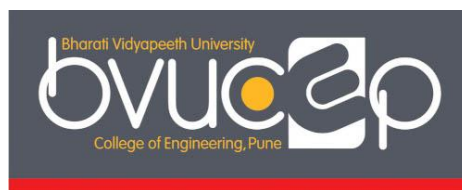




Bharati Vidyapeeth
(Deemed to be University)
Pune, India

College of Engineering, Pune



B. Tech (Information Technology) Sem-V-VI
(2023 CBCS COURSE)
Proposed Program Curriculum
As Per NEP Guidelines

VISION OF THE UNIVERSITY

Social Transformation through Dynamic Education

MISSION OF THE UNIVERSITY

- To make available quality education in different areas of knowledge to the students as per their choice and inclination
- To offer education to the students in a conducive ambience created by enriched infrastructure! and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities
- To make available quality education to the students of rural, tribal and other deprived sections of the population

VISION OF THE INSTITUTE

To be World Class Institute for Social Transformation Through Dynamic Education.

MISSION OF THE INSTITUTE

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

VISION OF THE DEPARTMENT

To be a leading Programme, transforming students into skilled IT professionals.

MISSION OF THE DEPARTMENT

- Amplify the student's technical skills by conducting continuing education programs, organizing and participating in various technical events.
- Provide comprehensive support in synchronization with industry to achieve professional and technological excellence.
- Provide an environment for effective social and ethical skills.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Cultivate IT graduates for industry, pertaining to Information Technology solutions.

PEO2: Practice technical competency and teamwork abilities.

PEO3: Exhibit social responsibilities by following ethical practices in graduate's professional pursuits.

PROGRAM OUTCOMES

1. Apply knowledge of Mathematics and Computer Science to analyse computer-based information systems.
2. Apply logical and programming skills to identify, formulate and analyse for solving computational problems.
3. Examine complex problems by a diagnosis of available information to provide an appropriate conclusion.
4. Design applications with suitable consideration of societal needs.

5. Use functional skills of modern IT tools and techniques for modelling and implementation.
6. Play the role of a team player to accomplish a common goal.
7. Convey technological concepts through significant documentation and presentation skills.
8. Demonstrate professional conduct by following norms of the Engineering practice.
9. Apply Software Engineering methodologies for sustainable development.
10. Follow ethical and legal practices related to the functioning of the IT industry.
11. Apply management skills and techniques for creating time-bound and cost-effective projects.
12. Exhibit lifelong learning by upgrading to state-of-the-art IT practices and technology.

PROGRAM SPECIFIC OUTCOMES

At the end of the program, Graduates will be able to

PSO 1: Use knowledge of core and allied courses for developing a computer-based system to deliver a quality product for real-world problems of society.

PSO 2: Apply modern IT tools and techniques for perusing student's professional career by practicing effective communication with team members.

PSO 3: Develop time-bound, cost-effective, and sustainable solutions by following professional ethics.

CORELATION BETWEEN GRADUATE ATTRIBUTES AND PROGRAMME OUTCOMES

Graduate Attributes/ Programme Outcomes	a	b	c	d	e	f	g	h	i	j	k	l
Engineering Knowledge	✓											
Problem Analysis		✓										
Design/Development of Solutions			✓									
Conduct Investigations of Complex Problems				✓								
Modern Tool Usage					✓							
The Engineer and Society						✓						
Environment and Sustainability							✓					
Ethics								✓				
Individual and Teamwork									✓			
Communication										✓		
Project Management and Finance											✓	
Life-Long Learning												✓

A. DEFINITION OF CREDITS:

1 Hour Lecture (L) per week	1 credit
1 Hour Tutorial (T) per week	1 credit
1 Hour Practical (P) per week	0.5 credits
2 Hours Practical (Lab) per week	1 credit

B. Course Code and Definition

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
TW	Term Work
O	Oral
SEE	Semester End Examination
MJ	Major (Core) Courses
MI	Minor Courses
GE	General Elective Courses
OE	Open Elective Courses
SE	Skill Enhancement Courses
AE	Ability Enhancement Courses
VE	Vocational Enhancement Courses
VS	Vocational Skill Courses

VA	Value Added Courses
CC	Co-curricular Courses
EC	Extra-Curricular Courses
ID	Inter-disciplinary Courses
MD	Multidisciplinary Courses
RP	Research / Project Courses
PC	Practical Courses
BS	Basic Science
ES	Engineering Science
AC	Audit Course
EC	Extracurricular Activities
BM	Basic Mathematics
BP	Basic Physics
BC	Basic Chemistry
UH	Universal Human Values

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. (Information Technology): Semester –I (2023 CBCS COURSE)**

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	BM	BM1113101	Engineering Mathematics- I	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	BC	BC1113102	Engineering Chemistry	3	2	-	60	40	50	-	-	150	3	1	-	4
3.	ES	ES1109103	Digital Electronics	4	2	-	60	40	50	-	-	150	4	1	-	5
4.	MJ	MJ1110104	Structured Programming	4	-	-	60	40	-	-	-	100	4	-	-	4
5.	MJ	MJ1110105	Web Technologies	4	2	-	60	40	25	-	-	125	4	1	-	5
6.	AE	AE1113106	Communication Skills	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	SE	SE1110107	Information Technology Laboratory-I	-	2	-	-	-	25	-	25	50	-	1	-	1
8.	SE	SE1111108	Computer Workshop Technology	-	2	-	-	-	25	-	-	25	-	1	-	1
			Total	18	12	1	300	200	225	0	25	750	18	6	1	25

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. (Information Technology): Semester –II (2023 CBCS COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	BM	BM1113201	Engineering Mathematics- II	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	BP	BP1113202	Engineering Physics	3	2	-	60	40	50	-	-	150	3	1	-	4
3.	MJ	MJ1110203	Content Management System	4	2	-	60	40	50	-	-	150	4	1	-	5
4.	MJ	MJ1110204	Computer Communication and Networks	4	2	-	60	40	25	-	-	125	4	1	-	5
5.	MJ	MJ1110205	Object Oriented Programming	4	-	-	60	40	-	-	-	100	4	-	-	4
6.	UH	UH1113206	Universal Human Values	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	SE	SE1110207	Information Technology Laboratory-II	-	2	-	-	-	25	-	25	50	-	1	-	1
8.	SE	SE1111208	Computer Aided Drawing & Design	-	2	-	-	-	25	-	-	25	-	1	-	1
			Total	18	12	1	300	200	225	0	25	750	18	6	1	25

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. (Information Technology): Semester –III (2023 CBCS COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	O R	Total	Th	Pr/Or	Tut	Total
1.	MJ	MJ1110301	Discrete Structure and Graph Theory	3		-	60	40	-	-	-	100	3	-	-	3
2.	MJ	MJ1110302	Database Management Systems	3	2	-	60	40	25	25	-	150	3	1	-	4
3.	MJ	MJ1110303	Operating System	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	MJ	MJ1110304	Microprocessors and Microcontrollers	3	-	-	60	40	-	-	-	100	3	-	-	3
5.	MJ	MJ1110305	Data Structures	3	2	-	60	40	25	25	-	150	3	1	-	4
6	SE	SE1110306	Information Technology Laboratory-III	-	2	1	-	-	25	25	-	50	-	1	1	2
			Total	15	08	1	300	200	100	75	25	700	15	4	1	20
7	AE	AE1110307	MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	2
8	VA	VA1110308	Value Added Course-I A) Cyber Security B) Data Analysis Tools	2	-	-	-	100	-	-	-	100	-	-	-	2

*** Indicate this is mandatory but the credits will not be considered in SGPA/CGPA. (As and when the students complete the course and submit the certificate, it should be reflected in the mark sheet. The student should clear the subject up to 7th Sem of his/her coursework.)**

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. (Information Technology): Semester –IV (2023 CBCS COURSE)

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	MJ	MJ1110401	Formal Languages and Automata Theory	3		-	60	40	-	-	-	100	3	-	-	3
2	MJ	MJ1110402	Advanced Database Management Systems	3	2	-	60	40	25	25	-	150	3	1	-	4
3.	MJ	MJ1110403	Software Engineering	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	MJ	MJ1110404	Computer Organization and Architecture	3	-	-	60	40		-	-	100	3	-	-	3
5.	MJ	MJ1110405	Applied Algorithms	3	2	-	60	40	25	25	-	150	3	1	-	4
6.	SE	SE1110406	Information Technology Laboratory-IV	-	2	1	-	-	25	25	-	50	-	1	1	2
			Total	15	08	1	300	200	100	75	25	700	15	4	1	20
7	AC	AC1113407	Indian Knowledge System	2	-			100	-	-	-	100	-	-	-	2
8	EC	EC1110408	Social Activity	-	-	-	-	-	-	-	-	-	-	-	-	2

*** Indicate this is mandatory but the credits will not be considered in SGPA/CGPA. (As and when the students complete the course and submit the certificate, it should reflect in the marksheet. The student should clear the subject up to 7th Sem of his/her course.)**

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

COLLEGE OF ENGINEERING, PUNE

B. Tech. (Information Technology): Semester –V (2023 CBCS COURSE)

Sr. No.	Category	Course Codes	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	MJ	MJ1110501	Mobile Application Development	3	2	-	60	40	25	25	-	150	3	1	-	4
2.	MJ	MJ1110502	Artificial Intelligence and Machine Learning	3	2	-	60	40	25	25	-	150	3	1	-	4
3.	MJ	MJ1110503	Data Ware Housing and Data Mining	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	MJ	MJ1110504	Distributed Systems	3	2	-	60	40	25	-	25	150	3	1	-	4
5.	MJ	MJ1110505	Agile Methodology	3	-	-	60	40	-	-	-	100	3	-	-	3
6.	SE	SE1110506	Information Technology Laboratory-V	-	2	-	-	-	25	25	-	50	-	1	-	1
			Total	15	10	0	300	200	125	75	50	750	15	5	0	20
7	VA	VA1103507	**Value Added Course- II	2	-	-	-	100	-	-	-	-	-	-	-	2
8	AE	AE1103508	**MOOC - II	-	-	-	-	-	-	-	-	-	-	-	-	2

**** Indicate this is mandatory but the credits will not be considered in SGPA/CGPA**

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE
B. Tech. (Information Technology): Semester –VI (2023 CBCS COURSE)

Sr. No	Category	Course Codes	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	MJ	MJ1110601	Cloud Computing	3	-	-	60	40	-	-	-	100	3	-	-	3
2.	MJ	MJ1110602	Deep Learning	3	-	-	60	40	-	-	-	100	3	-	-	3
3.	MJ	MJ1110603	Software Testing	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	MJ	MJ1110604	Full Stack Web Development	3	2	-	60	40	25	25	-	150	3	1	-	4
5.	PE	PE1110505	Professional Elective-I	3	2	-	60	40	25	-	-	125	3	1	-	4
6.	SE	SE1110506	Information Technology Laboratory-VI	-	2	-	-	-	25	25	-	50	-	1	-	1
7.	PS	PS1110507	Professional Skills	-	2	-	-	-	25	-	-	25	-	1	-	1
8.	AC	AC1110508	Environmental Studies	4	-	-	-	100	-	-	-	100	-	-	-	4
			Total	19	10	0	300	300	125	50	25	800	15	5	0	24

Professional Elective-I

	Subject
1	Network Security and Cryptography
2	Information Retrieval
3	Software Architecture

**BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE**

B. Tech. (Information Technology): Semester –III/IV/V/VI/VII (NEP-2020 COURSE)

MINOR DEGREE (CLOUD TECHNOLOGIES) DETAILS

Sr. No	Course Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
			L	P	T	ESE	Internal Assessment	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	MI1110301	SEM-III : Distributed Computing	3	2	-	60	40	25	-	25	150	3	1	-	4
2	MI1110401	SEM-IV: Cloud Systems and Infrastructures	3	2	-	60	40	25	-	25	150	3	1	-	4
3.	MI1110501	SEM-V: Cloud Virtualization	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	MI1110601	SEM-VI: Cloud Containers and Orchestrations	3	2	-	60	40	25	-	25	150	3	1	-	4
5.	RP1110602	Sem-VI Project		8	-			50		50	100		4	-	4
		Total	12	16	-	240	160	150	-	150	700	12	8	-	20

B. Tech
Information Technology
Semester V

Mobile Application Development					
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	03 Hours/Week	End Semester Examination:	60 Marks	Theory	03
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	Practical:	01
Total	05 Hours/Week	Term Work/ Practical:	25 Marks	Total	04
		Practical:	25 Marks		
		Total	150 Marks		
Course Objective:					
Students will learn about					
<ol style="list-style-type: none"> 1. Gain a comprehensive understanding of Android and iOS application development. 2. Build scalable, responsive, and interactive mobile applications. 3. Develop skills to deploy and publish mobile applications for commercial use. 4. Understand security, performance optimization, and monetization strategies in mobile app development. 					
Prerequisite:					
Students should have knowledge of					
<ol style="list-style-type: none"> 1. Java or other object-oriented programming knowledge. 2. Basic knowledge of RESTful APIs, JSON, and XML. 3. Experience in UI/UX design principles for mobile interfaces. 4. Familiarity with cloud integration for mobile backends. 					
Course Outcomes: On completion of the course, students will have the ability to					
<ol style="list-style-type: none"> 1. Understand the evolving features and architectures of mobile applications. 2. Apply advanced Android and iOS programming concepts. 3. Develop adaptive, dynamic user interfaces for mobile devices. 4. Create secure mobile applications integrated with server-side components and databases. 5. Implement effective testing, debugging, and deployment strategies. 6. Understand the app publishing process on Google Play Store and Apple App Store. 					
Unit I : Introduction to Mobile Application Development				(06 Hours)	
Overview of Mobile Applications, Mobile Development Frameworks and Tools (React Native, Flutter vs Cross-platform), Mobile OS Architectures: Kernel Structure and Comparison (Android, iOS, Windows and hybrid approaches), Understanding Front-End and Back-End Services, Mobile Application Development Life Cycle (MADLC).					
Unit II: Android Development Framework				(06 Hours)	
Android OS Features and Architecture, Android SDK Overview and Installation Android Studio: Setup, Development Workflow, Android Security Model, Declaring and using permissions, Using custom permissions, Application Components: Activities, Services, Broadcast Receivers, Content Providers, Manifest Configuration and Permissions Management and Security Best Practices, Externalizing Resources (values, themes, layouts, menus), Application Lifecycle Management.					

Unit III: Android UI Components and Layouts	(06 Hours)
Adaptive and Responsive UI Design, Views and Layouts (Constraint Layouts, Linear, Relative, and Grid), UI Input Widgets: Buttons, Spinners, Checkboxes, Text Fields, Advanced UI Features: Pickers, Dialogs, Fragments and Fragment Life Cycle, Introduction to Jetpack Compose, Testing UI Components Using Android Testing Tools.	
Unit IV: Database and Cloud Integration	(06 Hours)
The Evolution of Mobile App Development with Cloud Computing, SQLite Database: Database Creation, CRUD Operations and Best Practices, Shared Preferences and File Storage, Firebase Realtime Database and Firestore Integration, Multimedia Integration: Playing Audio, Video, and Image Handling, Content Providers for Data Sharing, Cloud Functions and Backend-as-a-Service Integration.	
Unit V: iOS Application Development	(06 Hours)
Introduction to iOS Development and Architecture, iOS Development Environment: Xcode, Swift, iOS App Lifecycle and Storyboards Concepts, UI Kit Components and Adaptive UI, Database Handling in iOS: Core Data and SQLite, Debugging and Testing iOS Applications, Integration with RESTful APIs, Security Features and Best Practices.	
Unit VI: Application Optimization and Publishing	(06 Hours)
Performance Optimization: Profiling, Garbage Collection, Memory Leaks, Code Minification and Obfuscation Techniques, Testing Strategies: Unit Testing, UI Testing, Publishing Applications: Signing, Versioning, and App Store Guidelines, App Monetization Strategies. Case study based on real time application and traffic management in mobile application	
Textbooks	
1. "Android Programming for Beginners" by John Horton, Packt Publishing, 2015.	
2. "Android Development with Kotlin: Build Effective Android Apps Quickly" by Marcin Moskala and Igor Wojda, Packt Publishing, 2021.	
3. "Head First Android Development" by Dawn Griffiths & David Griffiths, O'Reilly, 2017.	
4. "Swift Programming: The Big Nerd Ranch Guide" by Matthew Mathias, Big Nerd Ranch Guides, 2019.	
5. "Flutter for Beginners", Alessandro Biessek, Packt (2020)	
6. "Modern Android 13 App Development" by Murat Yener and Onur Dundar, Wiley, 2023.	
Reference Books	
1. " Programming iOS 15 " by Matt Neuburg, O'Reilly Media, 2022.	
2. " Android Programming for Beginners " by John Horton, Packt Publishing, 2021 (Updated Edition).	
3. " SwiftUI for Masterminds 3rd Edition " by J.D Gauchat, CreateSpace Publishing, 2022.	
4. " Advanced Android Application Development " by Joseph Annuzzi Jr., Lauren Darcey, Shane Conder, Addison-Wesley Professional, 2021.	

5. "Kotlin for Android Developers" by Antonio Leiva, Leanpub, 2021.
6. "iOS 16 Programming for Beginners" by Ahmad Sahar, Packt Publishing, 2023.
7. □ "Android Studio Arctic Fox Essentials" by Neil Smyth, Payload Media, 2022

List of Assignments:

- | |
|---|
| 1. Create a simple Android application displaying student attendance records. |
| 2. Develop an application using RESTful API integration. |
| 3. Create a dynamic user interface for an e-commerce app. |
| 4. Build a location-based service app using Google Maps API. |
| 5. Develop a Firebase-integrated chat application. |
| 6. Create an iOS application for a simple task management system. |
| 7. Implement push notifications in Android and iOS apps. |
| 8. Develop a simple weather forecast app with API integration. |
| 9. Build a currency converter app with REST API integration. |
| 10. Implement background tasks using WorkManager in Android. |

Project Based Learning Assignments

- | | |
|--|--|
| Note:- Students in a group of 3 to 4 shall complete any one project from the following list | |
| 1. E-commerce App: Design and develop a full-stack mobile application with payment integration. | |
| 2. IoT Monitoring App: Create an application to monitor IoT devices in real-time. | |
| 3. Health Tracker App: Develop an app to track fitness and health metrics using sensors. | |
| 4. Educational App: Design a gamified learning experience with progress tracking features. | |
| 5. Social Media App: Build a feature-rich social platform with multimedia sharing and user engagement. | |
| 6. Fitness tracking app: Build a app that records daily activities and syncs with Firebase. | |
| 7. Travel planner: Create an app with route suggestions and map integration. | |
| 8. Chat application: Develop an application with notification services. | |
| 9. Carpooling App: Match users for ride-sharing based on routes and schedules with GPS integration. | |
| 10. Weather Forecast App: Integrate APIs to provide real-time weather updates and alerts. | |

Syllabus for Unit Tests:

Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING				
TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
Lecture:	03 Hours/Week	End Semester Examination: 60 Marks	Theory	03
Practical:	02 Hours/Week	Continuous Assessment: 40 Marks		
Tutorials:	00 Hours/Week	TW : 25 Marks Practical: 25 Marks	Practical	01
Total: 05 Hours/Week		Total : 150 marks	Total : 04 Credits	
Course Overview				
The course provides an overview of the fundamentals of Machine Learning. It covers the basic components needed to design a model to solve a problem.				
Prerequisite:				
Fundamental understanding of statistics.				
Introduction to Python.				
Course Outcomes: On completion of the course, students will have the ability to:				
1. Understand the fundamentals of probability and statistics.				
2. Implement the clustering using unsupervised learning.				
3. Apply the classification techniques.				
4. Apply the regression techniques.				
5. Apply the regularization for balancing the bias and variance.				
6. Apply the model for decision-making.				
Unit I : Introduction to Machine Learning			06 Hours	
Probability Density Function, Normal Distribution, Standard Deviation, Regression Coefficient, Bias & Variance, Gradient Descent, Hypothesis Testing, and Loss Functions. Introduction to supervised and unsupervised learning.				
Unit II :Unsupervised Learning			06 Hours	
Clustering, Feature Extraction, Spurious Correlation, K-Means clustering				

KNN, Dimensionality Reduction, Principal Component Analysis, and Multidimensional Scaling.	
Unit III: Classification Algorithms	06 Hours
Classification Algorithms- Naïve Bayes, Logistic Regression, Support Vector Machine, Decision Tree, Result validation of Classification – Precision, Recall, F-Measure, MAP, R-Curve. Optimization Techniques.	
Unit IV: Regression algorithm	06 Hours
Linear Regression, Lasso Regression, Ridge Regression, Random Forest Regression Loss Function – Mean Average Error, Mean Standard Error LogCosh, Huber, Quantile Loss	
Unit V	06 Hours
Introduction to Transformer and Embeddings	
Introduction to Transformer, Encoder-Decoder, Foundation Models, Google-T5, Google-BERT, LaMDA (Language Model for Dialogue Applications)	
Unit VI	06 Hours
Introduction to Generative AI	
Introduction to Generative AI. Use of the components – Embeddings, Transformer, Encoder in GPT. Meta-Llama, Amazon-Bedrock, OpenAI-ChatGPT, Google - Gemini, Microsoft - CoPilot	
Textbooks	
1 Introduction to Machine Learning with Python: A Guide for Data Scientists 1st Edition, Andreas Müller, Sarah Guido	
2 Data Science from Scratch: First Principles with Python 2nd Edition, Joel Grus	
3 Machine Learning in Action, Manning Publication, Peter Harrington	
4 Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, O’Reilly Media Publication, First Edition, Aurelien Geron.	
5 Python Machine Learning, Packt Publication, Sebastian Raschka, Vahid Mirjalili.	

Reference Books
1 Pattern Recognition and Machine Learning, Author: Christopher M. Bishop, Springer Publication.
2 Machine Learning for Hackers: Case Studies and Algorithms to Get You Started Authors: Drew Conway & John Myles, O'Reilly Media Publication.
Project-Based Learning Assignments
Note:- Students in a group of 3 to 4 shall complete any one project from the following list
1. Apply statistical methods to analyze data and build a regression model. Use a dataset (e.g., housing prices) to calculate regression coefficients, plot data with a best-fit line, and evaluate the model using hypothesis testing.
2. Understand the role of loss functions in machine learning. Implement and compare different loss functions (MSE, Cross-Entropy) for a classification problem.
3. Perform clustering and interpret results. Use K-means clustering to group customers in a dataset (e.g., customer spending habits) and visualize clusters.
4. Reduce dataset dimensions and retain essential information. Apply PCA to a high-dimensional dataset (e.g., MNIST) and visualize the first two principal components.
5. Design a text classification model using Naïve Bayes. Classify emails as spam or not spam using the Naïve Bayes algorithm.
6. Evaluate a classification model's performance. Train a logistic regression model on a binary classification problem and calculate precision, recall, and F1-score, and plot the precision-recall curve.
7. Apply different loss functions in regression. Implement custom loss functions (e.g., LogCosh, Huber) in a regression model and analyze their effect on predictions.
8. Create a Model using the embeddings (Titan Embeddings)
9. Design the encoder and decoder for the simple Word document.
10. Design a model to answer the questions using the GPT.
List of Assignments
1. Identify the association between dependent and independent variables.
2. Apply the clustering techniques using unsupervised learning.
3. Apply dimensionality reduction using PCA
4. Apply Naïve Bayes classification algorithms.
5. Apply the KNN algorithm for the classification.
6. Implement Linear Regression Algorithm.
7. Implement SVM Algorithm for Regression.
8. Apply regularization to avoid overfitting.
9. Apply object detection from CCTV Footage.

10. Design a model to detect the Fake News from Multimodal data.	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit - VI

DATA WARE HOUSING AND DATA MINING

TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	3 Hours/Week	End Semester Examination: 60 Marks		Theory	3
Practical:	2 Hours/Week	Internal Assessment:	40 Marks	Oral	1
		Term work	25 Marks		
		Oral	25 Marks		
Total	5 Hours/Week	Total	150 Marks	Total	4

Course Objective:

Understand and Implement Data Warehousing Concepts
 Understand and Implement Data Mining Techniques and Applications
 Apply Data Mining Tools for Real-World Data Analysis

Prerequisite:

Students should have knowledge of Databases and their operations

Course Outcomes: On completion of the course, students will have the ability to

1. Interpret data warehouse and its schema design techniques
2. Analyze data preprocessing techniques
3. Assess methods of frequent pattern mining
4. Interpret classification techniques
5. Analyze concepts of clustering and outlier detection
6. Apply tools for data exploration, preprocessing, and basic predictive modeling.

Unit I : Data Warehouse

(6 Hours)

Introduction to Data Warehouse, Differences between operational data base systems and data Warehouse, Data Warehouse characteristics, Data Warehouse Architecture and its components, Extraction-Transformation-Loading, Logical (Multidimensional), Data Modeling, Schema Design, star and snow-Flake Schema, Fact Constellation, Fact Table, Fully Addictive, Semi-Addictive, Non-Addictive Measures; FactLess-Facts, Dimension Table characteristics; Fact-Less-Facts, Dimension Table characteristics; OLAP cube, OLAP Operations, OLAP Server Architecture-ROLAP, MOLAP and HOLAP

Unit II : Introduction to Data Mining

(6 Hours)

Motivation, Importance, Definition of Data Mining, Kind of Data, Data Mining Functionalities, Kinds of Patterns, Classification of Data Mining Systems, Data Mining Task Primitives, Integration of A Data Mining System With A Database or Data Warehouse System, Major Issues In Data Mining, Types of Data Sets and Attribute Values, Basic Statistical Descriptions of Data, Data Visualization, Measuring Data Similarity. PREPROCESSING: Data Quality, Major Tasks in Data Preprocessing, Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation , Data Transformation and Data Integration.

Unit III FREQUENT PATTERN MINING	(6 Hours)
Mining Frequent Patterns, Associations, and Correlations: Basic Concepts, Frequent Itemset Mining Method, Pattern Evaluation Methods, Pattern Mining in Multilevel, Multidimensional Space, Constraint-Based Frequent Pattern Mining	
Unit IV CLASSIFICATION	(6 Hours)
Classification: Basic Concepts, Decision Tree Induction, Bayes Classification Methods, Rule-Based Classification, Model Evaluation and Selection, Techniques to Improve Classification Accuracy, Classification by Backpropagation, Support Vector Machines, Lazy Learners (or Learning from Your Neighbors)	
Unit V CLUSTERING AND OUTLIER ANALYSIS	(6 Hours)
Cluster Analysis: Basic Concepts, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Evaluation of Clustering Outlier Detection: Outliers and Outlier Analysis, Outlier Detection Methods, Statistical Approaches, Proximity-Based Approaches, Clustering-Based Approaches, Classification-Based Approaches	
Unit VI	(6 Hours)
WEKA and Orange data mining: Data exploration and preprocessing, visualizations, Clustering and segmentation, Classification, predictive modeling, Overfitting, Model scoring end evaluation.	
Textbooks	
1. Jiawei Han, MichelineKamber, Jian Pei, Data Mining: Concepts and Techniques, 3 rd edition, Elsevier, United States of America	
Reference Books	
1. Arun K Pujari, “Data Mining Techniques”, 4th Edition, Universities Press, 2016.	
2. Sam Aanhory & Dennis Murray, “Data Warehousing in the Real World”, 4th impression, 2009.	
3. Margaret H Dunham, “Data Mining Introductory and advanced topics”, 6th Edition, Pearson Education, 2009	
Lab assignments	
Course instructor to design any 8 assignments based on data mining tools such as WEKA, Orange, Altair RapidMiner, KNIME, Neural Designer, Apache Mahout or any other. In addition to these any 2 real time case studie should be included.	
Project Based Learning Assignments	
Students in a group of 3 to 4 shall complete any one project using any data mining tool to implement data warehousing and data mining operations with visualizations.	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Distributed Systems					
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	03 Hours/Week	End Semester Examination:	60 Marks	Theory	03
Practical	02 Hours/Week	Internal Assessment:	40 Marks	Practical	01
		Termwork	25 Marks		
		Oral	25 Marks		
Total	05 Hours/Week	Total	150 Marks	Total	04
Course Objective:					
Students will learn about :					
<ol style="list-style-type: none"> 1. Concepts and Importance of Distributed Systems 2. Security issues in Distributed Systems 					
Prerequisite:					
Students should have knowledge of					
Course Outcomes: On completion of the course, students will have the ability to					
1. Understand the Fundamentals of Distributed Computing and Classify Distributed Computing Models and Systems					
2. Analyze the architecture and working principles of distributed file systems, Illustrate the design and functioning of peer-to-peer middleware and routing overlays					
3. Understand the principles of timestamp ordering, distributed transactions, atomic commit protocols and Apply different concurrency control techniques to resolve conflicts in distributed transactions and manage distributed deadlocks.					
4. Understand, Compare and Contrast the data-centric and client-centric consistency models, Illustrate the role of replica management in achieving consistency and availability in distributed systems.					
5. Understand the fundamental goals, design principles, and security challenges in distributed systems, Analyze various attacks on distributed systems and evaluate their impact on system security					
6. Understand the fundamental concepts of synchronous and asynchronous network models and various efficient Distributed Algorithms					
Unit I: Fundamentals				(06 Hours)	
Definition and evolution of Distributed Computing System, Models and Types of Distributed Computing Systems, Issues and Goals in designing Distributed System, Distributed Computing Environment, Types of Distributed Systems, Peer to peer systems, Peer to peer middleware, Routing overlays					
Unit II: Communication And Operating System Issues				(06 Hours)	
Communication: Fundamentals, Remote Procedure Call, Message Oriented Communication, Stream Oriented Communication, Multicast Communication, Distributed file systems - Name services, Domain name system, Directory and discovery services, Peer to peer systems, Napster file sharing					

system, Peer to peer middleware routing overlays – Clocks, Events and process states Clock Synchronization - Logical clocks Global states - Distributed debugging - Distributed mutual exclusion - Elections.	
Unit III: Distributed Transaction Processing	(06 Hours)
Transactions - Nested transactions - Locks - Optimistic concurrency control - Timestamp ordering - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery - Overview of replication, Distributed shared memory and Web services.	
Unit IV: Consistency, Replication and Distributed Coordination-Based Systems	(06 Hours)
Introduction, Data-Centric Consistency Models, Client-Centric Consistency Models, Replica Management, Consistency Protocols Distributed Coordination-Based Systems: architectures, processes, communication, naming, synchronization, consistency and replication, fault tolerance, security	
Unit V: Security	(06 Hours)
Distributed System Security: Goals, Design Principles, Attacks, Cryptography, Secure Channels, Access control, Digital Signatures, Security Management, Cryptographic hash Functions, Distributed hashing.	
Unit VI: Distributed Algorithms	(06 Hours)
Synchronous network model - Algorithms: leader election, maximal independent set. Asynchronous system model: I/O automata, operations on automata, fairness - Asynchronous shared memory model - Mutual exclusion: model, the problem, stronger conditions, lockout-free mutual exclusion algorithms, lower bound on the number of registers - Asynchronous network model - Asynchronous network algorithms: leader election in a ring and an arbitrary network.	
Textbooks	
1. George Coulouris, Jean Dollimore, Tim Kindberg, Gordon Blair, “Distributed Systems: Concepts and Design”, Pearson Education India; 5th edition	
2. Pradeep K. Sinha, “Distributed Operating Systems: Concepts and Design”, Wiley-IEEE Press.	
3. George Coulouris, Jean Dollimore, and Tim Kindberg, “ Distributed Systems Concepts and Design”, 5th ed., Pearson Education, 2011.	
4. Andrew S. Tanenbaum, Maarten van Steen, “Distributed Systems Principles and Paradigms”, 2nd ed., Pearson Education, 2006.	
5. Nancy A. Lynch, “Distributed Algorithms”, Hardcourt Asia Pvt. Ltd., Morgan Kaufmann, 2000.	
Reference Books	
1. Andrew S. Tanenbaum, Maarten van Steen, “Distributed Systems: Principles and Paradigms”, Prentice Hall India Learning Private Limited, Second edition	
2. Ajay D. Kshemkalyani, Mukesh Singhal, “Distributed Computing: Principles, Algorithms, and Systems”, Cambridge University Press- South Asian edition	

Project Based Learning Assignments	
Note:- Students in a group of 3 to 4 shall complete any one project from the following list	
1. Case study of any peer to peer system with application	
2. Case study of any middleware with application	
3. Detail study of DCE RPC	
4. Detailed study of CHORD DHT	
5. Implementation of any election algorithm	
6. Study of deadlocks and its avoidance	
7. Comparison of deadlock prevention algorithms	
8. Analysis of consistency and replication in Peer-to-Peer File Systems	
9. Replication for Web Hosting Systems and Web Applications	
10. Case study of NFS wrt architecture, communication, naming, semantics of file sharing, consistency and replication, security	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

AGILE METHODOLOGIES				
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME
Lecture:	03 Hours/Week	End Semester Examination: 60 Marks	Theory	03
		Internal Assessment: 40 Marks		
Total	03 Hours/Week	Total 100 Marks	Total	03
Course Objective:				
To prepare students for software development using agile methodology				
Prerequisite: Software Engineering				
Course Outcomes: On completion of the course, students will have the ability to				
1. Differentiate traditional project development methodology and Agile methodology.				
2. Identify the roles and responsibilities of agile practitioners in agile projects				
3. Apply requirement engineering practices behind several specific agile methodologies.				
4. Define the core practices behind Scrum framework				
5. Understand the role of design principles in agile software design				
6. Define the core practices behind Extreme Programming framework				
7. Describe implications of functional testing, unit testing, and continuous integration				
Unit I :				(6 Hours)
Introduction: Agile Software Development, Traditional Model vs. Agile Model, Agile Manifesto and Principles, Agile Project Management, Agile Team Interactions, Ethics in Agile Teams, Agile Documentations: Agile Drivers, Overview of Feature driven development, Lean Software Development				
Unit II				(6 Hours)
Agility and Requirements Engineering (RE): Impact of Agile Processes in RE– Current Agile Practices, Overview of RE Using Agile , Managing Unstable Requirements, Requirements Elicitation, Agile Requirements Abstraction Model, Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modelling and Generation, Concurrency in Agile Requirements Generation				
Unit III				(6 Hours)
Agile Scrum Framework: Scrum Artifacts, Meetings, Activities and Roles, Scrum Team Simulation, Scrum Planning Principles, Product and Release Planning, Sprinting: Planning, Execution, Review and Retrospective; User story definition and Characteristics, Acceptance tests and Verifying stories, Burn down chart, Daily scrum, Scrum Case Study, Kabana case study				

Unit IV	(6 Hours)
Agile Software Design and Development: Agile design practices, Role of design Principles, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control; Agility and Quality Assurance: Agile Interaction Design, Agile approach to Quality Assurance, Test Driven Development, Pair programming: Issues and Challenges.	
Unit V	(6 Hours)
Extreme Programming (XP): XP Lifecycle, The XP Team, XP Concepts: Refactoring, Technical Debt, Timeboxing, Stories, Velocity; Adopting XP: Prerequisites, Challenges; Applying XP: Thinking- Pair Programming, Collaborating, Release, Planning, Development; XP Case Study	
Unit VI	(6 Hours)
Agile and Testing: The Agile lifecycle and its impact on testing, Test driven development– Acceptance tests and verifying stories, writing a user acceptance test, Developing effective test suites, Continuous integration, Code refactoring. Risk based testing, Regression tests, Test automation.	
Textbooks	
1. Robert C. Martin, —Agile Software Development, Principles, Patterns and Practices, First International Edition, Prentice Hall.	
2. Ken Schwaber, Mike Beedle, —Agile Software Development with Scrum, International Edition, Pearson.	
Reference Books	
1. David J. Anderson and Eli Schragenheim, —Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results, Prentice Hall, 2003	
2. Hazza and Dubinsky, —Agile Software Engineering, Series: Undergraduate Topics in Computer Science, Springer, 2009.	
3. James Shore and Shane Warden, —The Art of Agile Development, O'Reilly Media, 2007	
4. Cohn, Mike, —User Stories Applied: For Agile Software Development, Addison Wesley, 2004	
Project Based Learning Assignments	
Note:- Students in a group of 3 to 4 shall complete any one project from the following list	
1. For example —solve the traveling salesman problem (TSP) using a algorithm in the context of an XP project.	
2. Develop sprint backlog for project under consideration.	
3. Develop a Kanban board for complete projects per week.	
4. Write a report and demonstrate the project using Extremes practices in software development	
5. Write a report and demonstrate the project using Scrum practices in software	

development	
6. Student database management projects in which the stories, sprints and action items can be created or updated weekly.	
7. Library management project in which the stories, sprints and action items can be created or updated weekly.	
8. Online appointment booking project in which the stories, sprints and action items can be created or updated weekly	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

INFORMATION TECHNOLOGY LABORATORY - V				
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME
Practical:	02 Hours/Week	Term work: 25 Marks	Practical:	01
		Practical: 25 Marks		
Total	02 Hours/Week	Total 50 Marks	Total	01
Course Objective:				
To acquire programming skills in core Python to develop applications in various domain.				
Prerequisite: Understanding of basic python programming and OOPs concepts				
Course Outcomes: On completion of the course, students will have the ability to				
<ol style="list-style-type: none"> 1. To acquire programming skills in core Python. 2. Demonstrate exception handling in various applications 3. To acquire database management with python 4. To develop the skill of data science using python 5. To develop the ability of Data Visualization using Python 6. Demonstrate the ability to implement Django Web Framework in Python 				
Unit I :			(06 Hours)	
Install Python and Environment Setup, First Python Program, Python Identifiers, Keywords and Indentation, Comments in Python, Command line arguments, Getting User Input, What are variables?, Python Core objects and Functions.				
Unit II			(06 Hours)	
What are Python Data Types? List, Set, Tuple, Python Dictionaries, String, Range, Understanding Iterators, Generators, Comprehensions and Lambda Expressions, Exception Handling in Python				
Unit III			(06 Hours)	
Using Databases in Python, Python MySQL Database Access, Install the MySQLdb and other Packages, Create Database Connection, CREATE, INSERT, READ Operation , DML and DDL Operation with Databases				
Unit IV			(06 Hours)	
Data Science Using Python Numpy: Introduction to numpy, Creating arrays , Indexing Arrays , Array Transposition , Universal Array Function , Array Processing , Array Input and Output.				
Unit V			(06 Hours)	
What are pandas? , Where it is used? , Series in pandas , Index objects , Reindex , Drop Entry , Selecting Entries , Data Alignment , Rank and Sort , Summary Statics , Index Hierarchy , Matplotlib: Data Visualization , Python for Data Visualization , Welcome to the Data Visualization Section , Introduction to Matplotlib				

Unit VI	(06 Hours)
Django Web Framework in Python, Introduction to MVC and MVT architecture in Web development, Django folder structure and flow of control.	
Textbooks	
1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705. 2. Fluent Python: Clear, Concise, and Effective Programming, by Luciano Ramalho 3. Introduction to Machine Learning with Python: A Guide for Data Scientists, by Sarah Guido and Andreas C. Muller	
Reference Books	
1. Python Cookbook: Recipes for Mastering Python 3, by David Beazley and Brian K. Jones 2. Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016 3. Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010	
List of Laboratory Exercises	
1. Write a program to implement Arithmetic Operations 2. Write a program to implement Built-in Functions 3. Write a program to implement Loops 4. Write a program to implement Data Types of python. 5. Write a program to implement Strings 6. Write a program to implement Databases (MySQL, MongoDB) 7. Write a program to implement Handle and store Two-dimensional data 8. Write a program to manipulate structured data. 9. Write a program to implement GUI application 10. Implement web applications using Django Web Framework	
Project Based Learning Assignments	
Note:- Students in a group of 3 to 4 shall complete any one project from the following list	
1. Automating boring Stuff Using Python (ex. Automate LinkedIn connections using Python) 2. Python Text to Speech and Vice-Versa (ex. Convert Speech to text and text to Speech, Build a Virtual Assistant Using Python) 3. Crawl Wikipedia pages with python 4. E-commerce website project 5. Build a blockchain using python 6. Python Django Projects (ex. Weather app, Voting system) 7. Twitter Sentiment Analysis using Python 8. Website Blocker using Python 9. Python Language Translator 10. Desktop Notifier Python App 11. Creating Notepad using Python	

VAC II: SOCIAL MEDIA AND DIGITAL MARKETING				
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME
Theory:	02 Hours/Week	Internal Assessment: 100 Marks		Theory: 02
Course Objective:				
To acquire programming skills in core Python to develop applications in various domain.				
Prerequisite: Understanding of basic python programming and OOPs concepts				
Course Outcomes: On completion of the course, students will have the ability to				
<ol style="list-style-type: none"> 1. To understand the fundamental concepts and significance of digital marketing. 2. To explore different components of digital marketing strategies. 3. To learn about search engine optimization (SEO) and paid advertising models. 4. To analyze the role of content and email marketing in digital campaigns. 5. To gain practical exposure to social media marketing and online advertising platforms. 				
Unit I: Introduction to Digital Marketing				(04 Hours)
Concept, significance, and scope of digital marketing, Digital marketing vs. traditional marketing, Digital marketing ecosystem (Website, Email, social media, Mobile, SEO, SEM), Digital marketing strategies and trends, Impact of digital marketing on society and business, Introduction to affiliate marketing.				
Unit II: Digital Marketing Environment and Strategy				(04 Hours)
Digital micro and macro environment (social, legal, technological, economic factors), Digital marketplace and online buyer behavior, Competitor and supplier analysis, integrated digital marketing approach, Channel marketing strategy, Internet marketing mix and strategy formulation.				
Unit III: Search Engine Optimization (SEO) & Website Development				(04 Hours)
Basics of SEO (On-page, Off-page, Technical SEO), Keyword research and analysis, Link building strategies, Google Analytics and Google Search Console, Website development (types of websites, templates, content writing, publishing), Mobile SEO and responsive web design.				
Unit IV: Social Media Marketing (SMM)				(04 Hours)
Overview of major platforms (Facebook, Instagram, LinkedIn, Twitter, YouTube, TikTok), Organic vs. paid social media marketing, social media engagement strategies, Social media ads (Facebook, Instagram, LinkedIn Ads), Influencer marketing and monetization strategies, Web analytics and social media insights				
Unit V: Content Marketing & Email Marketing				(04 Hours)
Importance of content in digital marketing, Types of content (blogs, videos,				

infographics, podcasts), Content creation, curation, and strategy, SEO integration with content marketing, Email marketing basics (list building, campaign design, segmentation, personalization), Email automation and mobile email optimization, Email marketing tools (MailChimp, HubSpot).	
Unit VI: Online Advertising & Performance Metrics	(04 Hours)
Google AdWords and online advertising (search, display, video, shopping ads), PPC (Pay-per-click) advertising strategies, Ad performance metrics (CPC, CPM, CPA, CTR, ECPC, VCPM), Targeting and retargeting strategies, Digital marketing budgeting and cost control, ROI calculation and ad campaign performance tracking, Freelancing and consulting in digital marketing, Selling digital products (e-books, courses, SaaS products), Case studies of successful digital marketing campaigns, Future trends in digital marketing.	
Textbooks	
<ol style="list-style-type: none"> 1. Ryan, D., & Jones, C. (2016). Understanding Digital Marketing. Kogan Page. 2. Chaffey, D., & Ellis-Chadwick, F. (2020). Digital Marketing: Strategy, Implementation, and Practice. Pearson. 3. Kotler, P., & Keller, K. L. (2019). Marketing Management. Pearson. 4. Tuten, T. L., & Solomon, M. R. (2020). Social Media Marketing. Sage. 5. Kingsnorth, S. (2022). Digital Marketing Strategy. Kogan Page. 	
Reference Books	
<ol style="list-style-type: none"> 1. Google Digital Garage – Free Online Courses on Digital Marketing. 2. Zarrella, D. (2013). The Social Media Marketing Book. O'Reilly Media. 3. Scott, D. M. (2022). The New Rules of Marketing & PR. Wiley. 4. Dodson, I. (2016). The Art of Digital Marketing. Wiley. 5. Hanlon, A. (2021). Digital Marketing: Strategic Planning & Integration. Sage. 	
Project Based Learning Assignments	
Note: - Students in a group of 3 to 4 shall complete any one project from the following list	
<ol style="list-style-type: none"> 1. Brand Awareness Campaign – Develop and execute a social media campaign for a real or simulated brand. 2. E-Commerce Digital Strategy – Create a complete digital marketing plan for an online store. 3. SEO and Website Development – Build and optimize a business website using WordPress. 4. Social Media Influencer Collaboration – Partner with influencers to increase brand engagement. 5. Lead Generation through Email Marketing – Design a lead generation strategy using email marketing automation. 6. Google Ads Performance Analysis – Conduct a campaign and analyze conversion rates. 7. Content Marketing Blog – Develop a blog strategy with SEO and monetization tactics. 8. Mobile App Marketing Plan – Design a marketing plan for promoting a mobile app. 9. Customer Engagement Strategy – Implement chatbot automation for a business website. 10. Digital Marketing for a Local Business – Create a complete digital marketing strategy for a small local business. 	

B. Tech
Information Technology
Semester VI

Cloud Computing				
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME
Lecture:	03 Hours/Week	End Semester Examination: 60 Marks	Theory	03
		Internal Assessment: 40 Marks		
Total	03 Hours/Week	Total 100 Marks	Total	03
Course Objective:				
Students will learn about				
To study fundamental concepts of cloud computing				
To learn various data storage methods on cloud				
To understand the implementation of Virtualization in Cloud Computing				
To learn the application and security on cloud computing				
To study risk management in cloud computing				
To understand the advanced technologies in cloud computing				
Prerequisite:				
Students should have knowledge of Computer Networks and Security				
Distributed System				
Course Outcomes: On completion of the course, students will have the ability to				
1. Understand the different Cloud Computing environment, models and architecture.				
2. Use appropriate data storage technique on Cloud, based on Cloud application				
3. Analyze virtualization technology and install virtualization software				
4. Develop and deploy applications on Cloud				
5. Apply security in cloud applications				
6. Use advance techniques in Cloud Computing				
Unit I : Introduction to Cloud Computing				(06 Hours)
What is Cloud compute, Cloud networking, Cloud storage, Importance of Cloud Computing, Characteristics, advantages and disadvantages of Cloud Computing, Migrating into the Cloud, Seven-step model of migration into a Cloud, Trends in Computing.				
Cloud Service Models: SaaS, PaaS, IaaS, Storage.				
Cloud Architecture: Cloud Computing Architecture, Developing Holistic Cloud Computing Reference Model, Cloud System Architecture, Cloud Deployment Models.				
Unit II : Data Storage and Cloud Computing				(06 Hours)
Data Storage: Introduction to Enterprise Data Storage, Direct Attached Storage, Storage Area Network, Network Attached Storage, Data Storage Management, File System, Cloud Data Stores, Using Grids for Data Storage.				
Cloud Storage: Data Management, Provisioning Cloud storage, Data Intensive Technologies for Cloud Computing.				

Cloud Storage from LANs to WANs: Cloud Characteristics, Distributed Data Storage.	
Unit III : Cloud and Virtualization:	(06Hours)
Introduction: Definition of Virtualization, Adopting Virtualization, Types of Virtualization, Virtualization Architecture and Software, Virtual Clustering, Virtualization Application, Pitfalls of Virtualization. Grid, Cloud and Virtualization: Virtualization in Grid, Virtualization in Cloud, Virtualization and Cloud Security. Virtualization and Cloud Computing: Anatomy of Cloud Infrastructure, Virtual infrastructures, CPU Virtualization, Network and Storage Virtualization.	
Unit IV: Cloud Platforms and Cloud Applications	(06 Hours)
Amazon Web Services (AWS): Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Amazon Database services (Dynamo DB). Microsoft Cloud Services: Azure core concepts, SQL Azure, Windows Azure Platform Appliance. Cloud Computing Applications: Healthcare: ECG Analysis in the Cloud, Biology: Protein Structure Prediction, Geosciences: Satellite Image Processing, Business and Consumer Applications: CRM and ERP, Social Networking, Google Cloud Application: Google App Engine. Overview of OpenStack architecture. Case Study: Hybrid and Multi cloud strategies.	
Unit V Security in Cloud Computing	(06 Hours)
Risks in Cloud Computing: Risk Management, Enterprise-Wide Risk Management, Types of Risks in Cloud Computing, Privacy in Cloud Computing. Data Security in Cloud: Security Issues, Challenges, advantages, Disadvantages, Cloud Digital persona and Data security, Content Level Security. Cloud Security Services: Confidentiality, Integrity and Availability, Security Authorization Challenges in the Cloud, Secure Cloud Software Requirements, Secure Cloud Software Testing, Cost optimization.	
Unit VI : Advanced Techniques in Cloud Computing	(06 Hours)
Future Trends in cloud Computing, Mobile Cloud, Automatic Cloud Computing: Comet Cloud. Multimedia Cloud: IPTV, Energy Aware Cloud Computing, Jungle Computing, Distributed Cloud Computing, Edge Computing, Containers, Docker, and Kubernetes, Introduction to DevOps, Fog Computing. IOT and Cloud Convergence: The Cloud and IoT in your Home, The IOT and cloud in your Automobile, PERSONAL: IoT in Healthcare.	
Textbooks	
1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, ISBN-13:978-1-25-902995-0	

2. A. Srinivasan, J. Suresh, "Cloud Computing: A Practical Approach for Learning and Implementation", Pearson, ISBN: 978-81-317-7651-3	
Reference Books	
1. Dr. Kris Jamsa, "Cloud Computing: SaaS, PaaS, IaaS, Virtualization and more", Wiley Publications, ISBN: 978-0-470-97389-9	
2. James Bond, "The Enterprise Cloud", O'Reilly Media, Inc. ISBN: 9781491907627	
3. Tim Mather, Subra K, Shahid L., "Cloud Security and Privacy", Oreilly, ISBN-13 978-81-8404-815-5	
4. Gautam Shrof, "ENTERPRISE CLOUD COMPUTING Technology Architecture, Applications", Cambridge University Press, ISBN: 9780511778476	
Project Based Learning Assignments	
Note:- Students in a group of 3 to 4 shall complete any one project from the following list	
9. Cloud-based Document Collaboration System	
10. IoT Data Processing with Cloud Services	
11. Cloud-based E-Learning Platform	
12. Cloud-based Healthcare Management System	
13. Serverless Image Processing Application	
14. Cloud-based Disaster Recovery System	
15. Blockchain Integration with Cloud Storage	
16. Cloud-based Mobile Health App	
17. Serverless Computing for Scalable Applications	
18. Cloud Gaming Platform	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Deep Learning				
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME
Lecture:	03 Hours/Week	End Semester Examination: 60 Marks	Theory	03
		Internal Assessment: 40 Marks		
Total	03 Hours/Week	Total 100 Marks	Total	03
Course Objective:				
Students will learn about				
<ol style="list-style-type: none"> 1. To understand the fundamental concepts and architectures of deep learning. 2. To explore various neural network models such as CNNs, RNNs, and transformers. 3. To implement and optimize deep learning algorithms for real-world applications. 4. To gain hands-on experience with frameworks like TensorFlow and PyTorch. 5. To analyze advanced deep learning techniques such as GANs, Autoencoders, and Reinforcement Learning. 6. To learn model deployment and optimization for industry applications. 				
Prerequisite:				
Students should know of				
<ol style="list-style-type: none"> 1. Mathematical Foundations: Linear Algebra, Probability, and Statistics 2. Programming Knowledge: Python (NumPy, Pandas, Matplotlib) 3. Machine Learning Basics: Supervised & Unsupervised Learning 4. Optimization Techniques: Gradient Descent, Loss Functions 5. Familiarity with Neural Networks (Preferred but not mandatory) 				
Course Outcomes: On completion of the course, students will have the ability to				
1. Develop and train deep learning models using various architectures.				
2. Apply CNNs for image processing tasks like classification and object detection.				
3. Implement RNNs and LSTMs for sequential data analysis.				
4. Utilize GANs and Autoencoders for data generation and feature extraction.				
5. Deploy deep learning models in real-world scenarios.				
6. Optimize deep learning models for efficiency and performance.				
Unit I : Introduction to Deep Learning				(06 Hours)
Basics of Machine Learning and Neural Networks, History and Evolution of Deep Learning, Activation Functions (ReLU, Sigmoid, Tanh, Softmax), Feedforward Neural Networks (FNN), Backpropagation and Gradient Descent Overfitting and Regularization (L1, L2, Dropout)				
Unit II: Convolutional Neural Networks (CNNs)				(06 Hours)
Convolution and Pooling Operations, CNN Architectures: LeNet, AlexNet, VGG, ResNet, Transfer Learning and Fine-tuning, Applications: Image Classification, Object Detection, Optimization Techniques for CNNs				

Unit III: Recurrent Neural Networks (RNNs)	(06 Hours)
Sequence Modeling and Time Series Analysis, Vanilla RNNs: Limitations and Challenges (Vanishing Gradient), Long Short-Term Memory (LSTM) Networks Gated Recurrent Units (GRUs), Applications: Text Generation, Speech Recognition.	
Unit IV: Transfer Learning	
The architecture of the Transfer Learning Model, LeNet, AlexNet, VGG, ResNet, Transfer learning in computer vision tasks, Object Detection and Segmentation, Region-based methods (R-CNN, Fast R-CNN, YOLO) Multimodal models, 3D vision and LiDAR.	
Unit V: Generative Models and Autoencoders	(06 Hours)
Autoencoders: Vanilla, Denoising, and Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs) vs. GANs, Applications: Image Generation, Style Transfer. Functioning of Generative Adversarial Networks (GANs). DCGAN.	
Unit VI: Advanced Topics in Deep Learning	(06 Hours)
Architecture: Generator and Discriminator, Loss functions in GANs, Variants: CycleGAN, StyleGAN, Variational Autoencoders (VAEs), Concept of latent space. Encoder-decoder architecture, Applications: image reconstruction, denoising. Diffusion Models, Fundamentals of diffusion processes, Applications: DALL-E, Stable Diffusion, Generative AI in Text, Overview of language models (GPT, BERT), Text-to-image models (CLIP, BLIP). Deployment of the Models	
Textbooks	
1. Aurelien Géron – Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow.	
2. Simon Haykin – Neural Networks and Learning Machines.	
Reference Books	
1. Ian Goodfellow, Yoshua Bengio, Aaron Courville – <i>Deep Learning</i>	
2. François Chollet – <i>Deep Learning with Python</i>	
Project-Based Learning Assignments	
Note: - Students in a group of 3 to 4 shall complete any one project from the following list	
1. Handwritten Digit Recognition (CNN on MNIST)	
2. Real-time Object Detection (YOLO, SSD, Faster R-CNN)	
3. Speech Emotion Recognition (RNN/LSTM)	
4. Chatbot using Transformer Models	
5. Style Transfer using CNNs	
6. AI-based Face Mask Detection	
7. Music Genre Classification using LSTMs	
8. AI-based Sign Language Recognition	

9. Fake News Detection using NLP Models	
10. Autonomous Driving Simulation using Deep Reinforcement Learning	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Software Testing				
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME
Lecture:	03 Hours/Week	End Semester Examination:	60 Marks	Theory
Practical:	02 Hours/Week	Internal Assessment:	40 Marks	
		Termwork:	25Marks	
		Oral:	25 Marks	Oral
Total	05 Hours/Week	Total Marks	150 Marks	Total
				04
Course Objective:				
Students will learn about				
<ol style="list-style-type: none"> 1. Create awareness among the students about the basic fundamentals of Software Testing Process. 2. To make students aware of various techniques and tools used for testing different kinds of software. 				
Prerequisite:				
Students should have knowledge of Software Engineering concepts.				
Course Outcomes: On completion of the course, students will have the ability to				
1. Understand and apply core software testing concepts				
2. Effectively design and manage test cases				
3. Apply manual testing processes and functional/non-functional testing techniques				
4. Understand the principles of test automation, recognize its benefits and challenges				
5. Effectively use various testing tools				
6.. Apply Agile testing principles and practices				
Unit I: Basics of Testing				(06 Hours)
Testing as an Engineering Activity – Basic Definitions – Bug, Defect, Verification validation, Debugging ,Software Testing Principles – The Tester’s Role in software Development Organization , Iterative development – Risk Driven and Client Driven, Test driven Development .Quality Assurance, Quality Control, V-Model of software testing, Testing techniques and Levels of Testing, Static Vs Dynamic testing, Test deliverables.				
Unit II: Software Testing Lifecycle and Test Case Design				(06 Hours)
Software Testing Lifecycle, Test planning – Definition, Test Plan Template, Test Case Fundamentals- Definition, Test Case Template, Test Case Parameters, Kinds of Test cases, Characteristics of Good Test Case, Writing Functional and Boundary Test Cases, Manual Test Cases Vs Automated Test Scripts .				

Unit III :Manual Testing Techniques	(06 Hours)
Manual Testing Process,Functional Testing Techniques,Non-Functional Testing Techniques,Manual Testing Tools: Test management tools(TestRail), Bug tracking tools: JIRA, Bugzilla	
Unit IV: Automated Testing	(06 Hours)
Introduction to Test Automation, Why automate? ,Benefits and challenges of test automation, Key principles of automation, Automation tools comparison (open-source vs. commercial tools, Types of test automation frameworks: Linear, Modular, Data-driven, Keyword-driven, Hybrid	
Unit V: Overview of Testing Tools	(06 Hours)
Selenium for Web Application Testing,Introduction to TestNG and JUnit for test execution, Integrating with CI/CD pipelines (e.g., Jenkins,GitLab CI,),Introduction to API testing tools (e.g., Postman, Rest Assured),Introduction to Performance Testing with JMeter , Tools for security testing (e.g., OWASP ZAP, Burp Suite),Tools for mobile testing (e.g., Appium, TestComplete),Cloud-based testing platforms (e.g., Sauce Labs, BrowserStack)	
Unit VI: Agile Testing Techniques and Quality Tools	(06 Hours)
Agile testing – Nine principles and six concrete practices for testing on agile teams. Six Sigma - Kaoru Ishikawa’s Basic Seven QC (Quality Control) Tools- Cause and Effect diagram, Check Sheet, Control charts, Histogram, Pareto chart, Scatter diagram, Flowchart ,Software Testing- ISO Standards, IEEE Standards- IEEE 829, IEEE 1008, IEEE 1012 etc	
Textbooks	
1. Paul C. Jorgensen: Software Testing, A Craftsman’s Approach, 3rd Edition, Auerbach Publications, 2008	
2. Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India	
3.Aditya P Mathur: Foundations of Software Testing, Pearson Education	
Reference Books	
1.Software testing Principles and Practices – Gopaldaswamy Ramesh	
2. Software Testing – Ron Patton	
3. The Craft of Software Testing – Brian Marrick	
4. Anirban Basu Software Quality Assurance, Testing and Metrics	
Laboratory Assignments:	
The faculty member will frame atleast 8 assignments on testing tools and testing techniques.	
Project Based Learning Assignments	
Note:- Students in a group of 3 to 4 shall complete any one project from the following list	
1. Testing of application using selenium	
2. Testing of application using postman	

3. Manual Testing for a Mobile Application	
4. Performance Testing Using JMeter	
5. Continuous Integration and Continuous Testing with Jenkins	
6. Security Testing for Web Applications Using OWASP ZAP	
7. Agile Testing Project with Scrum Framework	
Syllabus for Unit Tests:	
UnitTest-1	Unit-I,Unit-II,Unit-III
UnitTest-2	Unit-IV,Unit-V,Unit-VI

Full-Stack Development					
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	3 Hours/Week	End Semester Examination: 60 Marks		Theory	3
Practical:	2 Hours/Week	Internal Assessment: 40 Marks		Practical	1
		Term Work: 25 Marks			
		Practical: 25 Marks			
Total	5 Hours/Week	Total	150 Marks	Total	4
Course Objective:					
<ul style="list-style-type: none"> To provide students with a comprehensive understanding of full-stack web development concepts. To enhance students' problem-solving and critical thinking abilities in a web development context. 					
Prerequisite:					
Students should have knowledge of Programming, Fundamentals, Data Structures and Algorithms, Database Management Systems, Object-Oriented Programming, Web Technologie.					
Course Outcomes: On completion of the course, students will have the ability to					
1. Usage of various front and back-end Tools					
2. Implement web-based application using effective database access.					
3. Demonstrate designing of Website.					
4. Understand the concepts of NoSQL and MongoDB.					
5. Understand the concepts of full stack integration					
6. Understand the concepts of DevOps; Principles and practices of DevOps					
Unit I :					(6 Hours)
Front End Development					
HTML Basics: Elements, Headings, Paragraphs, Button, Attributes, Images, Hyperlinks, Containers, Lists					
CSS Basics: Rulesets, Properties, Colors, Units, Box Model, Margins, Paddings, Borders					
Bootstrap Components: Carousel, Embedding Videos.					
Unit II					(6 Hours)
JavaScript and Frameworks: JavaScript Variables, data types, and operators Control structures (conditionals and loops), Functions and events, DOM manipulation with JavaScript. Asynchronous JavaScript.					
Unit III					(6 Hours)
Front-End Frameworks: Introduction to ReactJS, Components and state, React Router for navigation, Handling user input and forms, State management with					

<p>Redux or Context API. Introduction to Node.js, Setting Up Server: Introduction to Node.js, Architecture, Installing and configuring Node.js, Node Module System, NPM(Node Package Manager), Creating a basic Node.js server, modules and package management in Node.js., RESTful API Development: Using Express framework: Creating Custom Middleware, Built-In Middleware, Third-party Middleware, Environments, Configuration.</p>	
Unit IV	(6 Hours)
<p>Back-End Development: Introduction to NoSQL databases, Setting up MongoDB, Schema design and modelling, Performing basic CRUD operations on databases using SQL queries and MongoDB commands, Creating, reading, updating, and deleting data in both SQL and NoSQL databases, Implementing data validation and error handling</p>	
Unit V	(6 Hours)
<p>Full Stack Integration: Integrating your React / Node frontend with Express.js and MongoDB backend. Building RESTful APIs in Express.js to handle data requests from the front end. Using React components to fetch and display data from the MongoDB database. Using WebSockets or other similar technologies,real-time communication between the front and back ends can be established.</p>	
Unit VI	(6 Hours)
<p>Implementing user authentication using JSON Web Tokens (JWTs) or session-based authentication. Developing secure routes and middleware to protect sensitive data and API endpoints, Managing user roles and permissions. Introduction to DevOps: Principles and practices of DevOps,</p>	
Textbooks	
<p>1. Vasan Subramanian, ‘Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node’, Second Edition, Apress, 2019</p>	
<p>2. Brad Dayley, Brendan Dayley, Caleb Dayley, ‘Node.js, MongoDB and Angular Web Development’, Addison-Wesley, Second Edition, 2018</p>	
Reference Books	
<p>1. Kirupa Chinnathambi, ‘Learning React: A Hands-On Guide to Building Web Applications Using React and Redux’, Addison-Wesley Professional, 2nd edition, 2018</p>	
<p>2. Chris Northwood, ‘The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer’, Apress; 1st edition, 2018</p>	
Laboratory Assignments:	
The faculty member will frame atleast 8 assignments, with atleast one assignment on every unit.	

Project Based Learning	
1. Create any website using Full Stack Technology learnt.	
2. Build a Chat module using Full Stack Technology learnt .	
3. Create a simple calculator Application using Full Stack Technology learnt	
4. Create a voting (any web) application using Full Stack Technology learnt.	
5. Create and Build a Password Strength Check using Full Stack Technology learnt	
6. Create and Build a star rating system using Full Stack Technology learnt	
7. Create a Simple Login form using Full Stack Technology learnt	
8. Create a project on Grocery delivery application/ any web application.	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

ELECTIVE-I: Network Security and Cryptography					
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	3 Hours/Week	End Semester Examination:	60 Marks	Theory	3
Practical:	2 Hours/Week	Internal Assessment:	40 Marks	Termwork	1
		Term Work:	25 Marks		
Total	5 Hours/Week	Total	125 Marks	Total	4
Course Objective:					
Students will learn about various methodologies of securing the network and also learn concepts of cryptography and it's applications.					
Prerequisite:					
Students should have basic knowledge of Computer Networks					
Course Outcomes: On completion of the course, students will have the ability to					
1. To understand the basics of number theory and its applications in cryptography.					
2. To study symmetric encryption techniques like DES, AES, and stream ciphers.					
3. To explore asymmetric encryption methods and secure key exchange protocols.					
4. To analyze hash functions, message digests, and their security aspects.					
5. To learn digital signatures, authentication protocols, and their real-world applications.					
6.. To study network, web, and system security mechanisms like SSL/TLS, IPSec, and firewalls.					
Unit I : Fundamentals of Number Theory				(6 Hours)	
Modular Arithmetic, Euclidean Algorithm, Primality Testing (Fermat's and Euler's Theorems), Chinese Remainder Theorem, Discrete Logarithms					
Unit II: Symmetric Encryption Techniques				(6 Hours)	
Stream Ciphers, Block Ciphers (DES, AES, IDEA), Block Cipher Operations, Random Bit Generation, RC4.					
Unit III: Asymmetric Encryption and Key Exchange				(6 Hours)	
Principles of Asymmetric Cryptography, Algorithms:RSA, ElGamal, Elliptic Curve Cryptography (ECC), Homomorphic Encryption and Secret Sharing, Key Distribution and Key Exchange Protocols: Diffie-Hellman Key Exchange, Man-in-the-Middle Attack.					
Unit IV: Message Digest and Hash Functions				(6 Hours)	
Requirements and Security, MD5, SHA (Secure Hash Algorithm), Birthday Attack, HMAC.					

Unit V Digital Signatures and Authentication Protocols	(6 Hours)
Authentication Concepts: Requirements and Functions, Message Authentication Codes (MAC), Digital Signatures:RSA and ElGamal Digital Signatures, Digital Signature Standards (DSS), Authentication Applications: Kerberos, X.509, Public Key Infrastructure (PKI)	
Unit VI: System, Web, and Network Security	(6 Hours)
Transport Layer Security: Secure Socket Layer (SSL), TLS (Transport Layer Security), IP Security (IPSec): Architecture and Encapsulating Payload Security E-mail Security: Pretty Good Privacy (PGP), S/MIME Web Security: Secure Electronic Transaction Protocol, System Security: Intrusion Detection, Password Management Firewalls Design Principles.	
Textbooks	
1. William Stallings , <i>Cryptography and Network Security: Principles and Practices</i> , Pearson	
2. Bruce Schneier , <i>Applied Cryptography: Protocols, Algorithms, and Source Code in C</i> , Wiley.	
Reference Books	
1. Behrouz A. Forouzan , <i>Cryptography and Network Security</i> , McGraw-Hill.	
2. Charlie Kaufman , <i>Network Security: Private Communication in a Public World</i> , Pearson.	
Laboratory Assignments:	
The faculty member will frame atleast 8 assignments, with atleast one assignment on every unit.	
Project Based Learning Assignments	
Note:- Students in a group of 3 to 4 shall complete any one project from the following list	
1. Develop a program to perform modular arithmetic operations and test for prime numbers using Fermat's and Euler's theorems.	
2. .Create an application that generates public-private key pairs and encrypts/decrypts messages using the RSA algorithm.	
3. Build a tool to demonstrate block cipher encryption and decryption processes using DES and AES algorithms.	
4. Implement the Diffie-Hellman key exchange protocol to simulate secure key sharing between two parties.	
5. Develop a program to compute hash values using MD5 and SHA, and demonstrate vulnerability using a birthday attack simulation.	
6. Create a project that digitally signs and verifies documents using RSA or ElGamal digital signature algorithms.	

7. Design a basic firewall simulation to filter and block unauthorized network traffic based on predefined rules.	
8. Build a prototype IDS to monitor and flag suspicious activities in a simulated network environment.	
9. Develop an email security application using PGP for encryption, decryption, and digital signing.	
10. Implement a secure web application that uses TLS to encrypt communication between client and server.	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Elective-I: Information Retrieval				
TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
Lecture:	03 Hours/Week	End Semester Examination: 60 Marks	Theory	03
Practical	02 Hours/Week	Internal Assessment : 40 Marks	Termwork	01
		Termwork : 25		
Total	05 Hours/Week	Total :125 Marks	Total	04
Course Objective:				
Students will learn about : <ul style="list-style-type: none"> • Learn to write code for text indexing and retrieval • Learn to evaluate information retrieval systems 				
Prerequisite:				
Students should have knowledge of				
Students must have the minimal concept of Data Base Management Systems , Basic mathematics background is also required. You are supposed to be familiar basic concepts of probability (e.g., Bayes's theorem), linear algebra (e.g., vector, matrix and inner product)				
Course Outcomes: On completion of the course, students will have the ability to				
1. Demonstrate genesis and diversity of information retrieval situations for text and hyper media.				
2. Understand the theoretical basis behind the standard models of IR (Boolean, Vector-space, Probabilistic and Logical models				
3. Describe models like vector-space, probabilistic and language models to identify the similarity of query and document				
4. Use performance evaluation metric for IR				
5. Analyze the performance of information retrieval using advanced techniques such as classification, clustering, and filtering over multimedia				
6.. understand the theoretical basis behind the standard models of IR (Boolean, Vector-space, Probabilistic and Logical models				
Unit I Introduction to Information Retrieval:				(06 Hours)
Goals and history of IR. The impact of the web on IR. Information retrieval process, Indexing, Information retrieval model, Boolean retrieval model The nature of unstructured and semi-structured text. Inverted index and Boolean queries.				
Unit II Basic Retrieval models:				(06 Hours)
ranked retrieval; text-similarity metrics; Simple term weights, TF-IDF (term frequency/inverse document frequency) weighting; cosine similarity. Retrieval strategies, Boolean and vector-space retrieval models; Non binary independence model, Language models				

Unit III Text Categorization and Filtering:	(06 Hours)
Introduction to text classification. Naive Bayes models. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting.	
Unit IV Text Clustering:	(06 Hours)
Clustering versus classification. Partitioning methods. k-means clustering. Mixture of Gaussians model. Hierarchical agglomerative clustering. Clustering terms using documents.	
Unit V Performance Evaluation , Relevance feedback and query expansion :	(06 Hours)
Performance metrics: recall, precision, Evaluating search engines. User happiness, precision, recall, F- measure. Creating test collections: kappa measure, interjudge agreement. Evaluations on benchmark text collections. Relevance feedback : pseudo relevance feedback, Query Reformulation Recommender System: personalization, Collaborative filtering recommendation, Content-based recommendation	
Unit VI Web search basics	(06 Hours)
History of Web,Indexing,Spidering/Crawling, Web crawling and indexes, directed spidering, Link Analysis (e.g. HITS ,hubs and authorities, Google PageRank); shopping agents	
Textbooks	
1. 1.Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007.	
2. Modern Information Retrieval. Baeza-Yates Ricardo and Berthier Ribeiro-Neto. 2nd edition, Addison-Wesley, 2011.	
3. Information Retrieval: Implementing and Evaluating Search Engines. Stefan Butcher, Charlie Clarke, Gordon Cormack, MIT Press, 2010.	
Reference Books	
1. Christopher D Manning, PrabhakarRaghavan, HinrichSchutze, An Introduction to Information Retrieval By Cambridge University Press, England, 2009.	
2. Introduction to Information Retrieval. Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schuetze, Cambridge University Press, 2007	
Laboratory Assignments:	
The faculty member will frame atleast 8 assignments, with atleast one assignment on every unit.	

Project Based Learning Assignments	
Note:- Students in a group of 3 to 4 shall complete any one project from the following list	
1. Implementation of inverted index	
2. Implementation of Boolean retrieval model	
3. Study of various data structure for fast accessing of the data(Hash table,B-trees,sparse lists)	
4. To find out cosine similarity using Tf and IDf	
5. Study of Zip's law .: Statistical and Mathematical study	
6. Implementation of various classification algorithm on text	
7. Implementation of various Clustering algorithm on text	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Elective-I: Software Architecture					
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME	
Lecture:	03 Hours/Week	End Semester Examination: 60 Marks		Theory	3
Practical	02 Hours/Week	Internal Assessment:	40 Marks	Termwork	1
		Termwork	25 Marks		
Total	05 Hours/Week	Total	125 Marks	Total	4
Course Objective:					
Equipping students with the knowledge and skills required to design, analyze, document, and implement scalable and maintainable software systems.					
Prerequisite:					
1. Basic understanding of software development and programming					
2. Knowledge of object-oriented programming (OOP) principles					
3. Familiarity with software engineering concepts					
Course Outcomes: On completion of the course, students will have the ability to					
1. Understand the principles of software architecture and design patterns.					
2. Learn how to analyze, design, and document software architecture.					
3. Explore various architectural styles and their applications.					
4. Understand quality attributes and trade-offs in architectural decision-making.					
5. Gain insights into tools, methodologies, and emerging trends in software architecture.					
6. Understand architecture documentation and Tools					
Unit I : Introduction to Software Architecture					(6 Hours)
Definition and importance of software architecture, Role of an architect in the software development lifecycle, Difference between design and architecture Software development methodologies and their impact on architecture					
Unit II : Architectural Principles and Concepts					(6 Hours)
Key principles of software architecture: scalability, maintainability, and performance, Architectural viewpoints and perspectives, Layered architecture: benefits and use cases, Abstraction and encapsulation					
Unit III : Software Design Patterns					(6 Hours)
Overview of design patterns, Structural patterns: Adapter, Composite, Proxy, Behavioral patterns: Observer, Strategy, Command, Creational patterns: Singleton, Factory, Builder					

Unit IV : Architectural Styles and Patterns	(6Hours)
Layered (n-tier) architecture, Microservices architecture, Service-Oriented Architecture (SOA), Event-driven and serverless architectures, Domain-Driven Design (DDD), Model-View-Controller (MVC)	
Unit V : Quality Attributes and Trade-offs	(6 Hours)
Understanding quality attributes: performance, security, usability, scalability, Attribute-Driven Design (ADD), Trade-offs in architectural decisions, Techniques to evaluate and measure software quality	
Unit VI : Architecture Documentation and Tools	(6 Hours)
Documenting software architecture: diagrams, views, and models, Unified Modeling Language (UML) and C4 model, Tools: Enterprise Architect, PlantUML, Lucidchart, Importance of stakeholder communication Emerging Trends and Best Practices, Cloud-native architecture and containerization (Docker, Kubernetes), DevOps and its influence on architecture AI-driven architectural analysis, Continuous integration and delivery pipelines	
Textbooks	
1. "Software Architecture in Practice" by Len Bass, Paul Clements, and Rick Kazman	
2. "Designing Software Architectures" by Humberto Cervantes and Rick Kazman	
Reference Books	
1. "Patterns of Enterprise Application Architecture" by Martin Fowler	
2. Online resources and documentation: AWS Architecture Center , Microsoft Azure Well-Architected Framework	
Laboratory Assignments:	
The faculty member will frame atleast 8 assignments, with atleast one assignment on every unit.	
Project Based Learning Assignments	
Note:- Students in a group of 3 to 4 shall complete any one project from the following list	
1. Design a software architecture for a given problem statement	
2. Analyze architectural patterns in existing systems	
3. Design and document a system architecture for a specific use case	
Syllabus for Unit Tests:	
Unit Test -1	Unit – I, Unit – II, Unit - III
Unit Test -2	Unit – IV, Unit – V, Unit – VI

Information Technology Laboratory-VI				
TEACHING SCHEME		EXAMINATION SCHEME		CREDIT SCHEME
Practical	02 Hours/Week	Practical :25 Marks	Practical	01
		Term work : 25 Marks		
Total	02 Hours/Week	Total 50 Marks	Total	01
Course Objective: To provide students foundation knowledge of DevOps environment, supportive automation tools, scripting language and hands on assignments to understand the DevOps workflow.				
Prerequisite: Students should have prior knowledge of software development life cycle, basics of cloud computing and Linux operating system.				
Course Outcomes: On completion of the course, students will have the able to				
1.Understand the benefits of DevOps over other software development processes.				
2. Interpret working of the DevOps workflow.				
3.Apply cloud computing services in DevOps environment.				
4.Implement Linux commands in DevOps environment.				
5.Implement Shell scripting for DevOps.				
6. Perform various Git commands associated with version controlling.				
Unit I: Introduction to DevOps				(4 Hours)
DevOps: Definition and Concept, Historical Background of DevOps, Goals of DevOps, difference between DevOps and traditional Software Development Life Cycle and Agile Model, benefits of working in a DevOps environment, roles, responsibilities and skills of a DevOps Engineer				
Unit II:DevOps Architecture				(04 Hours)
Continuous Development, Continuous Integration, Continuous Testing, Continuous Deployment, Continuous Monitoring, Continuous Feedback, Continuous Operations, DevOps Pipeline, DevOps principles, overview of DevOps Automation Tools, Benefits of the DevOps lifecycle				
Unit III:Cloud Computing Services				(04 Hours)
Understanding the Concept, Cloud Computing services, DevOps linking with cloud computing, Popular Public Cloud Providers: Amazon Web Services, Microsoft Azure, Google Cloud Services AWS: AWS DevOps Architecture, AWS CloudFormation, AWS EC2, AWS CloudWatch, AWS Code Pipeline				

Unit IV: LINUX Basic and Admin	(04 Hours)
Overview of Linux Significance of Linux in DevOps, Linux Basic Command Utilities, Group management Linux Basic Command Utilities, Linux Administration Linux Administration, Environment Variables, Networking, Linux Server Installation, Linux Networking and YUM Installation	
Unit V :Shell Scripting for DevOps	(04 Hours)
Introduction, Variables, Flow Controls, Loops, Functions, Lists, Manipulating Strings, Reading and Writing Files, Positional Parameters	
Unit VI:Version Control with Git	(04 Hours)
Version control architecture- introduction, features, benefits Source code management, Virtual private network, Types of version control systems. Git: Git Installation, commonly used commands in Git, Git workflow, Git branching and Merging, Working with Remote repository.	
Textbooks	
1. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation" by Jez Humble and David Farley:	
2. Jennifer Davis and Ryn Daniels, Effective DevOps, O'Reilly Publisher, 2022	
Reference Books	
1. The Phoenix Project: A Novel about IT, DevOps, and Helping Your Business Win" by Gene Kim, Kevin Behr, and George Spafford.	
2. Infrastructure as Code: Managing Servers in the Cloud" by Kief Morris.	
Laboratory Assignments	
1. Building a CI/CD Pipeline for a Web Application	
2. Automating Infrastructure Setup with Terraform/Ansible	
3. Implementing Continuous Monitoring and Feedback for a Cloud Application	
4. Deploying Microservices with Kubernetes	
5. Automating Infrastructure and Monitoring with AWS DevOps Tools	
6. Building and Managing a Linux-Based DevOps Server	
7. Automating DevOps Tasks with Shell Scripting	

PROFESSIONAL SKILLS				
TEACHING SCHEME		EXAMINATION SCHEME	CREDIT SCHEME	
Practical	02 Hours/Week	Internal Assessment: 25 Marks	Termwork	01
Total	02 Hours/Week	Total: 25 Marks	Total	01
<p>Course Objective: This course is structured to provide students with a well-rounded foundation in quantitative aptitude, logical and verbal reasoning, professional communication, employment skills, leadership development, and business ethics. By integrating these components, students will be better equipped to excel in recruitment processes and succeed in their professional careers.</p>				
<p>Prerequisite: The students should have knowledge of</p> <ol style="list-style-type: none"> 1. Basic mathematical concepts, reasoning skills, and comprehension abilities. 2. Fundamentals of communication processes and soft skills. 3. Basic understanding of leadership qualities, ethics, etiquettes, and values. 				
<p>Course Outcomes: On completion of the course, students will have the able to</p> <ol style="list-style-type: none"> 1. Apply shortcut techniques to solve quantitative aptitude questions efficiently in recruitment and competitive exams. 2. Utilize logical reasoning methods and mnemonics to enhance problem-solving skills in placement tests. 3. Improve verbal communication skills, including vocabulary, sentence patterns, and reading comprehension, for effective professional interactions. 4. Develop proficiency in job application writing, resume building, and interview skills to enhance employability. 5. Understand and apply soft skills, leadership qualities, and professional ethics in the workplace. 6. Demonstrate appropriate corporate etiquette, business ethics, and values in professional settings. 				
Unit I: QUANTITATIVE APTITUDE				(06 Hours)
Number System, Percentage, Profit and Loss, Simple & Compound Interest, Ratio, Proportion, and Average, Mixture and Allegation, Time, Speed & Distance, Time & Work, Permutation & Combination, Probability, Pipes and Cisterns				
Unit II: LOGICAL REASONING				(06 Hours)
Coding-Decoding, Number Series, Blood Relation, Directions, Cubes & Dices, Data Interpretation, Data Sufficiency, Set Theory & Syllogisms, Matching, Selection & Arrangement, Clocks & Calendars, Visual Reasoning, Input-Output & Flow Charts				
Unit III: VERBAL REASONING				(06 Hours)
Sentence Patterns, Sentence Correction, Spotting Errors, Vocabulary, Antonyms & Synonyms, Analogy Phrasal Verbs, Idiomatic Expressions, Reading Comprehension, Cloze Test, Sentence Rearrangement and Theme Detection.				

Unit IV: HONING EMPLOYABILITY AND PRESENTATION SKILLS:	(06 Hours)
Job Application Letters: Layout, Structure, Covering Letter, Resume & CV Building: Structure, Effective Writing Tips, Group Discussion: Skills, Strategies, and Evaluation, Interview Skills: Telephonic & Face-to-Face Interviews, Body Language, Grooming & Etiquette for GD & PI, Extempore Speaking Techniques, Presentation Skills: Structure, Layout, Flow, and PPT Creation.	
Unit V: SOFT SKILLS AND LEADERSHIP DEVELOPMENT:	(06 Hours)
Soft Skills: Definition, Importance, and Differences from Hard Skills Life Skills & Personal Development, Team Building & Conflict Resolution, Problem-Solving, Time & Stress Management, Pareto Principle (80/20 Rule), Time Management Matrix, Leadership Skills: Importance, Types, Attributes of a Good Leader, Motivational Theories and Emotional Intelligence in Professional Life.	
Unit VI: BUSINESS ETHICS, ETIQUETTES AND VALUES:	(06Hours)
Ethics & Values in the Business World Respect for Individuality and Workplace Diversity Key Features of Corporate Etiquette Corporate Grooming & Dressing Social & Office Etiquette Importance of Professional Behaviour in the Workplace, Corporate Social Responsibility (CSR): Need and Importance.	
Textbooks	
1. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation" by Jez Humble and David Farley:	
2. Jennifer Davis and Ryn Daniels, Effective DevOps, O'Reilly Publisher, 2022.	
Reference Books	
1. Quantitative Aptitude by R. S. Agarwal published by S. Chand	
2. The Book of Numbers by Shakuntala Devi	
3. A Modern Approach to Logical Reasoning by R. S. Agarwal published by S. Chand	
4. A New Approach to Reasoning Verbal & Non-Verbal by Indu Sijwali	
5. Business Communication by Meenakshi Raman, Prakash Singh published by Oxford University press, second edition	
6. Communication Skills by Sanjay Kumar, Pushp Lata, published by Oxford University press, second edition	
7. Technical Communication by Meenakshi Raman, Sangeeta Sharma published by Oxford University press	
8. Developing Communication Skills by Krishna Mohan, Meera Banerji published by Macmillan India Pvt Ltd	
9. Soft Skills by Meenkashi Raman, published by Cengage publishers	
10. Soft Skills by Dr. K Alex published by Oxford University press	
11. Soft skills for Managers by Dr. T. Kalyana Chakravarthi and Dr. T. Latha Chakravarthi published by biztantra	
Teamwork Assignments	
1. Solve 20 practice problems on Number System, Percentage, and Profit & Loss.	

2. Create a comparative analysis of Simple Interest vs. Compound Interest with real-world examples
3. Solve a set of logical reasoning problems covering Coding-Decoding, Blood Relations, and Directions.
4. Prepare a case study on how logical reasoning skills are used in competitive exams and corporate assessments.
5. Identify and correct errors in 10 sentences focusing on sentence structure and grammatical mistakes.
6. Develop a vocabulary list with antonyms, synonyms, and phrasal verbs commonly used in professional settings.
7. Draft a job application letter along with a structured resume tailored for a technical position.
8. Participate in a mock group discussion and receive peer and instructor feedback.
9. Conduct a mock interview (telephonic & face-to-face) and submit an evaluation report
10. Conduct self-assessment on personal soft skills and identify areas for improvement.
11. Develop a time management plan using the Pareto Principle (80/20 Rule) and Time Management Matrix.
12. Preparing a report on different leadership styles and their impact in the corporate world
13. Write a report on corporate ethics and how companies implement ethical policies.
14. Conduct a role-play activity demonstrating appropriate corporate etiquette in business interactions.
15. Prepare a presentation on the significance of Corporate Social Responsibility (CSR).