COURSE BOOK MCA II YEAR

AUTONOMOUS

KIET GROUP OF INSTITUTIONS
www.kiet.edu
Delhi-NCR, Ghaziabad

KIET
GROUP OF INSTITUTIONS
Connecting Life with Learning

CELEBRATING 25 YEARS OF EXCELLENCE

CURRICULUM STRUCTURE & SYLLABUS

Effective from the Session: 2025-26

MCA, 3rd Sem

S No.	Course Category (AICTE)	Course Category (UGC)	BOS	Course Code	Course Name	Type	Academic Learning (AL)			Continuous Internal Examination (CIE)			End Sem Examination (ESE)	Total Marks	Total Credits
							L	T	P	MSE	CA	TOTAL		CIE+ ESE	
1	PC	Major (Core)	MCA	CA205L	Analysis & Design of Algorithms	L	3	0	0	60	15	75	75	150	3
2	PC	Major (Core)	MCA	CA103L	Computer Networks Technologies	L	3	0	0	60	15	75	75	150	3
3	PE	SEC	MCA	-	Professional Elective-I	L	3	0	0	60	15	75	75	150	3
Blended															
4	PC	Major (Core)	MCA	CA206B	Web Development	B	2	0	2	60	15	75	75	150	3
Lab/Practical															
5	PC	Major (Core)	MCA	CA205P	Analysis & Design of Algorithms Lab	P	0	0	4	-	50	50	50	100	2
6	PW	SEC	MCA	CA301P	Major Project-I	P	0	0	10	-	125	125	125	250	5
7	PW	Summer Internship	MCA	CA107P	Internship	P	0	0	2		50	50	-	50	1
8	HS	Value Added Courses	ASH	HS301P	Communication for Employability	P	0	0	2	-	25	25	25	-	NC
Total Hours : 31 hrs.							**11**	**0**	**20**					**1000**	**20**

Professional Elective-1 (3rd Semester)

CA208E	Machine Learning and GenAI
CA209E	Data Analytics Essentials
CA210E	Data Science
CA106E	Cryptocurrency & Blockchain Applications
CA211E	UI/UX Design for Web Application
CA302E	Cloud-Native Development

MCA, 4th Sem

S No.	Course Category (AICTE)	Course Category (UGC)	BOS	Course Code	Course Name	Type	Academic Learning (AL)			Continuous Internal Examination (CIE)			End Sem Examination (ESE)	Total Marks	Total Credits
							L	T	P	MSE	CA	TOTAL		CIE+ ESE	
1	PC	Major (Core)	MCA	CA303L	DevOps for Scalable Applications	T	3	0	0	60	15	75	75	150	3
2	PE	SEC	MCA	-	Professional Elective-2	T	3	0	0	60	15	75	75	150	3
Lab/Practical															
3	PW	SEC	MCA	CA401P	Major Project-II	P	0	0	16	-	200	200	200	400	8
Total Hours : 22 hrs.							**6**	**0**	**16**					**700**	**14**

Professional Elective-2 (4th Semester)

CA304E	Cyber Security
CA305E	Network Security & Cryptography
CA306E	Digital Forensics
CA307E	Quality Assurance in Software Development
CA308E	Agile Development
CA309E	Software Project Management

Theory Courses Detail Syllabus

Course Code: CA205L	Course Name: Analysis & Design of Algorithms	L	T	P	C
		3	0	0	3

Pre-requisite: Understanding of programming language like C / C++ with all basic concepts.

Course Objectives:

The goal is to provide a mathematical foundation for designing and analyzing algorithms, equipping learners with strategies to solve real-world problems efficiently. It also focuses on developing optimized algorithms for various engineering applications, ensuring effective problem-solving in computational domains. Participate effectively in competitive programming contests.

Course Outcome:

Students will be able to:	
CO1	Determine algorithm characteristics and evaluate performance using asymptotic notations and benchmarking.
CO2	Apply Divide and Conquer to design algorithms and solve recurrences using suitable methods.
CO3	Illustrate efficient solutions using Greedy and Dynamic Programming, analyzing their trade-offs.
CO4	Analyze solutions for combinatorial problems using Backtracking and Branch & Bound techniques.
CO5	Classify problems using complexity classes and analyze lower bounds via reductions.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	-	-	-	-	-	1
CO2	3	3	3	-	2	-	-	2
CO3	3	3	3	2	2	-	-	2
CO4	3	3	3	1	-	-	-	2
CO5	3	3	3	2	-	-	-	3

Unit 1	Introduction and Complexity Analysis	09 hours

Introduction: Characteristics of the algorithm; Time and Space Complexity, **Asymptotic Notation**- Big O notation, Omega notation and Theta notation, **Algorithm Analysis**: Asymptotic analysis of complexity bounds–best, average and worst-case behavior; Analysis of Insertion Sort; empirical analysis and performance benchmarking, Time and space trade-offs.

Unit 2	Divide & Conquer and Recurrences	09 hours

Divide & Conquer: General Method, Finding maximum and minimum simultaneously, Applications of binary search, Defective Chessboard, Analysis of traditional and Strassen's matrix multiplication algorithms, **Analysis of recursive algorithms through recurrence relations**: Recursion tree method, Substitution Method, and Masters' theorem. Analysis of Merge sort and Quicksort,

Unit 3	Greedy & Dynamic Programming	09 hours

Greedy Method: General Method, Fractional knapsack problem, Activity Selection and Job sequencing with deadlines, **Dynamic Programming:** Multi stage graphs, all-pairs shortest paths, 0/1 knapsack. Matrix Chain Multiplication, String editing problems (Edit Distance -Levenshtein Distance), Travelling Salesperson Problem and Reliability Design.

Unit 4	Backtracking and Branch & Bound	09 hours

Backtracking: 8-queens, Sum of subsets, Graph Coloring, Hamiltonian cycles. Time complexity analysis of backtracking algorithms, **Branch-&-Bound**: Search Space Tree and Bounding Functions, 0/1 knapsack and Traveling Sales person problem.

Unit 5	Complexity Classes and Lower Bounds	09 hours

Lower Bound Theory: Comparison trees, Lower bounds through reduction, **Complexity Classes**: P, NP, NP-Hard, and NP-Complete classes; polynomial-time reductions **Real-world examples of NP-complete problems**: SAT, Vertex Cover, Subset Sum.

Total Lecture Hours	45 hours

Textbook:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, *Introduction to Algorithms*, 3rd Edition, MIT Press, 2009.
2. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2012.

Reference Books:

1. S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, 2014.
2. Kasturi Viswanath and S. S. Sane, Design and Analysis of Algorithms, Wiley India, 2017.
3. S. K. Basu, Design Methods and Analysis of Algorithms, PHI Learning, 2005.
4. A. Puntambekar, Design and Analysis of Algorithms, Technical Publications, 2019.
5. R. Panneerselvam, Design and Analysis of Algorithms, PHI Learning, 2013.
6. M. H. Alsuwaiyel, Algorithms: Design Techniques and Analysis, World Scientific Publishing, Indian Edition, 2016.
7. G. A. Vijayalakshmi Pai, Design and Analysis of Algorithms: A Contemporary Perspective, CRC Press, Indian Edition, 2018

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA103L	Course Name: Computer Networks Technologies	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of computer fundamentals.

Course Objectives:

The objective of this course is to provide insight about computer network concepts and to gain comprehensive knowledge of the layered communication architectures, their functionalities and key protocols.

Course Outcome:

Students will be able to:	
CO1	Understand networking concepts and functionality of the physical layer.
CO2	Illustrate the concept of the elementary data link layer protocol to build a robust network
CO3	Apply the concept of routing and IP addressing in the network layer.
CO4	Demonstrate the usage and working of the transport layer.
CO5	Determine the performance of different protocols used at the application layer.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	1	-	-	-	-	-	1
CO2	3	3	2	-	-	-	-	3
CO3	3	3	2	-	-	-	-	3
CO4	3	1	-	-	-	-	-	2
CO5	3	2	-	-	-	-	-	2

Unit 1	Introduction -Physical Layer	09 hours

Introduction to computer networks: Network applications and goals, modes of communications, LAN, MAN, WAN, Internet, network hardware, network software, Design issues of layers, reference models: OSI, TCP/IP layers, and characteristics. **Physical Layer:** Network devices, Network topology, Transmission media, Signal transmission, Network performance and transmission impairments, Switching techniques.

Unit 2	Data Link Layer	09 hours

Data Link layer: Design issues, Framing, Error Detection and Correction, Flow control (Elementary Data Link Protocols, Sliding Window protocols). **Medium Access Control and Local Area Networks:** Multiple access protocols: Random Access (ALOHA, CSMA, CSMA/CD, CSMA/CA), Controlled Access (Polling, Reservation, Token Passing), Channelization (FDMA, TDMA, CDMA). IEEE standards Wired LANs (Ethernet): Wireless LANs and Bluetooth.

Unit 3	**Network Layer**	**09 hours**

Network Layer: Network layer design issues, Logical addressing: Basic internetworking, Subnetting, NAT, network layer protocols, IPv4, IPv6. **Routing:** Static and dynamic routing, Routing algorithms and protocols (Shortest Path Algorithms, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing)

Unit 4	**Transport Layer**	**09 hours**

Transport Layer: Process-to-process delivery, Transport layer protocols (UDP and TCP), SCTP, Connection management. **Congestion control in TCP:** Congestion Control: Open Loop, Closed Loop choke packets; Quality of service: techniques to improve QoS: Leaky bucket algorithm, Token bucket algorithm

Unit 5	**Application Layer**	**09 hours**

Session Layer: Session Management, RPC, **Presentation Layer: Cryptography:** Symmetric-key cryptography, Asymmetric-key cryptography, Digital Signature, **Compression:** Lossless and Lossy Compression, **Application Layer:** Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Simple Network Management Protocol, Telnet.

Total Lecture Hours	**45 hours**

Textbook:

1. Behrouz Forouzan, "Data Communication and Networking" Fourth Edition-2006, Tata McGraw Hill
2. Andrew Tanenbaum "Computer Networks", Fifth Edition-2011, Prentice Hall.
3. William Stallings, "Data and Computer Communication", Eighth Edition-2008, Pearson.

Reference Books:

1. Kurose and Ross, "Computer Networking- A Top-Down Approach", Eighth Edition-2021, Pearson.
2. Peterson and Davie, "Computer Networks: A Systems Approach", Fourth Edition-1996, Morgan Kaufmann
3. Behrouz Forouzan, "TCP/IP Protocol Suite", McGraw Hill.

Mode of Evaluation:

Evaluation Scheme						
MSE		**CA**			**ESE**	**Total Marks**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3(ATT)**		
30	30	6	6	3	**75**	**150**
60		**15**				

Course Code: CA206B	**Course Name: Web Development**	**L**	**T**	**P**	**C**
		2	**0**	**2**	**3**

Pre-requisite: HTML, CSS, JavaScript with ES6 and DBMS.

Course Objectives:

Understand how to build scalable, high-performance, and interactive web applications by leveraging React.js for a dynamic frontend, Node.js for an efficient backend, and RESTful APIs for seamless data communication, ensuring modularity, security, real-time capabilities, and an optimized user experience.

Course Outcome:

Students will be able to:	
CO1	Demonstrate frontend web application using React JS.
CO2	Illustrate navigation and hooks in front end web application using React Router and React Hooks Library
CO3	Apply React AXIOS Library to fetch RESTful API.
CO4	Analyse backend web apps using Node JS.
CO5	Test RESTful API using Node JS.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	2	1	2	-	-	-	1
CO2	2	2	2	2	-	-	-	2
CO3	2	2	2	2	1	-	-	3
CO4	1	2	1	2	1	-	-	1
CO5	2	2	3	3	2	-	-	3

Unit 1	**INTRODUCTION TO REACT FUNDAMENTALS**	**12 hours**

React Fundamentals: Introduction to React, Running First React App using VS Code, Rendering, JSX & JSX Expression, Rendering Multiple Elements, Rendering List, Conditional Rendering, Functional Components, Props, Passing Props to Components, Bootstrap in React, Dynamic Class Rendering, Dynamic Expression Rendering, Event Handling, Component Composition, Passing Events to Components, Component Styling, Working with Forms.

Unit 2	**UNDERSTANDING ROLE OF REACT ROUTER AND HOOKS**	**12 hours**

React Router: Introduction to React Router, Browser Router, Routes, Route, Link, NavLink, Nested Routes, Index Routes, Dynamic Routes, Query Strings, Lazy Routing, Passing Props to Elements Components in React Router. **React Hooks:** Introduction to Hooks, useState Hook, useEffect Hook, useContext Hook, useReducer Hook, useCallback Hook, useMemo Hook, useRef Hook, useReducer and useContext to replace Redux.

Unit 3	**UNDERSTANDING RESTFUL API CALLING WITH REACT JS**	**12 hours**

React RESTful: Introduction to Frontend applications, RESTful web services, Introduction to JSON, Fetch API, Introduction to AXIOS, Calling GET, POST, DELETE and PUT API using AXIOS library in React JS. Form Handling in React, CURD App using Spring Boot.

Unit 4	**Introduction to Node.js**	**12 hours**

Node.js: Setting Up a Node.js Environment - Installing Node.js and npm - Creating a basic Node.js server - Handling HTTP requests and responses Programming with Node. Express JS-Configuring Routes-Working with Express Understanding asynchronous JavaScript - Callbacks and Promises - Introduction to async-File System-Read File-Writing a File-Opening a File-Deleting a File-Writing a file asynchronously-Other I/O Operations.

Unit 5	**Building RESTful APIs with Node.js and Express.js**	**12 hours**

Node.js with Express.js: Introduction to RESTful APIs- Understanding REST principles - HTTP methods and status codes - Building API endpoints with Express-Express Middleware and Error Handling - Using middleware in Express- Handling errors in Express applications - Logging and debugging-Building a RESTful API - Designing and implementing API routes - Integrating MongoDB with Mongoose - Testing APIs with Postman-Database Connectivity-Connecting String-Configuring-Updating Records-Working with Select Command-Deleting Records

	Total Lecture Hours	**60 hours**

Textbook:

1. Learning React: Modern Patterns for Developing React Apps" by Alex Banks and Eve Porcello, 2nd edition, published by O'Reilly Media on June 12, 2020.
2. Node.js Web Development (5th Edition) by David Herron, published by Packt Publishing on July 31, 2020.

Reference Books:

1. Full stack React: The Complete Guide to ReactJS and Friends" by Anthony Accomazzo, 1st Edition, published by Fullstack.io on September 12, 2017.
2. The Node Craftsman Book" by Manuel Kiessling, 1st Edition, published by Packt Publishing on April 28, 2017.

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA208E	**Course Name: Machine Learning and GenAI**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Probability & Statistics, Linear Algebra and Calculus, Fundamentals of Artificial Intelligence.

Course Objectives:

This course introduces the foundational concepts of Machine Learning and its integration into modern Generative AI systems. It emphasizes the application of supervised, unsupervised, and deep learning models – including transformers and LLMs – along with practical exposure to prompt engineering, generative models, and ethical AI practices.

Course Outcome:

Students will be able to:	
CO1	Understand ML and GenAI foundations and their lifecycle
CO2	Discuss supervised and unsupervised learning in GenAI-related scenarios
CO3	Explore neural networks and transformer models for generative tasks
CO4	Illustrate generative solutions using Autoencoders, GANs, and LLMs
CO5	Express ethical, explainable, and emerging trends in AI applications

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	-	-	1	-	-	-	-	1
CO2	2	1	2	-	-	-	-	2
CO3	2	2	3	-	-	-	-	2
CO4	2	2	3	1	1	-	-	3
CO5	1	1	1	-	2	-	2	1

Unit 1	**Introduction to ML and GenAI Foundations**	**09 hours**

Introduction to Artificial Intelligence, Machine Learning, and Generative AI. Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning. Machine Learning Lifecycle: Data Preprocessing, Feature Engineering, Model Training, Evaluation, Deployment

Introduction to Neural Networks and Deep Learning. Use Cases of GenAI in industry and academia

Unit 2	**Supervised and Unsupervised Learning Techniques**	**09 hours**

Supervised Learning: Linear Regression, Logistic Regression, Decision Trees, Evaluation Metrics (Accuracy, Precision, Recall, F1-score), Case Studies in Text Classification

Unsupervised Learning: Clustering: K-Means, Hierarchical Clustering, Dimensionality Reduction: PCA, t-SNE, Applications in GenAI pipelines (e.g., prompt clustering)

Unit 3	**Deep Learning and Neural Network Architectures**	**09 hours**

Neural Network Fundamentals: Architecture, Activation Functions (ReLU, Sigmoid), Loss Functions, CNNs for Vision Tasks and Feature Extraction, RNNs, LSTM, GRU for Sequential Data Modeling

Introduction to Transformers: Self-Attention, Positional Encoding, Transfer Learning and Fine-tuning Concepts

Unit 4	**Generative AI Models and Application**	**09 hours**

Generative Models Overview: Autoencoders and Variational Autoencoders, Generative Adversarial Networks (GANs): Concepts and Applications (StyleGAN)

Introduction to Large Language Models (LLMs): BERT, GPT, Prompt-based Generation: Text completion, Summarization, Paraphrasing, Case Studies using LLM APIs (OpenAI, Google, Meta)

Unit 5	**Responsible, Explainable, and Emerging AI Trends**	**09 hours**

Explainable AI (XAI): SHAP, LIME, Interpretability of complex models. Ethical AI: Fairness, Bias, Data Privacy, AI Governance. Prompt Engineering: Patterns, Optimization Techniques, Evaluation of Prompts. Fine-tuning LLMs for Domain-Specific Applications. Emerging Trends: Multimodal AI, Autonomous Agents, Federated Learning. Regulatory and Responsible Use of GenAI (AI Act, Ethical Frameworks)

	Total Lecture Hours	**45 hours**

Textbook:

1. Murphy, K. P. (2012). Machine learning: a probabilistic perspective. MIT Press.
2. Sabesan, K., Sivagamisundari, & Dutta, N. (2025). Generative AI for everyone: Deep learning, NLP, and LLMs for creative and practical applications. BPB Publications.
3. Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep learning. MIT Press.

Reference Books:

1. "Understanding Machine Learning: From Theory to Algorithms" by Shai Shalev-Shwartz and Shai Ben-David, Cambridge University Press, 1st Edition, 2014.

2. "Probabilistic Machine Learning: An Introduction" by Kevin P. Murphy, MIT Press, 1st Edition, 2022.
3. "Hands-on Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron, O'Reilly Media, 3rd Edition, 2022.

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA209E	Course Name: Data Analytics Essentials	L	T	P	C
		3	0	0	3

Pre-requisite: Fundamental statistics and probability concepts, Linear Algebra and Calculus, Machine Learning concepts (classification and regression)

Course Objectives:

This course provides a foundation in data analytics, covering the lifecycle, types of analytics, and real-world applications. It includes techniques in data preprocessing, EDA, and predictive analytics with machine learning, along with optimization methods.

Course Outcome:

Students will be able to:	
CO1	Understand the data analytics lifecycle and identify appropriate tools and techniques.
CO2	Describe data cleaning and pre-processing methods on real-world datasets.
CO3	Analyze data using modern BI and programming tools.
CO4	Apply basic machine learning models to solve practical problems.
CO5	Demonstrate end-to-end analytics with mini projects in selected domains.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	2	-	3	-	2	-
CO2	3	3	2	-	3	-	2	-
CO3	3	3	2	2	3	-	2	2
CO4	3	2	3	2	3	-	2	-
CO5	3	3	3	2	3	-	3	3

Unit 1	Introduction to Data Analytics and Tools	09 hours

Overview of Data Analytics: Scope, Types (Descriptive, Predictive, Prescriptive), Analytics Lifecycle: CRISP-DM, Knowledge Discovery, Data Sources and Formats: CSV, APIs, SQL, JSON, Tools Introduction: Python (Jupyter), Excel, Power BI/Tableau

Unit 2	Data Acquisition and Cleaning	09 hours

Data Import from Excel, APIs, Web, Handling Missing Values, Duplicates, and Outliers, Encoding Techniques (Label, One-Hot), Scaling, Combining Data: Merge, Join, Concat (Pandas-based)

Unit 3	Data Exploration and Visualization	09 hours

Univariate, Bivariate, and Multivariate EDA, Statistical Summaries and Correlation, Visualizations: Bar, Histogram, Boxplot, Heatmap, Storytelling with Power BI.

Unit 4	Predictive Analytics and Machine Learning	09 hours

Supervised Learning Basics: Regression and Classification, Algorithms: Linear Regression, Logistic Regression, Decision Trees, Evaluation Metrics: Accuracy, Precision, Recall, F1, ROC, Hands-on with Scikit-learn

Unit 5	Applications and Mini Project	09 hours

Time Series Analysis: Trend and Forecasting, Text Analytics: Tokenization, Sentiment Analysis (VADER/TextBlob), Mini Project: End-to-end problem-solving with real dataset, Report, Presentation, and Insight Generation

Total Lecture Hours	45 hours

Textbook:

1. Provost, F., & Fawcett, T. (2013). Data Science for Business. O'Reilly.
2. VanderPlas, J. (2016). Python Data Science Handbook. O'Reilly.

3. Grus, J. (2019). Data Science from Scratch. O'Reilly.

Reference Books:

1. McKinney, W. (2017). Python for Data Analysis. O'Reilly.
2. Kelleher, J.D., & Tierney, B. (2018). Data Science. MIT Press.
3. Montgomery & Runger (2014). Applied Statistics and Probability. Wiley.

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA210E	Course Name: Data Science	L	T	P	C
		3	0	0	3

Pre-requisite: Basic Python programming, Basics of Statistics and Linear Algebra.

Course Objectives:

The course aims to introduce students to the fundamental concepts and applications of data science, emphasizing Python programming, data manipulation, and machine learning. Students will gain hands-on experience in data analysis, visualization, and model deployment, preparing them to tackle real-world data problems.

Course Outcome:

Students will be able to:	
CO1	Understand the concept of data science and its scope, impact, and lifecycle in various real-world applications.
CO2	Apply Python programming skills to perform data manipulation, cleaning, and preprocessing using libraries like Pandas and NumPy.
CO3	Discuss exploratory data analysis (EDA) and various statistical methods to understand data patterns, distributions, and relationships.
CO4	Explore machine learning models using Python, including regression, classification, and clustering, with a focus on model evaluation metrics.
CO5	Demonstrate data science models using tools like Flask or FastAPI for real-time applications.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	-	-	-	-	-	-	-
CO2	1	2	2	2	-	-	-	-
CO3	3	2	2	2	2	-	-	2
CO4	2	3	-	2	2	-	-	2
CO5	2	2	2	-	3	-	2	2

Unit 1	INTRODUCTION TO DATA SCIENCE	09 hours

Overview of Data Science: Definition, scope, and impact across various fields such as healthcare, finance, marketing, and social media. Data Science Life Cycle: Stages from problem definition, data collection, and preparation to analysis and solution deployment.

Types of Data: Structured, semi-structured, and unstructured data with real-world examples. Sources of Data: Time series, transactional, biological, and social network data. Data Science Tools: Overview of tools like Python, Jupyter notebooks, and essential libraries.

Unit 2	PYTHON FOR DATA SCIENCE	09 hours

Python Basics: Variables, operators, data types, control structures, and functions. Python Libraries for Data Science: Introduction to NumPy, Pandas, Matplotlib, Seaborn, and scikit-learn. Data Structures in Python: Lists, dictionaries, tuples, and sets. Data Handling: Reading, cleaning, and preprocessing data with Python. Exploratory Data Analysis (EDA): Using Python to perform EDA on real-world datasets.

Unit 3	DATA MANIPULATION WITH PYTHON	09 hours
NumPy: Operations on arrays, indexing, reshaping, and special functions. Pandas: Creating, accessing, and manipulating DataFrames, handling missing data, merging datasets. Data Visualization: Basic and advanced visualizations with Matplotlib and Seaborn (e.g., histograms, scatter plots, box plots, pair plots). Handling Complex Data: Time series data, hierarchical data, and multi-dimensional data.		
Unit 4	**STATISTICAL ANALYSIS AND MACHINE LEARNING WITH PYTHON**	**09 hours**
Descriptive Statistics: Measures of central tendency, variability, and summary statistics. Inferential Statistics: Hypothesis testing, confidence intervals, and p-values. Regression Models: Simple and multiple linear regression with Python (using scikit-learn). Classification Models: Logistic regression, K-Nearest Neighbors (KNN), and decision trees. Model Evaluation: Accuracy, precision, recall, F1-score, and ROC curves. Clustering: K-means clustering, hierarchical clustering.		
Unit 5	**ADVANCED DATA SCIENCE TECHNIQUES**	**09 hours**
Dimensionality Reduction: Techniques such as PCA (Principal Component Analysis) for feature reduction. Optimization and Tuning: Hyperparameter tuning, cross-validation, and grid search. Time Series Forecasting: Basics of forecasting with Python using time series data. Model Deployment: Overview of model deployment using Flask or FastAPI for real-time applications.		
	Total Lecture Hours	**45 hours**

Textbook:

1. VanderPlas, J. (2016). Python Data Science Handbook: Essential Tools for Working with Data. O'Reilly Media.
2. McKinney, W. (2018). Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython. O'Reilly Media.
3. Raschka, S. (2015). Python Machine Learning. Packt Publishing.

Reference Books:

1. Practical Statistics for Data Scientists – Peter Bruce, First edition in May 2017.
2. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, Practical Data Science Cookbook, Packt Publishing.

Mode of Evaluation:

Evaluation Scheme						
MSE		**CA**			**ESE**	**Total Marks**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3(ATT)**		
30	30	6	6	3	**75**	**150**
60		**15**				

Course Code: CA106E	Course Name: Cryptocurrency & Blockchain Applications	L	T	P	C
		3	0	0	3

Pre-requisite: Basic programming knowledge and an understanding of blockchain technology and its core concepts.

Course Objectives:

To provide students with an understanding of blockchain principles, including its architecture, consensus mechanisms, smart contracts, and cryptocurrencies. The course explores real-world applications in industries such as healthcare, supply chain, education, and finance.

Course Outcome:

Students will be able to:	
CO1	Explain the fundamental concepts of blockchain technology, its structure.
CO2	Explore cryptocurrency fundamentals and the role of hash functions in securing transactions.
CO3	Acquire knowledge of consensus mechanisms like PoW, PoS, and BFT.
CO4	Evaluate the creation, deployment, and interaction of smart contracts using Solidity.
CO5	Use of blockchain in supply chain, healthcare, education, and CBDC to enhance security and transparency.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	-	-	-	2	-	1
CO2	2	-	-	2	-	2	-	2
CO3	2	1	1	-	2	2	-	2
CO4	1	2	1	1	1	1	-	1
CO5	1	2	2	2	1	2	-	2

Unit 1	**BLOCKCHAIN BASICS**	**09 hours**

Evolution of blockchain, decentralization, immutability, transparency, security, public blockchain, private blockchain, consortium blockchain, transaction lifecycle, block structure, hashing, Merkle trees, cryptocurrency and tokens, introduction to Distributed Ledger Technology (DLT), blockchain versus DLT

Unit 2	**CRYPTOCURRENCY & BITCOIN**	**09 hours**

Definition and history of cryptocurrency, role of cryptography, digital signatures, hash codes, peer-to-peer networks, origin and working of Bitcoin, Bitcoin transactions, basic scripting, roles of nodes

Unit 3	**CONSENSUS MECHANISMS**	**09 hours**

Proof of Work (PoW), mining process, scalability issues, Proof of Stake (PoS), staking and validators, Proof of Authority (PoA), Delegated Proof of Stake (DPoS), Byzantine Fault Tolerance (BFT), permissioned consensus algorithms like RAFT and PBFT, consensus elements

Unit 4	**SMART CONTRACTS & DEVELOPMENT**	**09 hours**

Smart contracts and automation, use cases, Solidity basics, writing simple contracts, contract deployment, Web3.js integration, Remote Procedure Call (RPC) protocols

Unit 5	**BLOCKCHAIN APPLICATION**	**09 hours**

Applications in supply chain and governance, security in IoT and DNS, blockchain for education and healthcare data, Central Bank Digital Currency (CBDC) in India, financial inclusion through blockchain

	Total Lecture Hours	**45 hours**

Textbook:

1. D. Drescher, Blockchain Basics: A Non-Technical Introduction in 25 Steps. New York, NY, USA: Apress, 2017.
2. A. M. Antonopoulos, Mastering Bitcoin: Unlocking Digital Cryptocurrencies, 2nd ed. Sebastopol, CA, USA: O'Reilly Media, 2017.
3. C. Dannen, Introducing Ethereum and Solidity: Foundations of Cryptocurrency and Blockchain Programming for Beginners. New York, NY, USA: Apress, 2017.

Reference Books:

1. Imran Bashir, *Mastering Blockchain*, 4th Edition, Packt Publishing, 2023
2. Quinn DuPont, *Cryptocurrencies and Blockchains*, Polity Press, 2023

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA211E	**Course Name: UI/UX Design for Web Application**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Understanding of mobile and web application.

Course Objectives:

Learn to create responsive and accessible designs for both mobile and web applications while gaining hands-on experience with standard tools. Develop essential skills by working on real-world projects, helping students to build a strong UI/UX portfolio and preparing them for a successful career in design.

Course Outcome:

Students will be able to:	
CO1	Understand UI/UX principles and their importance in web and mobile applications.
CO2	Demonstrate wireframes, prototypes, and user flows for different applications.
CO3	Apply UI design principles for aesthetically pleasing and functional interfaces
CO4	Use industry-standard tools like Figma, Adobe XD, and Sketch for UI/UX design.
CO5	Analyze UX designs using usability testing methods & Work on real-world projects.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	-	-	-	-	-	-	1
CO2	3	2	-	-	-	-	2	1
CO3	2	2	3	3	2	2	2	2
CO4	2	2	2	2	1	1	3	3
CO5	2	2	2	1	1	1	1	2

Unit - 1	INTRODUCTION TO UI/UX DESIGN	09 hours

Basics: Understanding UI (User Interface) and UX (User Experience), Differences between UI and UX, Importance of UI/UX in Web and Mobile Applications, UI/UX Design Process and Workflow, Design Thinking and Human-Centered Design (HCD), Design Thinking & User-Centered Design, Tools for UI/UX Design like Figma, Canva, Adobe XD, Sketch, Balsamiq.

Unit 2	USER RESEARCH & ANALYSIS	09 hours

UX Research Methods: Understanding User Needs and Behavior, Conducting User Interviews and Surveys, Competitor Analysis and Market Research, Defining User Journeys and User Flows, User Persona & User Journey, Information Architecture (IA), Wire-framing and Prototyping.

Unit 3	UI DESIGN PRINCIPLES	09 hours

Design Principles: Visual Design Principles (Color Theory, Typography, Layouts), Creating a Design System and Style Guide, Icons, Buttons, and Micro-interactions, UI Patterns and Design for mobile and web, Designing for Different Screen Sizes (Responsive and Adaptive Design)

Unit 4	WEB & MOBILE UI/UX DESIGN	09 hours

Web Design: HTML & CSS for UI Design, CSS Frameworks (Bootstrap, Tailwind CSS), Responsive Web Design (RWD) using Flexbox & Grid. **Mobile Design:** Mobile-First Design Approach, Touchscreen Design Considerations, Guidelines for iOS (Apple Human Interface Guidelines), Guidelines for Android (Material Design), Web Design vs. Mobile Design.

Unit 5	UX TESTING & EVALUATION	09 hours

Testing & Evaluation: A/B Testing and Usability Testing, Heatmaps and Analytics for User Behavior Tracking, Eye-Tracking and Click stream Analysis, Measuring UX Success with Metrics (Time on Task, Conversion Rates, etc.), UX Heuristics and Cognitive Load Analysis, Analyzing UI/UX of Popular Mobile and Web Applications.
Redesigning an Existing Application (Mini Project).

Total Lecture Hours	45 hours

Textbook:

1. Creative Tim, Roots of UI/UX: Learn to Develop Intuitive Web Experiences, Self-published, 2023.
1. Newbies Guide to UI/UX Design Using Figma, Author: Anthony E. Sanchez, Publisher: Inigi Publishers LLC, Year: 2024.

Reference Books:

1. The Art and Science of UX Design, Author: Anthony Conta, Year: 2023, Publisher: Pearson
2. Debasish Sarkar, Web and Mobile Interface Design, Oxford University Press, 2015.
3. Making Sense of UX Research, Authors: Raffaele Boiano & Riccardo Mazzucchelli, Year: 2022, Publisher: Apress Pawan Lingras and Rucha Lingras, Web Usability: A User-Centered Design Approach, Pearson India, 2017.

Mode of Evaluation:

Evaluation Scheme			
MSE	**CA**	**ESE**	**Total Marks**

	MSE1	MSE2	CA1	CA2	CA3(ATT)			
	30	30	6	6	3	75	150	
	60		15					

Course Code: CA302E	Course Name: Cloud-Native Development	L	T	P	C
		3	0	0	3

Pre-requisite: Basic understanding of cloud computing, Linux or Windows and data storage.

Course Objectives:

To provide a comprehensive understanding of cloud computing concepts, microservices architecture, DevOps automation, and cloud-native development.

Course Outcome:

Students will be able to:	
CO1	Understand the fundamental concepts of cloud computing and cloud-native development principles.
CO2	Demonstrate monolithic and microservices architectures.
CO3	Illustrate the importance of package management and containerization in modern software development.
CO4	Examine Kubernetes architecture and the role of automation in modern DevOps practices.
CO5	Explore cloud-based data storage solutions across different cloud platforms.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	1	-	-	-	-	-	1
CO2	2	2	-	-	-	-	-	2
CO3	2	-	-	1	-	-	-	2
CO4	2	2	1	3	-	-	-	2
CO5	2	-	2	3	-	-	-	3

Unit 1	CLOUD COMPUTING OVERVIEW	09 hours

Cloud Deployment Models: Public Cloud, Private Cloud, Community Cloud, Hybrid Cloud. Cloud Service Models: IaaS, PaaS, SaaS, Managed/Serverless Services, IT Ops, DevOps. Cloud Platforms: AWS, Google Cloud, Azure. Cloud-Native Development: Cloud-Native, Traditional Development vs. Cloud-Native. Agile Practices: Feature-Driven Development, Value-Driven Development, Agile Teams

Unit 2	MICROSERVICES	09 hours

Introduction to Microservices: Monolithic vs. Microservice Applications, Recognizing Microservice Boundaries, Stateful vs. Stateless Services, Managing Databases. Twelve-Factor Apps: The Twelve Factors. Microservice Architecture: Loosely-Coupled Services, Communicating Between Microservices, REST, OpenAPI

Unit 3	APPLICATION LIFECYCLE MANAGEMENT	09 hours

Package Management: Managing Application Dependencies, Maven and Gradle, Pip, NPM, NuGet. Source Control: Git, Basic Git Commands, GitHub, Version Control with Git on the Cloud. Docker: Understanding Docker, Containers, Advantages of Containers, Basic Docker Commands, Building Docker Images, Starting Containers, Stopping Containers, Deploying Docker Containers, Deleting Containers and Images.

Unit 4	KUBERNETES AND DEVOPS AUTOMATION (CI/CD)	09 hours

Kubernetes: Kubernetes Clusters, Kubernetes Architecture, EKS, GKE, Basic Kubernetes Commands, Pods, Deployments, Services, Configuration. DevOps Automation (CI/CD): Automation and DevOps, Automated Testing, Source and Version Control. CI/CD Pipelines: Cloud-Based (Azure, AWS, Google Cloud) CI/CD Tools, Jenkins, Spinnaker, Terraform.

Unit 5	CLOUD DATA SERVICES	09 hours

Storing Binary Data: Azure BLOB, S3, Cloud Storage. Relational Data Services: Azure Databases, AWS RDS, Google Cloud SQL and Cloud Spanner. NoSQL Data Services: Cosmos DB, DynamoDB, Firestore, Bigtable

	Total Lecture Hours	45 hours

Textbook:

1. Rajkumar Buyya, James Broberg, and Andrzej Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 1st edition, 2011
2. Sam Newman, Building Microservices: Designing Fine-Grained Systems, O'Reill, 2nd edition, 2021

3. Kief Morris, Infrastructure as Code: Managing Servers in the Cloud, O'Reilly, 2nd edition, 2020
4. Kelsey Hightower, Brendan Burns, and Joe Beda, Kubernetes Up & Running, O'Reilly, 2nd edition 2019

Reference Books:

1. Thomas Erl, Cloud Computing: Concepts, Technology & Architecture, Pearson, 1st edition, 2013
2. Pethuru Raj, Anupama Raman, The Internet of Things: Enabling Technologies, Platforms, and Use Cases, CRC Press, 1st edition, 2017
3. Gene Kim, Jez Humble, Patrick Debois, John Willis, The DevOps Handbook, IT Revolution Press, 1st edition, 2016
4. Nigel Poulton, The Kubernetes Book, Independently Published, 1st edition, 2017

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA303L	Course Name: DevOps for Scalable Applications	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of Software Development Lifecycle, Cloud Computing, and Version Control Systems.

Course Objectives:

This course aims to provide an in-depth understanding of DevOps and its role in scalable application development. It covers automation, continuous integration, and deployment practices, along with containerization and orchestration for efficient application management. Additionally, students will learn DevOps security best practices and monitoring strategies while assessing its impact in real-world scalable applications.

Course Outcome:

Students will be able to:	
CO1	Explain the principles and methodologies of DevOps.
CO2	Apply CI/CD pipelines for automated software delivery.
CO3	Demonstrate containerization using Docker and Kubernetes.
CO4	Apply DevOps security strategies and monitoring tools.
CO5	Apply the role of DevOps in scalable and high-availability applications.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	-	-	-	2	-	1
CO2	2	1	2	2	-	2	-	2
CO3	2	1	1	-	2	2	-	2
CO4	1	2	1	1	1	1	-	1
CO5	1	2	2	2	1	2	-	2

Unit 1	INTRODUCTION TO DEVOPS	09 hours

Fundamentals of DevOps and Agile Methodologies, DevOps Lifecycle and Workflow, Key Tools in DevOps (Jenkins, Git, Docker, Kubernetes, etc.)

Unit 2	CONTINUOUS INTEGRATION & CONTINUOUS DEPLOYMENT (CI/CD)	09 hours

CI/CD Pipeline: Concepts and Implementation, Source Code Management with Git and GitHub Actions, Jenkins and Automated Build Management, Deployment Strategies (Blue-Green, Canary)

Unit 3	CONTAINERIZATION AND ORCHESTRATION	09 hours

Docker: Containers, Images, and Registry, Kubernetes: Architecture, Components, and Services, Helm Charts and Kubernetes Deployment, Container Security Best Practices

Unit 4	DEVOPS SECURITY & MONITORING	09 hours

DevSecOps: Integrating Security into DevOps, Security Scanning and Vulnerability Assessment, Monitoring and Logging: ELK Stack, Prometheus, Grafana, Incident Response and Root Cause Analysis

Unit 5	DEVOPS FOR SCALABLE APPLICATIONS	09 hours
High Availability and Fault Tolerance, Scaling Applications with Kubernetes and Auto-scaling, Serverless Computing and Microservices Architecture, Case Studies of Large-Scale DevOps Implementations		
	Total Lecture Hours	**45 hours**

Textbook:

1. Gene Kim, Jez Humble, Patrick Debois, and John Willis, 2021. The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations.

Reference Books:

1. Kief Morris, 2016. Infrastructure as Code: Managing Servers in the Cloud.
2. Viktor Farcic, 2016. The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline with Containerized Microservices.
3. N. Ravishankar, 2024. DevOps Automation Cookbook.

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA304E	Course Name: Cyber Security	L	T	P	C
		3	0	0	3

Pre-requisite: Networking and Cloud computing

Course Objectives:

The course has been designed to meet the needs of professionals working in IT, web development, and the creation of intellectual properties. It equips prospective professionals with the skills to closely monitor their activities in various areas of Information Technology, helping them avoid mistakes while using technology. As a result, this course enhances their overall effectiveness in the IT world.

Course Outcome:

Students will be able to:		BL	KC
CO1	Understand the basic cybersecurity concepts along with its policies and compliances.	2	C
CO2	Describe secure enterprise networks architecture using firewalls, IDS/IPS, and VPNs.	2	C
CO3	Discuss various tools for endpoints security, cloud and application layers security.	2	C
CO4	Illustrate IAM systems, encryption techniques, and perform risk assessments to protect enterprise data and access.	3	C
CO5	Determine different security operations and incident response, and real-world case studies.	3	C

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	-	2	-	-	-	-	2	2
CO2	2	-	-	-	-	-	2	2
CO3	1	-	-	-	-	-	2	3
CO4	1	1	-	-	-	-	3	2
CO5	2	2	2	2	-	-	3	3

Unit 1	INTRODUCTION TO ENTERPRISE CYBER SECURITY	09 hours

Overview of Cyber Security: Basic concepts, terminologies, and goals (CIA triad), Cyber security vs. Information security. **Enterprise Security Landscape:** Enterprise architecture and attack surfaces, Security challenges in enterprises. **Threats, Vulnerabilities, and Attacks:** Common attack types: malware, phishing, ransomware, insider threats, Threat actors: script kiddies, hacktivists, APTs, cybercriminals. **Security Policies and Compliance:** Importance of security policies and governance, Overview of ISO 27001, NIST, GDPR, HIPAA.

Unit 2	NETWORK SECURITY IN ENTERPRISES	09 hours

Enterprise Network Architecture: DMZ, firewalls, routers, switches, and segmentation. **Firewalls and Intrusion Systems:** Packet filtering, stateful inspection, application-layer firewalls- IDS vs. IPS (host-based and network-based). **Virtual Private Networks (VPNs):** Site-to-site and remote-access VPNs- Tunneling protocols (IPSec, SSL). **Network Monitoring and Logging:** Traffic analysis tools (Wireshark, NetFlow)- SIEM basics (Security Information and Event Management).		
Unit 3	**ENDPOINT, CLOUD, AND APPLICATION SECURITY**	**09 hours**
Endpoint Security: Anti-malware, host-based firewalls, EDR (Endpoint Detection and Response). **Cloud Security:** Cloud service models (IaaS, PaaS, SaaS)- Cloud security challenges and shared responsibility model- Identity and access in the cloud (IAM, SSO, MFA). **Application Security:** Secure SDLC, OWASP Top 10 vulnerabilities- Web application firewalls (WAFs), input validation, and patch management.		
Unit 4	**IDENTITY MANAGEMENT, CRYPTOGRAPHY & RISK MANAGEMENT**	**09 hours**
Identity and Access Management (IAM): Authentication (2FA, biometrics), Authorization (RBAC, ABAC)- LDAP, SAML, OAuth, and OpenID. **Enterprise Cryptography:** Symmetric vs. Asymmetric encryption- Digital signatures, certificates, PKI. **Security Risk Assessment and Management:** - Risk analysis methods (qualitative/quantitative)- Threat modeling (STRIDE), vulnerability assessments- Business Continuity Planning (BCP) and Disaster Recovery (DR).		
Unit 5	**SECURITY OPERATIONS, INCIDENT RESPONSE & CASE STUDIES**	**09 hours**
Security Operations Center (SOC): Roles and responsibilities, SOC architecture. **Incident Response Lifecycle:** Preparation, detection, containment, eradication, recovery, lessons learned- Forensics basics in enterprise environments. **Case Studies and Recent Attacks:** Analysis of real-world enterprise breaches (e.g., Equifax, SolarWinds)- Lessons learned from major incidents. **Emerging Trends:** Zero Trust Architecture- AI/ML in cybersecurity- Cybersecurity in Industry 4.0 and IoT.		
	Total Lecture Hours	**45 hours**

Textbook:

1. What Everyone Needs to Know by P.W. Singer and Allan Friedman, published by Oxford University Press in its 1st edition (2014).
2. Computer Security: Principles and Practice by William Stallings and Lawrie Brown, published by Pearson in its 5th edition (2024).

Reference Books:

1. Network Security Essentials: Applications and Standards by William Stallings, published by Pearson in its 6th edition (2023).
2. Hacking: The Art of Exploitation by Jon Erickson, published by No Starch Press in its 2nd edition (2008).
3. Applied Cryptography: Protocols, Algorithms, and Source Code in C by Bruce Schneier, published by Wiley in its 2nd edition (1995).
4. The Web Application Hacker's Handbook by Dafydd Stuttard and Marcus Pinto, published by Wiley in its 2nd edition (2011).

Mode of Evaluation:

Evaluation Scheme						
MSE		**CA**			**ESE**	**Total Marks**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3(ATT)**		
30	30	6	6	3	**75**	**150**
60		**15**				

Course Code: CA305E	**Course Name: Network Security and Cryptography**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

Pre-requisite: Basic knowledge of computer networks and operating systems.

Course Objectives:

This course aims to provide a fundamental understanding of network security principles and cryptographic techniques. It covers various security threats, encryption methods, authentication mechanisms, and network defense strategies. Students will also explore security protocols, intrusion detection systems, and real-world cybersecurity applications.

Course Outcome:

Students will be able to:		BL	KC
CO1	Understand the fundamentals of network security and cryptographic techniques.	2	C
CO2	Apply cryptographic algorithms for encryption, decryption, and authentication.	3	C
CO3	Apply security measures to mitigate various network attacks and vulnerabilities.	3	C
CO4	Illustrate security protocols and mechanisms for data protection.	3	C
CO5	Apply security solution in practical scenario case studies.	3	C

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	-	-	-	-	-	-	1
CO2	3	3	2	-	-	-	1	2
CO3	2	3	3	-	-	-	2	2
CO4	1	1	2	-	-	-	2	2
CO5	2	1	1	-	2	-	2	3

Unit 1	INTRODUCTION TO NETWORK SECURITY	09 hours

Basics of Security: CIA Triad (Confidentiality, Integrity, Availability), Security Threats and Vulnerabilities: Malware, Phishing, DoS/DDoS attacks, Security Models and Policies, Overview of Network Security Architectures.

Unit 2	CRYPTOGRAPHY FUNDAMENTALS	09 hours

Introduction to Cryptographic Techniques: Symmetric vs Asymmetric Encryption, Classical Ciphers: Caesar Cipher, Vigenère Cipher, Playfair Cipher, Modern Cryptographic Algorithms: DES, AES, RSA, Key Exchange Protocols: Diffie-Hellman Key Exchange.

Unit 3	AUTHENTICATION & HASHING	09 hours

Authentication Mechanisms: Password-based Authentication, Multi-Factor Authentication, Digital Signatures and Certificates (PKI), Hash Functions: MD5, SHA-1, SHA-256, Message Authentication Codes (MAC) and HMAC.

Unit 4	NETWORK SECURITY MECHANISMS	09 hours

Firewalls: Types, Packet Filtering, Stateful Inspection, Intrusion Detection and Prevention Systems (IDS/IPS), Virtual Private Networks (VPN) and Secure Sockets Layer (SSL), Secure Email and Web Security (HTTPS, TLS).

Unit 5	SECURITY PROTOCOLS & APPLICATIONS	09 hours

Secure Network Protocols: IPSec, SSL/TLS, SSH, Wireless Security: WPA, WPA2, WEP Vulnerabilities, Cloud Security & IoT Security Challenges, Case Studies: Cyber Attacks and Countermeasures.

Total Lecture Hours	45 hours

Textbook:

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson.
2. Behrouz A. Forouzan, Cryptography & Network Security, McGraw-Hill.

Reference Books:

1. Charles P. Pfleeger, Security in Computing, Pearson.
2. Atul Kahate, Cryptography and Network Security, Tata McGraw-Hill.

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA306E	Course Name: Digital Forensics	L	T	P	C
		3	0	0	3

Pre-requisite: Basic understanding of computer systems and networking concepts.

Course Objectives:

To equip students with foundational knowledge of digital forensics, focusing on investigation procedures, data acquisition, and evidence analysis using forensic tools.

Course Outcome:

Students will be able to:		BL	KC
CO1	Understand the fundamentals of computer forensics, its legal concerns.	2	C
CO2	Explain computing investigations and advanced data recovery techniques.	2	C
CO3	Illustrate knowledge of data acquisition methods and its tools.	3	C
CO4	Determine the process of securing, seizing, and storing digital evidence from crime scenes.	3	C
CO5	Explore current computer forensic tools to validate & test its software.	3	C

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	-	-	-	-	-	2	1
CO2	2	2	-	-	-	-	-	2
CO3	2	2	2	2	-	-	-	2
CO4	2	3	1	-	-	-	2	1
CO5	3	1	2	3	-	-	1	2

Unit 1	FUNDAMENTALS OF DIGITAL FORENSICS AND LEGAL ASPECTS	09 hours

Introduction to Digital Forensics, Benefits of forensics, Computer Crimes, Legal Concerns, Computer forensics evidence and courts, private issues, and AI in Forensics

Unit 2	PROCEDURES AND METHODOLOGIES IN DIGITAL INVESTIGATIONS	09 hours

Understanding Computing Investigations – Digital Investigation Procedures, Procedure for corporate High-Tech investigations, Advanced Recovery Techniques, and understanding data recovery workstation & software.

Unit 3	ADVANCED DATA ACQUISITION AND STORAGE FORENSICS	09 hours

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, Cloud, and IoT Forensics

Unit 4	CRIME SCENE MANAGEMENT AND EVIDENCE HANDLING	09 hours

Processing crimes and incident scenes, securing a computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, Mobile Forensics, and Case Review.

Unit 5	MODERN FORENSIC TOOLS, EMAIL ANALYSIS, AND BLOCKCHAIN INTEGRATION	09 hours

Current computer forensics tools- software, hardware tools, validating and testing forensic software, addressing data-hiding techniques, performing remote acquisitions, E-Mail investigations- investigating email crime and violations, understanding E-Mail servers, specialized E-Mail forensics tool, and Role of Blockchain and AI in Forensics.

Total Lecture Hours	45 hours

Textbook:

1. Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
2. Nelson, B, Phillips, A, Enfinger, F, Stuart, C., "Guide to Computer Forensics and Investigations, 5th ed., Thomson Course Technology, 2016, ISBN: 978-1305102331.

Reference Books:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 3rd Ed, Charles River Media, 2014, ISBN: 978-1584500186.

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA307E	Course Name: Quality Assurance in Software Development	L	T	P	C
		3	0	0	3

Pre-requisite: Fundamental of Software Engineering

Course Objectives:

The objective of this course is to provide students with a comprehensive understanding of software quality assurance **(QA)**, equipping them with the knowledge, and methodologies needed to ensure software reliability.

Course Outcome:

Students will be able to:	
CO1	Understand basic concepts of software quality.
CO2	Explain Software Quality Assurance and Quality Control.
CO3	Apply Quality Metrices and Measurements for quality improvements of a software product.
CO4	Illustrate Software Reliability Models for quality assessment.
CO5	Demonstrate Static Testing and Dynamic Testing

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	-	-	-	-	-	-	-
CO2	2	-	-	-	2	-	-	1
CO3	3	3	1	-	-	-	-	2
CO4	3	3	1	-	-	-	-	1
CO5	1	3	1	-	2	-	-	2

Unit 1	**INTRODUCTION TO SOFTWARE QUALITY**	**09 hours**

Software Quality: Definition, Software Quality Attributes and Specification, Cost of Quality, Defects, Faults, Failures, Defect Rate and Reliability, Defect Prevention, Reduction, and Containment, Overview of Different Types of Software Review, Introduction to Measurement and Inspection Process, Documents and Metrics.

Unit 2	**SOFTWARE QUALITY ASSURANCE**	**09 hours**

Software Quality Assurance: Quality Planning and Control, Quality Improvement Process, Evolution of Software Quality Assurance (SQA), Major SQA Activities, Major SQA Issues, Zero Defect Software, SQA Techniques, Statistical Quality Assurance, Total Quality Management, Quality Standards and Processes.

Unit 3	**SOFTWARE QUALITY METRICS**	**09 hours**

Software Quality Metrics Product Quality Metrics: Defect Density, Customer Problems Metric, Customer Satisfaction Metrics, Function Points, In-Process Quality Metrics: Defect Arrival Pattern, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance: Backlog Management Index, Fix Response Time, Fix Quality, Software Quality Indicators.

Unit 4	**SOFTWARE QUALITY MANAGEMENT & RELIABILITY**	**09 hours**

Software Quality Management and Models: Modeling Process, Software Reliability Models: The Rayleigh Model, Exponential Distribution and Software Reliability Growth Models, Software Reliability Allocation Models, Criteria for Model Evaluation, Software Quality Assessment Models: Hierarchical Model of Software Quality Assessment.

Unit 5	**SOFTWARE VERIFICATION & VALIDATION**	**09 hours**

Software Verification, Validation & Testing: Verification and Validation, Evolutionary Nature of Verification and Validation, Impracticality of Testing all Data and Paths, Proof of Correctness, Software Testing, Functional, Structural and Error-Oriented Analysis & Testing, Static and Dynamic Testing Tools, Characteristics of Modern Testing Tools.

	Total Lecture Hours	**45 hours**

Textbook:

1. Software Quality Engineering (SQE), Jeff Tian, Wiley-Interscience, 2005
2. Metrics and Models in Software Quality Engineering, Stephen H. Kan, Addison Wesley(2002)
3. Software Metrics, Norman E. Fenton and Shari Lawrence Pfleeger, Thomson, 2003

Reference Books:

1. Software Quality, Mordechai Ben – Menachem and Garry S.Marliss, Thomson Asia Pte Ltd
2. Software Quality Assurance, Daniel Galin, Pearson Education
3. Software Testing And Quality Assurance: Theory And Practice, Kshirasagar Naik, Priyadarshi Tripathy, Wiley
4. Software Quality Assurance, Nina Godbole, Norosa

Mode of Evaluation:

Evaluation Scheme

MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)	75	150
30	30	6	6	3		
60		15				

Course Code: CA308E	Course Name: Agile Development	L	T	P	C
		3	0	0	3

Pre-requisite: Fundamental of Software Engineering and Cloud Computing

Course Objectives:

The objective is to introduce students to Agile methodologies and highlight their significance in modern software development. Additionally, it aims to help students understand the principles and frameworks of Agile development, including Scrum, Kanban, and XP.

Course Outcome:

Students will be able to:	
CO1	Understand the core principles and values of Agile development.
CO2	Apply Agile frameworks such as Scrum and Kanban in software development.
CO3	Utilize Agile planning techniques, including user stories, sprints, and backlog management.
CO4	Illustrate Agile practices for continuous integration, testing, and deployment.
CO5	Evaluate Agile adoption challenges and recommend solutions for process improvement.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	1	-	-	-	2	1	3	-
CO2	2	1	2	-	3	3	2	2
CO3	2	-	2	1	3	3	2	3
CO4	-	-	1	-	2	2	1	3
CO5	3	2	1	2	3	1	3	3

Unit 1	INTRODUCTION TO AGILE DEVELOPMENT	09 hours

Introduction to Agile methodologies, Agile Manifesto, and its principles. Comparison with traditional models, emphasizing flexibility, collaboration, and iterative development. Overview of Agile roles, benefits, and challenges in adoption. Case studies on Agile transformation and best practices.

Unit 2	AGILE FRAMEWORKS AND MODELS	09 hours

Detailed study of Scrum, Kanban, and XP frameworks. Scrum roles, ceremonies, and artifacts. Kanban principles, workflow visualization, and WIP limits. XP practices like TDD and Pair Programming. Comparative analysis and real-world applications.

Unit 3	AGILE PLANNING AND ESTIMATION	09hours

Agile project planning, backlog management, and estimation techniques like Planning Poker and T-Shirt Sizing. Agile metrics, sprint planning, and stakeholder communication. Strategies for maintaining sustainable Agile workflows and adapting to evolving requirements.

Unit 4	AGILE DEVELOPMENT PRACTICES	09 hours

Agile engineering practices, including CI/CD, TDD, and BDD. Code quality, refactoring, and technical debt management. DevOps integration, risk management, and high-performing Agile team collaboration techniques.

Unit 5	SCALING AGILE AND AGILE TRANSFORMATION	09 hours

Agile at scale using SAFe, LeSS, and DAD. Agile leadership, cultural transformation, and overcoming resistance. Agile portfolio management, performance tracking, and real-world case studies on successful Agile adoption beyond software development.

Total Lecture Hours	45 hours

Textbook:

1. Clean Agile: Back to Basics – Robert C. Martin (1st Ed., 2019)
2. EDGE: Value-Driven Digital Transformation – Jim Highsmith, Linda Luu, and David Robinson (1st Ed., 2020)
3. The Project Manager's Guide to Mastering Agile – Charles G. Cobb (2nd Ed., 2023)

Reference Books:

1. Agile Estimating and Planning – Mike Cohn
2. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation – Jez Humble and David Farley
3. Kanban: Successful Evolutionary Change for Your Technology Business – David J. Anderson

Mode of Evaluation:

Evaluation Scheme						
MSE		CA			ESE	Total Marks
MSE1	MSE2	CA1	CA2	CA3(ATT)		
30	30	6	6	3	75	150
60		15				

Course Code: CA309E	Course Name: Software Project Management	L	T	P	C
		3	0	0	3

Pre-requisite: Basic knowledge of software engineering.

Course Objectives:

This course equips students with core and advanced SPM knowledge, including Agile, DevOps, planning, risk management, and team collaboration, preparing them for industry challenges and research.

Course Outcome:

Students will be able to:	
CO1	Explain core concepts of SPM, including methodologies, lifecycles, and governance
CO2	Illustrate various project plans using tools like WBS, Gantt charts, and PERT/CPM.
CO3	Express agile practices (Scrum, Kanban) and DevOps principles in projects.
CO4	Apply risks, quality metrics, and cost-benefit trade-offs in software projects.
CO5	Explore emerging trends like AI in project management and hybrid methodologies.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	2	1	-	-	-	-	-	2
CO2	2	3	-	2	2	2	-	1
CO3	2	2	2	2	2	1	-	1
CO4	2	2	1	-	-	2	2	1
CO5	1	1	-	-	-	-	1	2

Unit 1	FUNDAMENTALS OF SOFTWARE PROJECT MANAGEMENT	09 hours

Introduction to SPM: Definition, importance, and challenges; Differences between project, program, and portfolio management; Project Lifecycles: Predictive, Iterative, Agile; Hybrid models and their applications; Roles & Responsibilities: Project manager, product owner, Scrum master, development team; Stakeholder analysis and communication strategies; Governance & Ethics: PMI, ISO, and CMMI standards; Ethical dilemmas in project management.

Unit 2	REQUIREMENTS, ESTIMATION & RESOURCE MANAGEMENT	09 hours

Introduction to SPM: Definition, importance, and challenges; Differences between project, program, and portfolio management; Project Lifecycles: Predictive, Iterative, Agile; Hybrid models and their applications; Roles & Responsibilities: Project manager, product owner, Scrum master, development team; Stakeholder analysis and communication strategies; Governance & Ethics: PMI, ISO, and CMMI standards; Ethical dilemmas in project management.

Unit 3	MODERN SOFTWARE DELIVERY: AGILE FRAMEWORKS, IAC, AND METRICS	09 hours

Agile Methodologies: Scrum: Roles (PO, Scrum Master), artifacts (product backlog, sprint backlog), ceremonies (daily standups, retrospectives); Kanban: Work-in-progress (WIP) limits, cumulative flow diagrams; Scaling Agile: SAFe, LeSS, Spotify model; Infrastructure as Code (IaC) using Terraform/Ansible; Metrics & Performance: Agile metrics (velocity, sprint burndown).

Unit 4	RISK AND QUALITY AND STAKEHOLDER MANAGEMENT	09 hours

Risk Management: Identification (brainstorming, SWOT analysis); Quantitative (Monte Carlo simulation) vs. qualitative (risk matrix) analysis; Mitigation strategies (avoidance, transfer, acceptance); Quality Assurance: Standards: ISO 9001, CMMI, Six

Sigma; Testing: Unit, integration, system, UAT; Tools: Selenium, JUnit, Postman; Stakeholder Management: Communication plans, conflict resolution techniques; Negotiation and expectation management.		
Unit 5	**EMERGING TRENDS AND CASE STUDIES**	**09 hours**
AI in Project Management: Predictive analytics for risk assessment; AI-driven chatbots for stakeholder communication; Hybrid Models: Agile-Waterfall blends for regulated industries (healthcare, finance); Case Studies: Successes: Spotify's Agile model, NASA's risk management; Failures: Knight Capital's DevOps disaster, NHS IT project; Ethics & Future Trends: Remote team management, gig economy challenges; Sustainability in project management.		
	Total Lecture Hours	**45 hours**

Textbook:

1. Hughes, B., Cotterell, M., & Rajkumar, R. (2020). Software project management (6th ed.). McGraw-Hill Education.
2. Cohn, M. (2005). Agile estimating and planning. Pearson Education, Ist edition.

Reference Books:

1. Sangamithra, A. (2021). Project management for IT professionals. Wiley.
2. Kim, G., Debois, P., Willis, J., & Humble, J. (2021). The DevOps handbook: How to create world-class agility, reliability, & security in technology organizations (2nd ed.). IT Revolution Press.

Mode of Evaluation:

Evaluation Scheme						
MSE		**CA**			**ESE**	**Total Marks**
MSE1	**MSE2**	**CA1**	**CA2**	**CA3(ATT)**		
30	30	6	6	3	**75**	**150**
60		**15**				

Practical Courses Detail Syllabus

Course Code: CA205P	**Course Name: Analysis & Design of Algorithms Lab**	**L**	**T**	**P**	**C**
		0	**0**	**4**	**2**

Pre-requisite: Understanding of programming language like C / C++ with all basic concepts.

Course Objectives:

This course aims to equip students with a strong foundation in algorithm design, analysis, and optimization techniques. Students will learn string matching algorithms, dynamic programming, graph algorithms, and advanced data structures.

Course Outcome:

Students will be able to:	
CO1	Compute time and space complexity of algorithms using asymptotic analysis.
CO2	Apply Divide and Conquer strategy for recursive algorithms.
CO3	Solve optimization problems using Greedy and Dynamic Programming approaches
CO4	Demonstrate solutions to constraint-based problems using Backtracking and Branch & Bound.
CO5	Identify NP-Complete problems and simulate real-world cases using polynomial-time reductions

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	3	2	-	-	-	-	-	1
CO2	3	3	3	-	**2**	-	-	2
CO3	3	3	3	2	**2**	-	-	2
CO4	3	3	3	1	-	-	-	2
CO5	3	3	3	2	-	-	-	3

List of Practical's (Indicative & Not Limited to)

Unit 1: Introduction and Complexity Analysis

1. Write a program to implement and analyze the **Insertion Sort** algorithm. Count and display the number of comparisons and swaps made.
2. Write a program to compare the **empirical and theoretical time complexity** of Bubble Sort, Insertion Sort, and Selection Sort across varying input sizes. Plot the results using a graph.
3. Write recursive and iterative programs to calculate **factorial or Fibonacci numbers**, and analyze their time and space complexities.

Leet Code Problems:

- Solve the problem **"Two Sum"** to find indices of two numbers that add up to a target sum. (LeetCode #1)
- Solve the problem **"Time Based Key-Value Store"** to understand time and space complexity in data structure design. (Leet Code #981)

Unit 2: Divide & Conquer and Recurrences

4. Write a program to implement **Merge Sort** and **Quick Sort**, and compare their time complexity empirically using different input sizes.
5. Write a program to implement **Binary Search**, and extend it to find the **first and last occurrence** of an element in a sorted array.
6. Write programs to implement **traditional matrix multiplication** and **Strassen's matrix multiplication**, and compare their performance.

LeetCode Problems:

- Solve the problem **"Search in Rotated Sorted Array"**, which uses an enhanced binary search. (LeetCode #33)
- Solve the problem **"Kth Largest Element in an Array"**, which can be optimized using Quickselect (a divide-and-conquer strategy). (LeetCode #215)
- Solve the problem **"Majority Element"** to practice recurrence-based analysis. (LeetCode #169)

Unit 3: Greedy Method and Dynamic Programming

7. Write a program to implement the **Fractional Knapsack Problem** using a greedy strategy. Sort items by profit-to-weight ratio.
8. Write a program to solve the **0/1 Knapsack Problem** using dynamic programming with tabulation. Display the optimal subset of items selected.
9. Write a program to solve the **Edit Distance Problem** (Levenshtein Distance) using dynamic programming.
10. Write a program to solve the **Matrix Chain Multiplication Problem** using dynamic programming.

LeetCode Problems:

- Solve the problem **"Coin Change"**, which requires dynamic programming to find the minimum number of coins. (LeetCode #322)
- Solve the problem **"Longest Increasing Subsequence"** using dynamic programming. (LeetCode #300)
- Solve the problem **"House Robber"** to practice interval DP. (LeetCode #198)
- Solve the problem **"Partition Equal Subset Sum"**, which involves subset sum using DP. (LeetCode #416)

Unit 4: Backtracking and Branch & Bound

11. Write a program to solve the **N-Queens Problem** using backtracking. Display all valid configurations for placing N queens.
12. Write a program to solve the **Subset Sum / Sum of Subsets Problem** using backtracking. Display all subsets that sum to a target value.

13. Write a program to solve the **0/1 Knapsack Problem using Branch and Bound**, and display the search space tree or bounding information.
14. Write a program to solve the **Travelling Salesperson Problem** using Branch and Bound technique.

LeetCode Problems:

- Solve the problem **"Combination Sum"** using backtracking to find all combinations that sum to a target. (LeetCode #39)
- Solve the problem **"Word Search"**, where a backtracking solution helps in 2D search. (LeetCode #79)
- Solve the problem **"Sudoku Solver"** using backtracking to fill a 9x9 grid. (LeetCode #37)
- Solve the problem **"Permutations"** to generate all permutations of a list. (LeetCode #46)

Unit 5: Complexity Classes and Lower Bound Theory

15. Write a program to solve the **Subset Sum Problem**, demonstrating its NP-Complete nature. Accept a set of integers and target sum as input.
16. Write a program to check the existence of a **Hamiltonian Cycle** in a graph using backtracking.
17. Write a program to solve the **Vertex Cover Problem** using brute force or approximation for small graphs.
18. (Optional/Advanced) Implement a simplified version of the **2-SAT Problem** using implication graph.

LeetCode Problems:

- Solve the problem **"Course Schedule"**, which involves topological sorting and cycle detection (NP-related). (LeetCode #207)
- Solve the problem **"Jump Game"**, which can be analyzed under P/NP context. (LeetCode #55)
- Solve the problem **"N-Queens II"**, where the number of distinct solutions needs to be counted. (LeetCode #52)
- Solve the problem **"Subset Sum Equal Partition"**, which connects to NP-complete problems. (LeetCode #416)

Total Lecture Hours	**60 hours**

Textbook:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, 3rd Edition, MIT Press, 2009.
2. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2012.

Reference Books:

1. S. Sridhar, Design and Analysis of Algorithms, Oxford University Press, 2014.
2. Kasturi Viswanath and S. S. Sane, Design and Analysis of Algorithms, Wiley India, 2017.
3. S. K. Basu, Design Methods and Analysis of Algorithms, PHI Learning, 2005.
4. A. Puntambekar, Design and Analysis of Algorithms, Technical Publications, 2019.
5. R. Panneerselvam, Design and Analysis of Algorithms, PHI Learning, 2013.
6. M. H. Alsuwaiyel, Algorithms: Design Techniques and Analysis, World Scientific Publishing, Indian Edition, 2016.
7. G. A. Vijayalakshmi Pai, Design and Analysis of Algorithms: A Contemporary Perspective, CRC Press, Indian Edition, 2018

Mode of Evaluation:

Evaluation Scheme			
CA		**ESE**	**Total Marks**
CA1	**CA2**		
25	25	**50**	**100**
50			

Course Code: HS301P	**Course Name: Communication for Employability**	**L**	**T**	**P**	**C**
		0	**0**	**2**	**NC**

Pre-requisite: Students must have completed Communication Skills in the 1st semester and Campus to Corporate module in the 2nd semester.

Course Objectives

To enhance students' employability through advanced verbal ability, structured recruitment readiness, and communication strategies for a dynamic corporate environment.

Course Outcome:

Students will be able to:	
CO1	Apply advanced verbal ability and communication strategies in real-time scenarios to demonstrate professional readiness.
CO2	Analyze various components of employability for effective participation and performance in the recruitment processes.
CO3	Evaluate workplace communication scenarios and behavioural responses to demonstrate professional competence.

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

CO-PO Mapping	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8
CO1	-	1	-	-	2	-	-	1
CO2	-	1	-	-	2	-	-	1
CO3	-	-	-	-	2	-	-	2

Topic - 1	**Resume Based Discussions**	
Overview- To enable the students to confidently articulate and defend their resumes along with highlighting their skills during a job interview. Activity- Discussions		**02 Hours**
Topic - 2	**Company based Verbal Ability Paper-I**	
Overview – The students will be made to solve and discuss the previous year/company pattern based VA Paper Activity – Solving VA Papers		**02 Hours**
Topic - 3	**Effective Presentation Techniques**	
Overview: Structuring a presentation, storytelling techniques, use of visuals. Activity: "Idea Pitch" – 1-minute presentation on a tech idea and Duolingo Assessment		**04 Hours**
Topic - 4	**Group Discussion Strategies for Placements**	
Overview: Abstract/Case-based group discussion strategies for placements Activity: "Mock Group Discussion" related to previous year topics (DEI)		**02 Hours**
Topic - 5	**Company based Verbal Ability Paper-II**	
Overview – The students will be made to solve and discuss the previous year/company pattern based VA Paper Activity – Solving VA Papers		**02 Hours**
Topic - 6	**Introduction to psychometric testing**	
Overview- Providing exposure to the students on psychometric testing. Activity- Solving Big 5 (OCEAN)/ ROTTER's Locus of Control		**02 Hours**
Topic - 7	**Company based Verbal Ability Paper-III**	
Overview – The students will be made to solve and discuss the previous year/company pattern based VA Paper Activity – Solving VA Papers		**02 Hours**
Topic - 8	**Problem-Solving & Decision-Making Strategies**	
Overview- Analytical thinking, root cause analysis, structured problem-solving. Activity: "The CEO's Dilemma" – Solve and discuss a case study on a corporate challenge in a group		**04 Hours**
Topic - 9	**Advanced Interview Skills**	
Overview- To equip the candidates with strategic techniques, behavioral insights, and answering strategies to excel job interviews. Activity: STAR method, Remasto, SRTs, and follow up questions.		**06 Hours**
Topic - 10	**Company based Verbal Ability Paper-IV**	
Overview – The students will be made to solve and discuss the previous year/company pattern based VA Paper Activity – Solving VA Papers		**04 Hours**
	Total hours	**30 Hours**

Textbook:

1. Jeff Butterfield, (2019) Soft Skills for Everyone, 2nd Edition, Cengage Learning
2. Personality Development and Soft Skills, By Barun Mitra

Reference Books:

1. Business Communication for Managers; Payal Mehra, Pearson Delhi, 2012

2. Uma Maheshwari, (2018), Soft Skills for Campus Placements, 1st Edition, Wiley India Private Limited.
3. Wren, P.C.; Martin, H.; Prasada Rao, N.D.V. (1973–2010). High School
4. English Grammar & Composition. New Delhi: S. Chand. ISBN 81-219-2197-X.
5. Sherfield et. al. (2012) Developing Soft Skills, 4th Edition, Pearson Education

Mode of Evaluation:

Evaluation Scheme					
MSE		**CA**		**ESE**	**Total Marks**
MSE1	**MSE2**	**CA1**	**CA2**	**25**	**50**
-	-	12	13		
-		**25**			