamentals of control systems and their mathematical modeling
CO2	Analyze System Response in the Time Domain
CO3	Determine System Stability and Frequency Response
CO4	Perform Root Locus and Nyquist Analysis
CO5	Design and Implement Control Strategies

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Fundamentals of control system**	Introduction to control system, Open and closed loop control system, Mathematical modeling of physical systems, Transfer function of electrical and mechanical system, Analogous systems, Block Diagram Reduction Algebra and signal flow graph, Mason's gain formula.	8	CO1
2	**Time Domain Analysis**	Time domain criteria; Test Signals; Transient and steady state response of first and second order feedback systems; Performance indices; Response analysis with proportional, Proportional- Derivative (PD) controller, Proportional-Integral (PI) controller and Proportional- Integral –Derivative (PID) controller.	8	CO2
3	**Stability Analysis**	Asymptotic and conditional stability, Routh Hurwitz criterion, Frequency response analysis, Correlation between time and frequency domain specifications, Resonant peak, Resonant frequency, Bandwidth, Cutoff frequency, Polar plots, Bode plots.	8	CO3
4	**Root Locus & Stability**	The root locus concepts, Construction of root loci, Nyquist stability criterion, Relative stability, Gain margin, Phase margin, Constant M and N circles.	8	CO4
5	**Design of control system and Introduction to State space**	Design through compensation Techniques; Realization of Lag, Lead, And Lag-Lead compensation; Design of closed loop control system using root locus and bode plot compensation. Introduction to State variable analysis, State space representation, State equations, State transfer matrices, Controllability and observability.	8	CO5

PRACTICAL

S.No	**List of Experiments**	**Contact Hrs.**	**Mapped CO**
1.	To study the performance characteristics of a DC motor speed control system. 1) Open loop 2) Close loop	2	1
2.	To study the steady state behavior of type 0 system.	2	2
3.	To study the phase lag network.	2	4
4.	To study the performance of various types of controllers used to control the temperature of an oven. • ON /OFF control • Proportional control	2	4
5.	To study the Transient response of a series RLC circuit.	2	2
6.	To study and plot speed vs voltage characteristic of the dc servo motor	2	1
7.	To plot root-locus and Nyquist plot using MATLAB/ SIMULINK.	2	3
8.	To design controller using root-locus in MATLAB/ SIMULINK.	2	5

Reference Books:
1 .B. C. Kuo, “Automatic Control system”, Wiley, 9th Edition, 2014.
2. I. J. Nagrath & M. Gopal, “Control system Engineering”, New Age International, 4th Edition, 2015.
3. K. Ogata, “Modern Control Engg.”, PHI, 4th Edition, 2002.
4. S. K. Bhattacharya, “Control system Engg.”, Pearson Education, 2nd Edition, 2008.
5. S. Hasan Saeed, “Automatic control system”, Kataria and sons, New Delhi, 8th Edition, 2016
e-Learning Source:
https://archive.nptel.ac.in/courses/107/106/107106081/

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

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

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**EE214**	**Title of the Course**	**Signal and Systems**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	3	0	0	3
Pre-Requisite	**None**	**Co-requisite**	**None**				
Course Objectives	• Demonstrate an understanding of the fundamental properties of linear systems • Uses of transform analysis and convolution, to analyze and predict the behavior of linear time invariant systems						

Course Outcomes	
CO1	Understand mathematical description and representation of continuous and discrete time signals and systems.
CO2	Develop input output relationship for linear time invariant system and understand the convolution operator for continuous and discrete time system.
CO3	Understand and resolve the signal in frequency domain using Fourier series and Fourier transforms.
CO4	Understand the limitations of Fourier transform and need for Laplace transform and develop the ability to analyze the system in s- domain
CO5	Analyze the discrete time signals and system using DTFT, DFT and Z transform

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Formalizig Signals**	Continuous-time/discrete-time, Periodic/non-periodic, even/odd, energy/power, deterministic/ random, Unit step, Unit ramp, Unit impulse, Sinusoid, complex exponential signals. **Signal Properties:** Periodicity, absolute integrability, determinism and stochastic character. **System properties:** Linearity, additivity and homogeneity, Scaling, shift invariance, causality. **Continuous and discrete time linear shift invariance system:** The impulse response and step response, convolution, input-output behavior.	8	CO1
2	**Fourier Transform Analysis**	Fourier series representation, Exponential and compact trigonometric form of Fourier series, Fourier symmetry, Fourier Transform, convolution/ multiplication and their effect in frequency domain, magnitude and phase response, Fourier domain duality, inverse Fourier transform, Application to circuit analysis, Dirichlet's condition.	8	CO2
3	**Discrete Fourier Transform**	Discrete time Fourier transform (DTFT), Discrete Fourier transform (DFT), Parsevals theorem, properties convergence, Sampling theorem and its implication, Reconstruction: Ideal interpolator, zero order hold, aliasing and its effect, Relation between continuous and discrete time system.	8	CO3
4	**Laplace Transform**	Laplace Transform for continuous time signals and systems: The notion of Eigen function of LSI system, region of convergence, system functions, poles and zeros of system functions and signals Convolution theorem, Laplace domain analysis, Waveform synthesis, solution to differential equation and system behavior.	8	CO4
5	**Z-Transform Analysis**	Z Transform for discrete time signal and system, Eigen function , region of convergence, system function, poles and zeroes of system sequences, Z domain analysis, solution of difference equation, pulse transfer function	8	CO5

Reference Books:

1. S.H. Saeed, Faizan Arif Khan, "Basic System Analysis'' 2nd Edition, Katson Publishing Delhi.
2. A.V. Oppenhiem, A.S. Wilsky and I.T. young, "Signals & Systems", Prentice Hall, 1983
3. M E Van-Valkenberg; "Network Analysis", Prentice Hall of India.
4. B. P. Lathi, "Linear Systems & Signals" Oxford University Press, 2008.
5. I. J. Nagrath, S.N. Saran, R. Ranjan and S. Kumar, "Signals and Systems", Tata Mc. Graw Hill

e-Learning Source:

NPTEL :: Electronics & Communication Engineering - Signals and Systems

Lecture Notes | Signals and Systems | Electrical Engineering and Computer Science

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

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

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**EE217**	**Title of the Course**	**Electrical Machines**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	3	0	2	4
Pre-Requisite		**Yes**	Basic Electrical Engineering				
Course Objectives	▪ Knowledge of principle of electromechanical energy conversion in rotating machines and the laws governing it ▪ Evaluate the performance of ac machines different types of electrical DC and AC machines. ▪ Student can perform test on DC and AC machines to evaluate the performance of dc machines ▪ Knowledge of the performance of special electrical machines used in computer science applications.						

Course Outcomes	
CO1	Understand the Principles of Electromechanical Energy Conversion, Faraday's Law, Lenz's Law and Analyze the construction, working, and classification of rotating electrical machines.
CO2	Analyze DC and DC Machines to Evaluate the efficiency, speed control techniques, for industrial and computing systems.
CO3	Analyze Transformers to Understand the working principle, equivalent circuit, and efficiency of single-phase.
CO4	Analyze AC Machines to understand the working principle, equivalent circuit, and efficiency of single-phase and three-phase transformers
CO5	Understand the Principles and applications of special motors used in different computer and printing machines.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Basic Electrical Machine and Principles.**	Principle of Electromechanical Energy Conversion, Faraday's Law of Electromagnetic Induction, Fleming's Right-Hand Rule, Fleming's Left-Hand Rule, Lenz's Law, Working principle of DC and AC generator and Motor, Construction types of D.C. Motor and Generator, EMF equation of DC motor, Torque equation of DC Motor.	8	CO1, CO2
2	**DC Machines**	Types of DC generator and motor, starting (Two point and Three-point starter), Speed control. Performance of DC machine, Efficiency of DC machines, Application of DC motor, Simple Numerical, EMF equation, Torque, and efficiency, Application of DC Machines.	8	CO2
3	**Transformer**	Principle of operation of single phase transformer, Types of transformers (on the basis of construction and Voltage level) equivalent circuit of transformer, Open circuit and short circuit test of single phase transformer, Losses, efficiency of transformer, Simple Numerical on efficiency. Application of Transformer.	8	CO3
4	**AC Machines**	Principle of operation of three phase induction motor, Types of three phase induction motor, Industrial application of three phase induction motor and numerical. Characteristics of three phase induction motor, Principle of operation of single phase induction motor, Types of single phase induction motors,	8	CO4
5	**Three phase Synchronous and Special Machine**	Construction and types of synchronous machine, Principle of operation Synchronous generators, Principle of operation of synchronous motor, Methods of starting of synchronous motor, Working and Applications of Brushless DC (BLDC) Motor, Stepper Motors, PCB motor.	8	CO5

Reference Books:

1. Electric Machinery and Transformers, Irving. L. Kosow, PHI
2. Electrical Machine, I J Nagrath and D P Kothari (TMH)
3. Electric Machines , Mohammed Arifuddin Mallick , Wiley India Pvt. Ltd
4. Electric Machine, Ashfaque Husain, Dhanpat Rai & Co. (P) Limited.
5. Electrical Machinery, Fitzgerald, Kingsley (McGraw Hill)
6. Electrical Machines and their applications, J Hind Mars

e-Learning Source:

https://www.youtube.com/@IITKharagpurJuly-is9ie

https://www.youtube.com/@IITKharagpurJuly-is9ie

https://www.youtube.com/@DrAfrozAlam/playlists

PRACTICAL			
Exp. No.	**List of Experiment**	**Contact Hrs.**	**Mapped CO**
1	To Study 2 Point & 3 Point Starter.	2	CO-1
2	To Perform Speed Control of a DC Shunt Motor.	2	CO-2
3	To obtain Load Characteristic of A DC Shunt Generator.	2	CO-3, CO-5
4	To obtain Load Characteristic of DC Series Generator.	2	CO-3, CO-5
5	Polarity Test of Single-Phase Transformer.	2	CO-5
6	Parallel operation of D.C Generators.	2	CO-4
7	To obtain and Plot Magnetization Characteristic of DC Shunt Generator	2	CO-3, CO-5
8	Sumner's Test of Single-Phase Transformer.	2	CO-3
9	To obtain Load Characteristic of a DC Compound Generator	2	CO-3, CO-5
10	To D.O.L starter of three Phase induction Motor.		

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

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

Integral University, Lucknow

Effective from Session:2025-26 (NEP)							
Course Code	CS212	**Title of the Course**	Database Management System	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	0	2	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To describe a sound introduction to the discipline of database management systems and introduce concepts of the Entity-Relationship model. • To build concepts of relational data model design by writing database queries using Relational Algebra and basic SQL as a universal database language • To demonstrate the principles behind systematic database design approaches by covering conceptual design, logical design through normalization. • To provide an overview of the concept of transactions, serializability, recoverability, deadlock, and how to recover from deadlock. • To understand database locks, timestamps and various concurrency control protocols.						

Course Outcomes	
CO1	***Explain*** *the fundamental concepts of Database Management Systems (DBMS), including data models, schemas, and overall structures.*
CO2	***Design*** *an Entity-Relationship (ER) model and* ***develop*** *a relational database using SQL with appropriate constraints and keys for real-world applications.*
CO3	***Construct*** *complex SQL queries using relational algebra to efficiently retrieve and manipulate data in database.*
CO4	***Apply*** *normalization techniques to optimize database design and* ***Implement*** *modern database tools through case studies for real-life applications*
CO5	***Implement*** *transaction management, concurrency control mechanisms, and deadlock handling strategies to ensure database integrity and performance.*

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction to DBMS and Overall Database Structure**	An Overview of Database Management System, Database System Vs File System, Database System Concepts and Architecture, Data Models, Schema and Instances, Data Independence, Database Languages and Interfaces, Data Definitions Language, Data Manipulation Language, Data Control Language, Overall Database Structure, Indexing and Hashing.	8	1
2	**ER Model, Integrity Constraints & SQL**	ER Model Concepts: Notation for ER Diagram, Examples based on E-R diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables. Integrity Constraints: Entity Integrity, Referential Integrity, Domain Constraints, Relational Algebra and SQL: Select, Insert, Update and Delete Operations. Joins, Unions, Intersection, Minus and aggregate function.	9	2
3	**Data Base Design & Normalization**	Functional Dependencies, Normal Forms, First, Second, and Third Normal Forms, BCNF, Fourth Normal Form, Fifth Normal Form, Normalization using FD, MVD, and JDs, Loss less join & Dependency preserving decomposition, case studies.	9	4
4	**Transaction Processing Concepts**	Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling.	8	5
5	**Concurrency Control Techniques**	Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction.	8	5

PRACTICAL

S. No.	List of Experiments	Contact Hrs.	Mapped CO
1	Overview of using SQL, data types in SQL, concept of DDL, DML & DCL commands, creating tables (along with primary and foreign keys), altering tables, and dropping tables.	2	2
2	Practicing DML commands- Insert, Select, Update, Delete.	2	2
3	Write queries using Logical Operators (=, <, > etc).	2	3
4	Write queries using SQL operators (BETWEEN…AND, IN (list), LIKE, ISNULL and along with negation expressions).	2	3
5	Write queries using COUNT, SUM, AVG, MAX, MIN, GROUP BY, HAVING.	2	3
6	Write queries using ANY, ALL, IN, EXISTS, NOT EXISTS, UNION, INTERSECT, MINUS, CONSTRAINTS etc.	2	3
7	Write queries for extracting data from more than one table (Equi-Join, Natural Join and Outer Join).	2	3

8	Write queries for Sub queries, Nested queries, VIEWS Creation and Dropping.	2	3
9	CASE STUDY: Student should decide on a case study and formulate the problem statement, Database Design using ER Model (Identifying entities, attributes, keys and relationships between entities, cardinalities, generalization, specialization etc.) **Note: Student is required to use MS Access/Lucid Chart app to design ER-Diagram and take a print out.**	2	4
10	Converting ER Model to Relational Model (Represent entities and relationships in Tabular form, represent attributes as columns, identifying keys), Create tables using SQL. **Note: Student is required to use Oracle/PostGreSQL/MS Access/Other Database Application for showing the database tables created from ER Model.**	2	4

Reference Books:

1 Korth, Silbertz, Sudarshan, "Data base concepts", McGraw-Hill

2 Elmasari, Navathe, "Fundamentals of Database Systems", Addison Wesley

3 Date C.J., "An Introduction to Database Systems", Addison Wesley

4 Hector Garcia-Molina, Jeffrey D. Ullman, and Jennifer Widom, "Database Systems: The Complete Book", Pearson

5 Pramod J. Sadalage and Martin Fowler ,"NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence", Addison-Wesley Educational Publishers Inc

6 Baron Schwartz, Peter Zaitsev, and Vadim Tkachenko, "High-Performance MySQL: Optimization, Backups, and Replication", O'Reilly Media

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc19_cs46/preview

https://onlinecourses.nptel.ac.in/noc25_cs40/preview

https://onlinecourses.nptel.ac.in/noc22_cs91/preview

https://onlinecourses.swayam2.ac.in/ini24_cs01/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	PSO1	PSO2	PSO3
CO1	1											2	3	1
CO2	3	2	1								1	3	3	
CO3	3	3	3								1		3	
CO4	3	3	2		2						2	3		
CO5	1		1								2	3		2

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

Integral University, Lucknow
Attributes &SDGs Common for all branches/Disciplines
B.Tech. (All Branches)

Effective from Session:							
Course Code	**ES203**	**Title of the Course**	**Disaster Management and Mitigation**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	2	1	**0**	**3**
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	1. **Understand** the various types of disasters and **analyze** their profiles in the Indian context. 2. **Explain** the causes and **evaluate** the impacts of different disasters through case studies of national and global events. 3. **Apply** risk reduction approaches in disaster management and **analyze** safety measures for mitigating industrial disasters. 4. **Comprehend** the fundamental concepts of the Disaster Management Cycle and **implement** appropriate risk reduction strategies. 5. **Examine** national disaster mitigation acts and policies, and **assess** the roles of key stakeholders such as the Army, Police, Community, Corporate sector, and Media in post-disaster management from both national and global perspectives.						

Course Outcomes	
CO1	Students will be able to learn types of disasters and its profile in India
CO2	Students will be able to understand the causes and impacts of disasters on environment
CO3	Students will be able to learn about risk reduction approaches of disasters with safety issues in mitigating industrial disasters.
CO4	To understand the concept of Disaster Management Cycle and its Risk Reduction
CO5	Students will be able to learn the role of Acts, Policies, National and International Organizations in Disaster Management

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to disaster	Introduction to Disasters, Concepts, Definition and types (Natural and Man-made), Disaster profile of India.	6	CO1
2	Impact of Disaster	Repercussions of Disasters and Hazards: Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem., Case studies from Disasters, Large Hydro projects and its risks for Disasters.	8	CO2
3	Disaster Risk Reduction	Approaches to Disaster risk Reduction, Risk Assessments and Vulnerability Analysis Techniques, Safety issues in mitigating, Case studies, EHS	7	CO 3
4	Disaster Management	Disaster Management Cycle. Reconstruction and Rehabilitation. Early warning Systems Pre-Disaster Management, Post Disaster Management	6	CO4
5	Disaster Act and Policies	National Acts and policies for mitigating Disasters (Disaster Management Act 2005, NDRF, National Policy for Disaster Management 2009, Role of Army and Police Force in Disaster, Role of International/National Humanitarian aid/ Relief Organizations for Disaster management, Role of Community, Corporate, Media etc. for post Disaster Management.	9	CO5
6	Global Perspective (Natural and Manmade Disasters)	Case Studies of disasters induced by Human Activities and climate change such as earthquake, forest fire, flood, drought, landslides, Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War and Conflicts.	9	CO 5

Reference Books:

(1) Gupta Harsh K., Disaster Management, Hyderabad University Press, Publications-Meerut.
(2) Sethi, V.K., Disaster Management, New Delhi Maxford Books
(3) Bhattacharya, Tushar, Disaster Science and Management, New Delhi Tata Mc Graw Hill.
(4) Nidhi Gauba, Dhawan/ Ambrina Sardar Khan, Disaster Management and Preparedness, CBS

e-Learning Source:

https://www.youtube.com/watch?v=9WIwlljva_s

https://www.youtube.com/watch?v=uA_OLKfQpYA

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	1	1	1	1	2	3	-	2	2	1	2	1	2	-	-	-	-
CO2	2	2	2	1	2	2	3	-	2	2	2	2	1	2	-	-	-	-
CO3	3	2	2	1	2	2	3	-	2	2	1	2	1	2	-	-	-	-
CO4	2	2	3	1	2	2	3	-	2	1	1	2	1	2	-	-	-	-
CO5	1	1	2	2	1	1	2	-	2	2	1	2	1	2	-	-	-	-

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

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**EE221**	**Title of the Course**	**Numerical Analysis**	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	**3**	**0**	**0**	**3**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems. • To solve problems in the field of applied mathematics, theoretical physics and engineering which requires computing of numerical results using certain raw data. • To solve complex mathematical problems using only simple arithmetic operations. The approach involves formulation of mathematical models of physical situations that can be solved with arithmetic operations. • To deal with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, and solution of matrix problems. • To facilitate numerical computing.						

Course Outcomes	
CO1	Apply Numerical analysis which has enormous application in the field of science and some fields of Engineering.
CO2	Describing and understanding of the several errors and approximation in numerical methods.
CO3	The explaining and understanding of the several available methods to solve the simultaneous equations by modern IT tools.
CO4	To solve problems in the field of applied mathematics, theoretical physics and engineering which requires computing of numerical results using certain raw data by using modern tools and follow the ethical rules.
CO5	To deal, communicate and environment sustainability with various topics like finding roots of equations, solving systems of linear algebraic equations, interpolation and regression analysis, numerical integration & differentiation, solution of differential equation, boundary value problems, and solution of matrix problems in the field of Engineering and modern life.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Errors and Approximations**	**Error:** Error definitions, accuracy and precision, round off and truncation errors **Roots of equations:** Solution of Algebraic and Transcendental equations, Newton-Raphson method, Bisection method, Fixed Iteration method, Regula-Falsi method. **Finite differences:** Forward differences, Back ward differences	8	CO1
2	**Solutions of Simultaneous Linear Algebraic Equations**	**Linae algebraic equations:** Gauss elimination method, Gauss-Jordan method, L-U decomposition methods, **Iterative Method**: Gauss-Seidel, Jacobi's method.	8	CO2
3	**Curve Fitting and Interpolation**	**Curve fitting:** Introduction, method of least square, fitting of a straight line by method of least square, change of origin and scale, normal equations for different form of curve. **Interpolation:** Interpolation with equal and unequal intervals: Newton's Gregory forward interpolation, Newton's Gregory backward interpolation, Newton's divided difference interpolation, Lagrange's interpolation	8	CO3
4	**Numerical Differentiation and Integration**	**Numerical differentiation:** Newton's Gregory forward interpolation formula to get derivatives, Newton's Gregory backward interpolation formula to get derivatives. **Numerical integration:** Newton-cotes quadrature formula, Trapezoidal rule, Simpson's rule.	8	CO4
5	**Numerical Solutions for Ordinary Differential Equations**	**Ordinary differential equations:** Initial and Boundary value problems, Euler's method, Modified Euler method, Runge-Kutta Method (First, second, third and fourth order)	8	CO5

Reference Books:

1. Josef Stoer and R. Bulirsch, "Introduction to Numerical Analysis" Springer Science & Business Media, ISBN 978-1-47575-592-3, Third Edition, 2013.
2. Lloyd N. Trefethen and David Bau III, "Numerical Linear Algebra", Society of Industrial and Applied Mathematics, ISBN: 978-0-898713-61-9, illustrated edition, 1997.
3. C. T. Kelley, "Iterative Methods for Linear and Nonlinear Equations", Frontiers in Applied Mathematics, Society for Industrial and Applied Mathematics, Philadelphia, ISBN:978-0-89871-352-7, 1995.

e-Learning Resources:

1. https://archive.nptel.ac.in/courses/111/101/111101165/
2. https://archive.nptel.ac.in/courses/111/107/111107105/
3. https://ocw.mit.edu/courses/18-330-introduction-to-numerical-analysis-spring-2012/

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

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

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CS303	**Title of the Course**	Principles of Operating System	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	0	0	3
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	The course introduces fundamental operating system concepts, including memory management, process scheduling, synchronization, deadlocks, file systems, and security mechanisms.						

Course Outcomes	
CO1	Describe the fundamental concepts, evolution, structures, and kernel types of operating systems, including case studies on Android OS, iOS, Virtual OS, and Cloud OS.
CO2	Explain process management concepts, including process states, threads, scheduling criteria, and algorithms for uniprocessor and multiprocessor systems.
CO3	Analyze concurrency principles, synchronization mechanisms, and deadlock handling methods in operating systems.
CO4	Describe memory management concepts, including address spaces, paging, segmentation, and implement page replacement algorithms and techniques to handle thrashing.
CO5	Apply disk scheduling algorithms, file system structures, and evaluate allocation methods to optimize storage management and system performance.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Desktop OS and Mobile OS**	Importance of Operating Systems; Basic Concepts and Terminology; Evolution of Operating Systems: Batch, Interactive, Time Sharing & Real Time Systems. Operating System Structure: Simple Structure, Layered Approach; System Calls; Kernels: overview, objectives of kernel, types of kernels. Architecture, Case Study- Android OS, iOS, Virtual OS, Cloud OS and their design.	8	1
2	**Process, Threads, CPU Scheduling and Real Time Scheduling**	Introduction, Process Model, Process State, Process Control Block. Overview, benefits of threads, types of threads. Basic Concepts, Scheduling Criteria, And Types of Scheduling, Scheduling Algorithms: FCFS, SJF, Round Robin, Priority Scheduling, Multilevel Queue Scheduling, Multilevel, Feedback Scheduling. Introduction, Uniprocessor scheduling, Multiprocessor Scheduling.	8	2
3	**Process Synchronization and Deadlock**	Principles of Concurrency, Race Condition, Critical Section, Critical Section Problem, Synchronization Mechanism, Semaphores and Classical Problems of Synchronization: Bounded Buffer Problem, Readers Writers Problem. Principles, System Model, Deadlock Characterization, Methods of Deadlock Handling: Prevention, Avoidance, Detection & Recovery from Deadlock	8	3
4	**Memory Management and Virtual Memory Management**	Introduction, logical vs. physical address space, swapping, contiguous memory allocation, paging, segmentation, segmentation with paging. Introduction, demand paging, performance, page replacement, page replacement algorithms (FCFS, LRU, Optimal), allocation of frames, thrashing. Other Memory Management Schemes: Swapping, Overlays.	8	4
5	**Device Management, Disk Scheduling and Protection & Security**	Introduction, types of devices, FCFS, SSTF, SCAN, CSCAN, LOOK, C-LOOK Scheduling File Systems: file concept, Access Mechanism, directory structure, file system structure, allocation methods (Contiguous, linked, indexed), free-space management (bit vector, linked list, grouping), Directory implementation (linear list, hash table), efficiency & performance.	8	5

Reference Books:

1. Galvin, Silberchatz "Operating Systems Principles", Addision Wesley.
2. Milenekovie, "Operating System Concept", McGraw Hill.
3. Dietal, "An Introduction to Operating System", Addion Wesley.

e-Learning Source:

https://nptel.ac.in/courses/106105214

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

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

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

Integral University

Effective from Session: 2025-26 (NEP)							
Course Code	CS272	**Title of the Course**	Python Programming Lab	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	0	0	2	1
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	To build a strong foundation of python and its IDEs and learn various object oriented programming constructs and data structures available in Python by Writing and using functions and modules. To Understand file handling application by exploring python libraries and developing real-world applications.						

Course Outcomes	
CO1	Understand the process of installing and configuring Python along with its IDEs.
CO2	Apply and create basic programs using Python's data structures, demonstrating foundational programming skills.
CO3	Develop, apply, and evaluate small modules and components using object-oriented programming principles in Python
CO4	Implement, analyze, and develop applications utilizing Python libraries, focusing on effective file handling techniques.
CO5	Create, apply, and assess working applications in Python, integrating multiple programming concepts for practical implementation

Unit No.	List of Experiment	Contact Hrs.	Mapped CO
1	• Understanding Python installation and its Integrated Development Environments (IDEs). • Write a program to illustrate various data types & concepts of variables/Constant in Python.	2	1
2	• Write a program to perform different Arithmetic Operations on numbers in Python (Addition, Subtraction, Multiplication, Division, etc.) • Write a program in python to demonstrate the concept of "Loop" and print the following pattern of prime numbers if input is number of lines. e.g.; if n=3, output should be:	2	1
3	• Write a program to implement the concept of "List" (create, append, and remove lists in python). • Write a program to search an input number in a list of n numbers and print a "YES" along with its position (index) otherwise print a "No".	2	2
4	• Write a program to create, concatenate and print a "String" and accessing sub-string from a given string. • Write a program to demonstrate working of "Tuples" in python.	2	2
5	• Write a program to illustrate the working of "Dictionaries" in python. • Write a program to check whether input string is "Pangram" or not.	2	2
6	• Write a program to find factorial of a number using "Recursion". • Write a program implement the concept of "Functions" in python and sort „n" numbers in ascending and descending order after taking input (Integer number) from user.	2	3
7	• Write a program to define a "module" and import a specific function in that module to another program. • Write a program that reads an input text "File" and prints all of the unique words in the file in (alphabetical order).	2	3
8	• Write a program that depicts the implementation of Python "Class" which reverse a string word by word. • Write a python script to print the current date in the following format "Sun May 29 02:26:23 IST 2017".	2	4
9	• Write a Python class to implement pow (x, n) • Write a program to implement the working of "NumPy" in python.	2	5

Reference Books:

1. Guido van Rossum and Fred L. Drake Jr., —An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011
2. Kenneth A. Lambert, —Fundamentals of Python: First Programs, CENGAGE Learning,2012.
3. Timothy A. Budd, —Exploring Python, Mc-Graw Hill Education (India) Private Ltd., 2015.
4. Robert Sedgewick, Kevin Wayne, Robert Dondero, —Introduction to Programming inPython: An Interdisciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

e-Learning Source:

https://python-iitk.vlabs.ac.in/

https://nptel.ac.in/courses/106106145

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

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

Integral University, Lucknow

Effective from Session: 2025-26							
Course Code	**EE216**	**Title of the Course**	**Mini Project**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	**IV**	**0**	**0**	**4**	**2**
Pre-Requisite		**Co-requisite**					
Course Objectives	• Implementing a project independently by applying knowledge to practice • Literature review and well-documented report writing • Creating PPTs and effective technical presentation skills • Writing technical paper in scientific journal style & format						

Course Outcomes	
CO1	Apply knowledge to practice to design and conduct experiments and utilize modern tools for developing
CO2	Working models / process / system leading to innovation and entrepreneurship
CO3	Demonstrate the competencies to perform literature survey, identify gaps, analyze the problem
CO4	Prepare a well-documented Minor project report

Continuous Internal Evaluation (CIE) for Minor Project

1) The Minor Project Evaluation Committee shall be constituted with HoD as a Chairman, B. Tech. Coordinator as a Convener and three to five other faculty members representing various specializations in that particular programme as members.
2) Students have to take up minor project as a group of 3 on innovative ideas, innovative solutions to common problems using their knowledge relevant to courses offered in their program of study which would supplement and complement the program assigned to the students
3) The Committee shall allot a faculty supervisor to each student group for guiding on
(a) Selection of topic
(b) Literature survey and work to be carried out
(c) Preparing a report in proper format
(d) Right conduct of research and academic activity to promote academic integrity
(e) Use of anti-plagiarism software to detect plagiarism in the report and submission of Minor project report within acceptable plagiarism levels
(f) Effective minor project oral presentation before the committee
4) The CIE for mini project is as follows:

Assessment	**Weightage**
Minor project Supervisor Assessment	**20%**
Committee Assessment: **(i)** Registration presentation **(10%)** **(ii)** Working model / process / software package / system developed **(20%)** **(iii)** Minor project report **(20%)** **(iv)** Minor project paper **(10%)** **(v)** Final presentation (with PPT) and viva-voce **(20%)**	**80 %**
Total Weightage	**100%**

Note: It is mandatory for the student to
(i) appear for final presentation (with PPT) and viva-voce to qualify for course evaluation
(ii) write minor project paper in given journal format
(a) **Minor Project Topic**: The topic should be interesting and conducive to discussion. Topics may be found by looking through recent issues of peer reviewed Journals/Technical Magazines on the topics of potential interest
(b) **Working Model**: Each student group is requested to develop a working model/ process/ software package /system on the chosen work and demonstrate before the Committee as per the dates specified by the Committee
(c) **Minor Project Report:** Each student is required to submit a well-documented mini project report as per the format specified by the Committee
(d) **Anti-Plagiarism Check:** The minor project report should clear plagiarism check as per the Anti- Plagiarism policy of the institute
(e) **Presentation:** Each student should prepare PPT with informative slides and make an effective oral presentation before the committee as per the schedule notified by the department

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO- PSO **CO**	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO 2	PSO3
CO1	3	3	3	3	3						3	3	1	1
CO2	3	3	3	3	3						3	3	1	1
CO3	3	3	3	3	3						3	3	1	1
CO4	3	3	3	3	3						3	3	1	1

2-LowCorrelation;2-ModerateCorrelation;3-SubstantialCorrelation