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	CS236	**Title of the Course**	Computer Organization & Microprocessor	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	4	0	2	5
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	This course provides the fundamental structure and functioning of computer systems, including memory hierarchy, input/output mechanisms, and instruction execution. It Develop hands-on experience in assembly language programming, interfacing, and optimizing microprocessor-based systems for real-world applications.						

Course Outcomes	
CO1	Understand and analyze the basic architecture of digital computers, data representation formats, arithmetic operations, and error detection techniques.
CO2	Comprehend processor organization, memory hierarchy, cache mapping, and control unit design, including both hardwired and microprogrammed approaches.
CO3	Evaluate and apply concepts of parallel and pipelined processing, superscalar architecture, hazard mitigation, and high-performance computing techniques.
CO4	Develop and implement assembly language programs using 8086 and microcontrollers and explore the architecture and applications of embedded systems.
CO5	Design and simulate fundamental digital circuits including flip-flops, adders, counters, and registers to demonstrate core principles of digital electronics.

THEORY

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Fundamentals of Processors and Data Representation**	Bus Architecture, and Bus Arbitration, Register Transfer, Bus and Memory Transfer, Arithmetic, Logic & Shift Microoperations, Fixed & IEEE 754 Floating Point Representation, Error Detection Codes, Signed Number Representation, Addition and Subtraction, Booth's Algorithm, Restoring and Non-Restoring Division Algorithm.	8	1
2	**Central Processing Unit, Computer Organization & Design**	Concept of Address Mapping, Instruction Codes, Instruction Cycle, Instruction Formats, Addressing Modes, CPU Organization & it's types, RISC and CISC Architectures, Timing & Control, I/O Interrupt Cycle, Interrupt types.	8	2
3	**Memory, I/O Organization & Programming**	Memory, Mapping of Cache Memory, I/O Interface, Data Transfer Techniques, DMA Controller, Serial Communication, Machine Language, Assembly Language, Assembler.	8	3
4	**Hardwired vs Microprogrammed control design, Parallel Processing & Pipelining**	Hardwired Control Design, Microprogrammed Control Design, Concept and Implementation of Parallel and Pipelined processing**,** Pipeline Hazards Instruction & Arithmetic Pipelining, Instruction Pipelining**,** Superscalar, Vector Processing Array Processor, and VLIW architecture	8	4
5	**Microprocessors and Embedded Systems**	**8086 Microprocessor:** Architecture, Pin Diagram**,** Instruction Set, 8086 assembly language Programming**, Introduction to Embedded Systems:** Features, applications, and real-time processing, Introduction to Microcontroller: 8051	8	5

Practical

S. No.	List of Experiments	Contact Hrs.	Mapped CO
1	Write a program to two add 16-bit Hexadecimal numbers with and without carry.	2	4
2	Write a program to multiply two 16-bit numbers result should be greater than 16 bits.	2	4
3	Write a program to find the greatest number from an array of 10 numbers. Write a program to multiply two 8-bit signed - numbers.	2	4
4	Write a program to input 5 numbers and arrange them in descending order. Write a program to convert the string data it's Two's complement form.	2	4
5	Write a program to move a block of data from one memory location to another.	2	4
6	Write a program to move a block of data from one memory location to another	2	4
7	Design & Implementation of various flip flop SR, JK, D and T.	2	5
8	Design & Implementation of Half adder and Full adder circuit. Design & Implementation of Half Subtractor and Full Subtractor circuit.	2	5
9	Design & Implementation counters. Design & Implementation Registers.	2	5
10	Design & Implementation of 2*2 bit unsigned multiplier.	2	5
11	Design & Implementation of associative memory cell.	2	5
12	Design & Implementation of MUX & DEMUX.	2	5

Reference Books:
1.William Stallings, "Computer Organization and Architecture: Designing for Performance", Pearson Education, 2020
2 David A. Patterson, John L. Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann, 2021
3. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization and Embedded Systems", McGraw Hill, 2011
4.R.S. Gaonkar, "Microprocessor Architecture, Programming, and Applications with 8085/8080", Penram International.
5.B. Ram, "Fundamentals of Microprocessors and Microcomputers", Dhanpat Rai Publications.
6. Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", McGraw-Hill Education.
e-Learning Source:
1. https://onlinecourses.nptel.ac.in/noc21_ee18/preview?utm_source=chatgpt.com
2. https://www.coursera.org/learn/comparch?utm_source=chatgpt.com
3. https://www.edx.org/learn/computer-architecture/arm-education-introduction-to-microprocessors?utm_source=chatgpt.com

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

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

Integral University, Lucknow

Effective from Session: 2025-26 (NEP)							
Course Code	CS260	**Title of the Course**	Data Science Fundamentals	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	4	0	0	4
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	This course introduces the fundamentals of data science, including Anaconda setup, basic statistical concepts, and data analysis using Python tools such as Pandas and Scikit-learn. Students will learn data cleaning, exploratory data analysis, and apply core machine learning algorithms like Linear and Logistic Regression.						

Course Outcomes	
CO1	Understand about Data Science Life Cycle and various steps like data wrangling, data exploration and selecting the model.
CO2	Students must be able to preprocess the data using cleaning, integration, transformation and find correlations among the data.
CO3	Students must be able to perform Exploratory Data Analysis (EDA).
CO4	Students must be able to characterize Machine Learning algorithms as Supervised and Unsupervised
CO5	Students must be able to implement Machine Learning Algorithms.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction to Data Science**	What is Data Science, what does a data scientist do, Real-world Applications (Healthcare, Finance, E-commerce, IoT)., Data Science Lifecycle**,** Python for Data Science (Jupyter Notebook, Anaconda) Various steps in Data Science processes like data wrangling, data exploration and selecting the Mode	8	1
2	**Data Manipulation and Visualization**	NumPy Basics: Arrays, Mathematical operations, Pandas Basics: Series operations, DataFrame operations, Indexing, Filtering, Data Cleaning & Transformation: Handling missing data, Outlier detection. Introduction to Matplotlib, Using Matplotlib for plotting Graphs and charts like Scatter, Bar, Pie, Line, Histogram and more**.**	8	2
3	**Machine Learning using Python**	Introduction to machine learning, Need for Machine learning, Key applications, Types of machine learning (Supervised vs Unsupervised Learning) and workflow of Machine Learning, Use Cases in ML: Fraud detection, Recommendation systems and its various algorithms.	8	3
4	**Supervised and Unsupervised Learning**	Supervised Learning: ● Regression**:** Linear Regression, Polynomial Regression, Ridge & Lasso Regression. ● Classification**:** Logistic Regression, Decision Trees, SVM, Random Forest. .Unsupervised Learning: ● Clustering**:** K-Means, DBSCAN, Hierarchical Clustering. Dimensionality Reduction**:** PCA, t-SNE.	8	4
5	**PROJECT**	Research Activities on Data Science with projects and research letters Problem definition and dataset selection (Kaggle/UCI repositories). Mini-project (Prediction, Classification, or Clustering task).	8	5

Reference Books:

1. Data Science Fundamentals and Practical Approaches: Understand Why Data Science Is the Next by Dr Gypsy Anand/ Dr Rupam Sharma.
2. Python Data Science Handbook: Essential Tools for Working with Data by Jake Vander Plas.
3. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" by EMC Education Services.
4. IBM Content/Books.

e-Learning Source:

https://integral.skillsnetwork.site/

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	2	2	2	3	1		1	2			2	2	2	3
CO2	2	2	2	3	2		1	2	3	1	1	2	2	2
CO3	2	3	2	3	2		1	2				2	2	2
CO4		2	1	1	1					2	2		1	1
CO5	2	2	3	3	3	2	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	CS229	**Title of the Course**	Software Engineering	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	0	0	3
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• Explain the basic understanding of software, its characteristics, and importance of following engineering principles to develop software. • Assess the applicability, strengths, and weaknesses of the different development life cycle models to provide real world software solutions. • To understand various processes of each phase of SDLC and make the students capable of preparing quality documentation for software development. • To develop effort estimation and risk management skills for developing software. • Study of CASE tools, Quality Assurance activities etc. for focusing on quality issues of software.						

Course Outcomes	
CO1	Identify the best suitable SDLC model for a given set of user requirements.
CO2	Estimate the total effort, to assess and manage the potential risks involved while developing the software.
CO3	Create a good quality SRS and design a highly cohesive and low coupled software
CO4	Follow the standard coding guidelines and practices and prepare best possible test cases to uncover errors.
CO5	Work on modern CASE tools and follow the international quality standards to produce good quality software.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction to Software Engineering**	Types of Software, Software Characteristics, Quality of a Good Software, Software Myths, Software Crisis, Software Engineering: Definition, Challenges, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes. Software Development Life Cycle Models: Waterfall Model, Prototyping Model, RAD Model Iterative Enhancement Model and Spiral Model.	8	1
2	**Planning a Software**	Process Planning, Effort Estimation: Uncertainties in Effort Estimation, Building Effort Estimation Models, COCOMO Model, Project Scheduling & Staffing: Overall Scheduling, Detailed Scheduling, Team Structure, Software Configuration Management (SCM): - Baselines, Version Control, Change Control & Configuration Audit, Risk Management, Software Risks, Risk Analysis, Identification, Projection, Assessment, Monitoring and Managing the Risk, RMMM Plan.	8	2
3	**Software Requirements Analysis and Specification**	Software Requirements: Need for SRS, Requirement Process, Problem Analysis: Informal & formal Approaches, Data Flow Modeling, Prototyping, Requirements Specifications: Characteristics of an SRS, Components of SRS, Specification Language, Structure of Requirement Document: IEEE Standards for SRS. Software Design: Designing: Function Oriented Design: Design Principles: Problem Partitioning and Hierarchy, Abstraction, Modularity, Top Down and Bottom-Up Strategies, Module Level Concepts: Coupling, Cohesion; Introduction to Object Oriented Design, Software Measurement Metrics: Various Size Oriented Measures- Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.	8	3
4	**Coding & Testing**	Coding: Programming Principles and Guidelines: Common Coding Errors, Structured Programming, Information Hiding, Coding Standards, Refactoring, Verification: Code Inspection. Testing: Testing Fundamentals: Error Fault and Failure, Unit Testing, Integration Testing:: Top Down and Bottom up, Acceptance Testing: Alpha and Beta Testing., Regression Testing, functional and non-functional testing. Testing Techniques: White Box: Logic Coverage, Path Coverage, Loop Coverage. Black Box Testing: Boundary Value Analysis, Equivalence Class Testing.	8	4
5	**Computer Aided Software Engineering (CASE)**	CASE Tools, Scope, Benefits of CASE Tool, support in Software Life Cycle, Architecture of CASE Environment, Types of CASE Tools, Software Reliability and Quality Management: -Software Quality Management: Quality Concepts, Software Quality Assurance, Software Reviews, Formal Technical Reviews, Software Reliability, ISO 9000 Quality Standards, CMM Levels.	8	5

Reference Books:

1. Software Engineering: A Practitioner's Approach by Roger S. Pressman, McGraw-Hill International edition.
2. An Integrated Approach to Software Engineering, by Pankaj Jalote, Narosa Publishing House
3 Software Engineering by K.K. Agarwal.
4. Software Engineering by Ian Sommerville, Addison-Wesley

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc20_cs68/preview

https://archive.nptel.ac.in/courses/106/105/106105182/

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

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

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: 2016-17							
Course Code	BM226	**Title of the Course**	Human Values & Professional Ethics	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**0**	**0**	**0**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To understand the moral values that ought to guide the Management profession, Resolve the moral issues in the profession, • To justify the moral judgment concerning the profession. • To create an awareness on Management Ethics and Human Values. • To inspire Moral and Social Values and Loyalty. Intended to develop a set of beliefs, attitudes, and habits that engineers should display concerning morality. • To create awareness about the important global issues: . Multinational corporations - Environmental ethics - computer ethics - weapons development						

Course Outcomes	
CO1	Development of moral and ethical values, right understanding and relationships
CO2	Knowledge of Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property rights and its laws.
CO3	Awareness about the Professional Responsibility of engineers, Responsibility of engineers related to risks, hazards and safety.
CO4	Development of Engineers Ethics. Understanding of variety of moral issues, moral judgment concerning the profession.
CO5	Understanding of various of global issues; Environmental ethics - computer ethics - weapons development.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Human Value Education	Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration. Its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, 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	Professional Responsibility	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 Responsibilities of Engineers: The emerging consensus on the Responsibility for safety among engineers, hazards and risks.	6	CO3
4	Engineers Ethics	Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas – moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles theories about right action – Self-interest - customs and religion - uses of ethical theories. Valuing Time – Cooperation – Commitment.	6	CO4
5	A Glimpse of Life Stories, Global Issues	Life story of Prophet Mohammad, Mahatma Gandhi, Swami Vivekanand, Marie Curie and Steve Jobs. Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers consulting engineers-engineers as expert witnesses and advisors -moral leadership.	6	CO5

Reference Books:

1. R.S. Naagarazan 2006, "A Textbook on Professional Ethics and Human values" New Age International Publisher.
2. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.
3. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.

e-Learning Source:

1. Value Education website, http://www.uptu.ac.in . 2. Story of Stuff, http://www.storyofstuff.com
2. **https://www.youtube.com/watch?v=nlh9V5gd8hg&list=PLbMVogVj5nJQ20ZixllzM69agBq-m8ndV**
3. **https://www.youtube.com/watch?v=9LSEBK03CiY&list=PLysZquKdjuWSv87TaE7pByn5TE_e46O2C**

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
CO1	3	3	2	3	3			3		2		2	2	2	3

CO2	3	3	2	3	3			2					2	3	3
CO3	2	3	2	3	2			3		3			3	3	3