Shroff S.R. Rotary Institute of Chemical Technology

Ref: UPL University /SRICT/BOS/CO/2026-27/02

Date: 09-06-2026

Teaching Scheme for

Third Year Bachelor of Information Technology

Semester-V (Information Technology) Structure

Sr. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs/ week	Credits	E	M	I	V	Total
				L	T	P							
1	Humanities & Social Science	CO2301	Economics & Business Management	3	0	0	3	3	70	30	0	0	100
2	Professional Core Course	CO2302	Data Mining	3	0	2	5	4	70	30	20	30	150
3	Professional Core Course	CO2303	Design & Analysis of Algorithm	3	0	2	5	4	70	30	20	30	150
4	Professional Core Course	IT2305	Distributed Operating System	3	0	2	5	4	70	30	20	30	150
5	Professional Elective Course		Professional Elective 2	2	0	2	4	3	70	30	20	30	150
6	Open Elective		Open Elective 1	2	0	2	4	3	70	30	20	30	150
7	Mandatory Course	MH2301	CPDP 1	1	1	0	2		50	30	20	0	100
8	Inplant Training	MH2303	Industrial Internship	0	0	0	0	1	0	0	50	0	50
	Total			**17**	**1**	**10**	**28**	**24**	**Total**				**1000**

Professional Elective 2			Open Elective 1		
Sr No	**Code No.**	**Course Title**	**Sr No**	**Code No.**	**Course Title**
1	CO2305	Information Security	1	CO2307	Computer Graphics
2	CO2306	Advanced Java Programming	2	IT2301	Blockchain Technology

Shroff S.R. Rotary Institute of Chemical Technology

Semester-VI (Information Technology) Structure

Sr. No	Category of Course	Code No.	Course Title	Hours per week			Total contact hrs / week	Credits	E	M	I	V	Total
				L	T	P							
1	Professional Core Course	IT2302	Cloud Computing	2	0	2	4	3	70	30	20	30	150
2	Professional Core Course	CO2310	Artificial Intelligence	3	0	2	5	4	70	30	20	30	150
3	Professional Elective Course		Professional Elective 3	2	0	2	4	3	70	30	20	30	150
4	Professional Elective Course		Professional Elective 4	3	0	2	5	4	70	30	20	30	150
5	Open Elective		Open Elective 2	3	0	2	5	4	70	30	20	30	150
6	Open Elective		Open Elective 3	3	0	2	5	4	70	30	20	30	150
7	Mandatory Course	MH2302	CPDP 2	1	1	0	2	2	50	30	20	0	100
	Total			**17**	**1**	**12**	**30**	**24**	**Total**				**1000**

Professional Elective 3			Professional Elective 4			Open Elective 2		Open Elective 3		
Sr No	Code No.	Course Title	Sr No	Code No.	Course Title	Code No.	Course Title	Sr No	Code No.	Course Title
1	CO2311	Advance Technologies	1	IT2303	Mobile Application with Flutter	CO2315	Big Data Analytics	1	CO2317	Internet of Things
2	CO2312	.Net Programming	2	IT2304	Data Visualization using Python	CO2316	Image Processing	2	CO2318	Cyber Security

A. Course code and definition:

Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
E	Theory External Examination Marks
M	Theory Internal Examination Marks
I	Practical Internal Examination Marks
V	Practical External Examination Marks

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2301
Subject Name: Economics & Business Management

Semester: - V

Type of course: Humanities & Social Science

Prerequisite: Basic knowledge of Social Sciences.

Rationale: Understanding of basic principles of modern economics and its application in various field of engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction** Definition of Economics-by different economist (Science of Wealth, Science of Scarcity, Science of Human Behavior & Science of Sustainability). Basics of Economics, Differences between Micro and Macro Economics.	4
2	**Basic Terms of Economics** Relationship Between Demand And Supply, Price & Supply Curve, Price & Demand Graph, Demand & Supply Curve, Operation Of Invisible Hand By Smith. Definition Of Gdp, Gnp, Ndp, Nnp, Per Capita Income, And Factor Cost & Market Cost.	6
3	**National Income** Meaning of National Income. Calculate NI. Methods of calculation national income(Income Methods, Production Method, Expenditure Method)	4

Bachelor of Engineering
Subject Code: CO2301
Subject Name: Economics & Business Management

	SECTION-B	
4	**Indian Banking System** History of Indian Banking System, Types of Bank, Reserve Bank Of India and its monetary policy in economics. Quantitative Approach and Qualitative Approach Used By Rbi To Control Economy In India, Different Rates Of Rbi,Repo Rates, Reverse Repo Rate, Msf Rates, Psl.Moral Suation And Direct Action.	**4**
5	**Introduction to Business Management** Definition of Management, Organizational Behavior – Utility function, Rate of commodity substitution, Maximization of utility, Demand functions, Price and Income elasticity's of demand, Indifference Curve Analysis, Substitution and income effects, Consumer's surplus. Monopoly and Monopolistic Competition. Duopoly and Oligopoly. Organization Design and Structure - Organization – Meaning, Process, Principles, Or Organization Structure – Determinants and Forms: Line, Functional, Line & Staff, Project, Matrix and Committees; Formal and Informal Organization; Departmentation – Meaning and Bases.	**8**
6	**Planning and Decision Making** Planning: Nature, importance, forms, types, making planning effective, Significance & Limitations of Planning; Planning Premises – Meaning & Types, Strategic Planning –Meaning & level, BCG model etc, MBO – Meaning, Process, Importance of decision making – Meaning, Types, Process, Schools of decision making.	**4**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**40**	**35**	**15**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Bachelor of Engineering
Subject Code: CO2301
Subject Name: Economics & Business Management

Text Book:

1. Indian Economy, 12th Edition, by Ramesh Singh 2020-21, Mc Graw Hill.
2. Weihrich and Koontz, et al: Essentials of Management; Tata McGraw Hill

Reference Books:

1. Modern Economics by Ahuja HL, Sultan Chand Publication.
2. Robbins, S. P: Management, Prentice Hall.

Course Outcomes:
Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** the basics of Economics.
CO-2	**Analyze** the classification of economics based on the terms evolved in economic.
CO-3	**Apply** the knowledge of taxation based on which one given.
CO-4	**Understand** the basic of banking system and the main role of RBI.
CO-5	**Evaluate** the importance of calculating National Income.
CO-6	**Remember** the meaning of Inflation and Deflation.

Bachelor of Engineering
Subject Code: CO2302
Subject Name: Data Mining

Semester: - V

Type of course: Professional Core

Prerequisite: Knowledge of RDBMS and OLTP

Rationale: To understand the need for Data Mining and advantages to the business world. To get a clear idea of various classes of Data Mining techniques, their need, scenarios (situations) and scope of their applicability. To learn the algorithms used for various type of Data Mining problems

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to data mining (DM)** Motivation for Data Mining, Data Mining, Definition and Functionalities, Classification of DM Systems, DM task primitives, Integration of a Data Mining system with a Database or a Data Warehouse, Issues in DM-KDD Process.	6
2	**Data Pre-processing** Data summarization, data cleaning, data integration and transformation, data reduction, data discretization and concept hierarchy generation, feature	8

Bachelor of Engineering
Subject Code: CO2302
Subject Name: Data Mining

	extraction , feature transformation, feature selection, introduction to Dimensionality Reduction, CUR decomposition.	
3	**Concept Description, Mining Frequent Patterns, Associations and Correlations** Concept description, Data Generalization and summarization based characterization, Attribute relevance, class comparisons, Basic concept, efficient and scalable frequent item set mining methods, mining various kind of association rules, from association mining to correlation analysis.	**7**
SECTION-B		
4	**Classification and Prediction** Classification vs. prediction, Issues regarding classification and prediction, Statistical Based Algorithms, Distance Based Algorithms, Decision Tree Based Algorithms, Neural Network Based Algorithms, Rule Based Algorithms, Combining Techniques, accuracy and error measure.	**6**
5	**Neural Network Prediction Methods** Linear and nonlinear regression, Logistic Regression Introduction of tools such as DB Miner / WEKA / DTREG DM Tools	**4**
6	**Cluster Analysis** Clustering: Problem Definition, Clustering Overview, Evaluation of Clustering Algorithms, Partitioning Clustering -K-Means Algorithm, K-Means Additional issues, PAM Algorithm; Hierarchical Clustering Agglomerative Methods and divisive methods, Basic Agglomerative Hierarchical Clustering, Strengths and Weakness; Outlier Detection, Clustering high dimensional data, clustering Graph and Network data.	**8**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**35**	**25**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Bachelor of Engineering
Subject Code: CO2302
Subject Name: Data Mining

Text Books:

1. Data Mining Concepts and Techniques by Jiawei Han and Micheline Kamber Kaufmann Publishers, 2011.
2. Data Mining Techniques by Arun K Pujari Orient Longman Publishers.
3. Fundamentals of Data Warehouses by M.Jarke, M Lenzerni.
4. Principles of Data Mining by David Hand, Heikki Mannila, Padhraic Smyth, PHI.

Reference Books:

1. Data Mining Concepts and Techniques by J. Han, M. Kamber, Morgan Kaufmann .
2. Data mining: Concepts, models, methods and algorithms by M. Kantardzic,, John Wiley &Sons Inc.
3. Data Mining: Introductory and Advanced Topics by M. Dunham, Pearson Education.

List of Practicals:

Tools: Data Mining using 'R' Programming / Python

1. Create your own data set (like customer, weather, agriculture etc.), load it and apply any pre-processing technique and clean the data, show results.
    a. Clean missing values
    b. Remove Data
2. Pre-process and classify any data set like customer, agriculture, weather etc.
3. Create your own data set and load it and apply any pre-processing technique and perform Data Smoothing using Binning
4. Pre-process and classify any data set like customer, agriculture, weather etc. Implement Decision Tree algorithm by taking appropriate data set and predict the result.
5. Pre-process and classify any data set like customer, agriculture, weather and Calculate entropy and information gain.
6. Implement Association mining algorithm by taking appropriate data set and find support and confidence.

Bachelor of Engineering
Subject Code: CO2302
Subject Name: Data Mining

7. Implement K-medoids algorithm by taking appropriate data set and predict the result.
8. Implement Naive Bayesian algorithm taking any dataset of your choice and predict the result.
9. Implement CART algorithm by taking appropriate data set and predict the result.
10. Implement K-Nearest Neighbor algorithm by taking appropriate data set and predict the result.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** the preprocessing of data and apply mining techniques on it
CO-2	**Identify** the association rules, classification, and clusters in large data sets.
CO-3	**Analyze** and solve real world problems in business and scientific information using data mining.
CO-4	**Create** data analysis tools for scientific applications
CO-5	**Apply** various supervised machine learning algorithms
CO-6	**Formulate** various machine learning approach to solve the complex problem.

List of Open Source Software/learning website:

1. Vlabs.iitb.ac.in
2. https://nptel.ac.in/courses/106105175/
3. www.coursera.org

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2303
Subject Name: Design & Analysis of Algorithm

Semester: - V

Type of course: Professional Core

Prerequisite: Data Structure & Basic Programming

Rationale: Understanding of basic principles of Engineering is required in various field of engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Basic Concepts of Algorithms** Notion of Algorithm, Fundamentals of Algorithmic Solving, Asymptotic Notations and Basic Efficiency Classes, Mathematical analysis of non-recursive algorithms. Mathematical analysis of recursive algorithm: recurrence relations, solution of recurrence relations using substitution method	6
2	**Divide and Conquer Strategy** Basic algorithm and characteristics, Binary Search: method and analysis of binary search for best, worst and average case for searches, Quick Sort, Merge Sort: method and analysis of algorithms, Finding the largest and smallest number in a list, Matrix Multiplication.	9

Bachelor of Engineering
Subject Code: CO2303
Subject Name: Design & Analysis of Algorithm

3	**Greedy Approach** The Greedy Method: basic algorithm and characteristics, Fractional Knapsack Problem solving using greedy method, Optimal merge patterns and optimal storage on tapes, Job Sequencing with deadlines, Huffman Coding: greedy method, Minimum cost spanning trees: Prim's and Kruskal's Algorithm, Single source shortest path.	**5**
4	**Dynamic Programming** Dynamic Programming Method: basic algorithm and characteristics, 0/1 Knapsack Problem solving using DP method, Multistage graphs, Optimal binary search trees, Travelling salesperson problem.	**11**
5	**Backtracking, Branch and Bound** Basic algorithm and characteristics, Solving n-queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycle (TSP). Branch and bound: basic algorithm and characteristics, solving n-queens using branch & bound, FIFO Branch and Bound & Least Cost Branch & Bound, Least Cost Search, 15-puzzle, Solving Travelling salesperson problem using branch & bound.	**3**
6	**Introduction to NP-Completeness** The class P and NP, Polynomial reduction, NP- Completeness Problem, NP-Hard Problems. Travelling Salesman problem, Hamiltonian problem, Approximation algorithms.	**5**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Bachelor of Engineering
Subject Code: CO2303
Subject Name: Design & Analysis of Algorithm

Text Book:

1. Fundamentals of algorithms by Horowitz E, Sahini S, Rajasekaran S., University Press 2008.

Reference Books:

1. Algorithm Design, Jon Kelinberg and Eva Tardos, 1st Edition, by Pearson Education 2014.
2. Design & Analysis of Algorithms,by Gajendra Sharma, Khanna Book Publishing 2018.
3. An introduction to analysis of algorithms, R. Sedgewick, 1st edition, by Pearson Education 1996.

List of Practicals:

1. Implementation and Time analysis of Bubble sort.
2. Implementation and Time analysis of Selection sort & Insertion sort.
3. Implementation and Time analysis of Quick sort.
4. Implementation and Time analysis of Merge sort.
5. Implementation and Time analysis of searching algorithm.
6. Implementation of shortest path algorithm.
7. Implementation of Minimum Cost Spanning Tree.
8. Implementation of backtracking.
9. Implementation of greedy algorithm.
10. Implementation of a dynamic programming.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Design** algorithms to appreciate the impact of algorithm design in practice.
CO-2	**Understand** different complexity classes.
CO-3	**Apply** the best data structure for designing an algorithm to solve a given problem.

Bachelor of Engineering
Subject Code: CO2303
Subject Name: Design & Analysis of Algorithm

CO-4	**Evaluate** different algorithms with respect to time and space complexity.
CO-5	**Analyze** the concept of dynamic programming & apply the concept to demonstrate NP completeness.
CO-6	**Demonstrate** different computational problems.

List of Open Source Software/learning website:

1. Vlabs.iitb.ac.in
2. https://nptel.ac.in/courses/106101060

Bachelor of Engineering
Subject Code: IT2305
Subject Name: Distributed Operating System

Semester: - V

Type of course: Professional Core

Prerequisite: Knowledge of Operating Systems, Network

Rationale: This course is offered for understanding the principles and techniques of data visualizations through various libraries and tools.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Operating Systems and Communication** Modes of Communication, System Processes, Interrupt Handling, System Calls, Protection of Resources, Resource Management, Micro-Kernel Operating Systems.	4
2	**Distributed Operating System Fundamentals** Network Operating Systems, Distributed Operating Systems, Comparison of Network and Distributed Operating Systems, Issues in the Design of Distributed Operating Systems, Overview of Computer Networks.	9
3	**Inter-Process Communication (IPC) and Remote Procedure Calls** Inter-Process Communication, Linux IPC Mechanisms, Remote Procedure Calls (RPC), RPC Exception Handling, Security Issues in RPC, RPC in Heterogeneous Environments, Case Study: Linux RPC.	5

Bachelor of Engineering
Subject Code: IT2305
Subject Name: Distributed Operating System

SECTION-B		
4	**Synchronization and Coordination in Distributed Systems** Logical Clocks, Physical Clocks, Clock Synchronization, Clock Synchronization Algorithms, Mutual Exclusion, Election Algorithms, Deadlocks in Distributed Systems, Thrashing.	**7**
5	**Process, Resource and Memory Management** Resource Management, Load Balancing Approach, Load Sharing Approach, Process Management, Process Migration, Threads, Overview of Shared Memory, Consistency Models, Page-Based Distributed Shared Memory (DSM), Shared Variable DSM, Object-Based DSM.	**8**
6	**Distributed File System** File Models, File Access, File Sharing, File Caching, File Replication, Fault Tolerance, Network File System (NFS), Directory Services, Security in Distributed File Systems, Case Study: NFS on Linux.	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**20**	**10**	**10**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Distributed Systems - Maarten van Steen and Andrew S. Tanenbaum
2. Distributed Systems: An Algorithmic Approach - Sukumar Ghosh

Reference Books:

1. Distributed Operating Systems Concepts and Design, Pradeep K. Sinha, PHI
2. Distributed Systems: Concepts and Design by George Coulouris, Jean Dollimore, Tim Kindberg, Pearson
3. Distributed Operating Systems by Andrew S Tannebaum, Pearson 4. Distributed Computing by Sunita Mahajan & Seema Shah OXFORD

Bachelor of Engineering
Subject Code: IT2305
Subject Name: Distributed Operating System

List of Practicals:

1. Write a program to create parent and child processes using fork() in C and display their Process IDs.
2. Implement process creation and execution using fork(), exec(), and wait() system calls in C.
3. Develop a program for Inter-Process Communication (IPC) using Pipes in C.
4. Implement Shared Memory IPC between two processes using C.
5. Implement Message Queue Communication between sender and receiver processes using C.
6. Create a TCP Client-Server Application using Python Socket Programming.
7. Create a UDP Client-Server Application using Python Socket Programming.
8. Write a Python program for UDP Client-Server communication.
9. Study and configure Network File System (NFS) in Linux.
10. Study Directory Services and user authentication in Linux.

Course Outcomes:
Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** the fundamentals and architecture of distributed systems.
CO-2	**Learn** scheduling, communication, and RPC mechanisms in distributed systems.
CO-3	**Explore** Distributed File Systems (DFS) and Distributed Shared Memory.
CO-4	**Apply** Java RMI and NFS for distributed application development.
CO-5	**Implement** synchronization and deadlock handling mechanisms in distributed systems.
CO-6	**Develop** distributed applications using Java RMI and Network File System

List of Open Source Software/learning website:

1. http://cquestionbank.blogspot.com
2. www.intelligentedu.com/
3. www.hermetic.ch/cfunlib.htm
4. N.P.T.E.L. Video Lecture Series

Bachelor of Engineering
Subject Code: CO2305
Subject Name: Information Security

Semester: - V

Type of course: Professional Elective

Prerequisite: Basic knowledge of Computer Programming, Mathematical concepts: Random numbers, Number theory, finite fields

Rationale: Knowing the concepts, principles and mechanisms for providing security to the information/data is very important for the students of Computer Engineering. The subject covers various important topics concern to information security like symmetric and asymmetric cryptography, digital signatures and overview of the malware technologies.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
1	**Introduction and Security Trends** Need of Security, Computer Security Concepts, Security Attacks, Security Services, Security Mechanisms, A Model for Network Security, Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.	4

Bachelor of Engineering
Subject Code: CO2305
Subject Name: Information Security

2	**Block Cipher** Block Cipher Principles, The Data Encryption Standard (DES), A DES Example, The Strength of DES, Block Cipher Design Principles, Stream Ciphers, Advanced Encryption Standard (AES) with Structure, Transformation Functions, Key Expansion, Example, and Implementation	**6**
3	**Cipher Mode** Multiple encryption and triple DES, Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback mode, Output Feedback mode, Counter mode, Key Management and Distribution for Symmetric Encryption	**3**
	SECTION-B	
4	**Public-Key Cryptosystems** Principles of Public-Key Cryptosystems, RSA Algorithm, it's computational aspects and security, Diffie-Hellman Key Exchange, Man-in-Middle attack, Key Management and Distribution for Asymmetric Encryption.	**4**
5	**Authentication** Authentication Requirements, Application of Cryptographic Hash Function, Requirements and Security of Hash Function, Secure Hash Algorithm (SHA), Message Authentication Codes, Message Authentication Functions, Requirements and Security of MACs, MACs based on Hash Functions.	**5**
6	**Digital Signature** Digital Signature, Its Properties, Requirements and Security, Various Digital Signature Schemes (ElGamal and Schnorr), Remote User-Authentication Principles, Remote User-Authentication with Symmetric and Asymmetric Encryption. **Web Security** Web security Threats and Approaches, SSL Architecture and Protocol, Transport Layer Security, HTTPS and SSH.	**4**

Bachelor of Engineering
Subject Code: CO2305
Subject Name: Information Security

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**25**	**25**	**15**	**10**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Book:

1. Cryptography And Network Security Principles And Practice Sixth Edition by William Stallings, Pearson

Reference Books:

1. Cryptography and Network Security by Atul Kahate, Tata Mc Grawhill, India.
2. Information Security Principles and Practice By Mark Stamp, Willy India Edition.
3. Cryptography & Network Security by Forouzan, Mukhopadhyay, McGrawHill
4. Cryptography and Security by C K Shyamala, N Harini, T R Padmanabhan, Wiley-India.

List of Practicals:

1. To implement Caesar cipher and Monoalphabetic cipher encryption-decryption.
2. To implement Playfair cipher encryption-decryption.
3. To implement Hill cipher encryption-decryption.
4. To implement Rail Fence and Columnar transposition cipher encryption-decryption.
5. To implement Simplified Data Encryption Standard.
6. To implement RSA encryption-decryption algorithm.
7. To implement Diffi-Hellman Key Exchange method.
8. Demonstrate and perform various encryption-decryption techniques with cryptool.
9. Study and use open-source packet analyzer-Wireshark to understand security

Bachelor of Engineering
Subject Code: CO2305
Subject Name: Information Security

mechanism of various network protocols.

10. Detail Case study: Real world implementation of Network Security Algorithm/Concept.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Develop** concept of security needed in communication of data through computers and networks along with various possible attacks.
CO-2	**Explore** the basic principles of the symmetric cryptography and techniques with their strengths and weaknesses from perspective of cryptanalysis
CO-3	**Implement** and analyze various symmetric key cryptography algorithms and their application in different context.
CO-4	**Compare** public key cryptography with private key cryptography and Implement various asymmetric key cryptography algorithms.
CO-5	**Understand** authentication requirements and study various authentication mechanisms.
CO-6	**Use** the techniques and standards of digital signature and understand network security concepts and study different web security mechanisms.

List of Open Source Software/learning website:

- vlabs.iitb.ac.in
- https://nptel.ac.in/courses/106105031/
- Cryptool - https://www.cryptool.org/en/
- Wireshark - https://www.wireshark.org/download.html

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2306
Subject Name: Advanced Java Programming

Semester: - V

Type of course: Professional Elective

Prerequisite: Basic knowledge of core JAVA and Spring

Rationale: Web application based on Java uses Servlet, JSP. Spring framework gives flexibility and makes the web applications loosely coupled.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Collection and Generic** Introduction to Generics , Generics Types and Parameterized Types, WildCards, Java Collection Framework, Collections (Basic Operations, Bulk Operations, Iteration) List, Set, Maps	6
2	**Introduction Java EE Programming** JSP Architecture, JSP building blocks, Scripting Tags, implicit object, Introduction to Bean, standard actions, session tracking types and methods. Custom Tags, Introduction to JSP Standard Tag Library (JSTL) and JSTL Tags.	4
3	**Servlets** Introduction to Java Servlet, Servlet Interface, GenericServlet, HttpServlet and the Servlet Life Cycle, Servlet Communication, Handling	4

Bachelor of Engineering
Subject Code: CO2306
Subject Name: Advanced Java Programming

	HTTP get and post Requests , Session Tracking	
SECTION-B		
4	**Spring and AOP** Aspect Oriented Programming with Spring, Types of advices, Defining Point Cut Designator, Annotations.	**4**
5	**JDBC Data Access with Spring** Managing JDBC Connection, Configuring Data Source to obtain JDBC Connection, Data Access operations with JdbcTemplate and Spring, RDBMS operation classes , Modelling JDBC Operations as Java Objects	**4**
6	**Introduction to Spring Boot** Spring Boot and Database, Spring Boot Web Application Development, Spring Boot RESTful Web Services.	**4**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**30**	**30**	**10**	**5**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Java 8 Programming, BlackBook, Edition 2015 by DreamTech Press,.
2. Professional Java Development with the Spring Framework by Rod Johnsonet al.John Wiley & Sons 2005.

Reference Books:

1. Java 6 Programming Black Book by Wiley–Dreamtech.
2. Spring in Action, 3rd Edition,by Craig Walls, Manning.
3. Beginning Spring, Mert Calıs kan and KenanSevindik Published by John Wiley & Sons, Inc.

Bachelor of Engineering
Subject Code: CO2306
Subject Name: Advanced Java Programming

List of Practical:

1. Write a program that prints an array of different type using a single Generic method.
2. Write a program that demonstrates List using ArrayList and LinkedList class.
3. Write a program that demonstrates HashSet and TreeSet implementation.
4. Write a program that demonstrates HashMap implementation.
5. Implement the shopping cart for users for the online shopping. Apply the concept of session.
6. Develop a simple servlet program which maintains a counter for the number of times it has been accessed since its loading; initialize the counter using deployment descriptor.
7. Implement cookies to store firstname and lastname using Java server pages.
8. Create spring JDBC application which performs CRUD operations.
9. Implement Spring Boot JdbcTemplate example with CRUD Rest API.
10. Create a spring boot application with spring AOP.

Course Outcomes:
Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** how to use frameworks for a given problem.
CO-2	**Implement** webpage with dynamic content using JSP.
CO-3	**Develop** server side programs using Servlets.
CO-4	**Analyze** Aspect Oriented Programming(AOP) along with Spring
CO-5	**Create**, update and retrieve the data from the databases using JDBC-ODBC.
CO-6	**Use** advanced concepts related to Web Services and spring.

List of Open Source Software/learning website:

1. vlabs.iitb.ac.in
2. http://www.oracle.com/technetwork/java/index-jsp-135475.html
3. http://www.oracle.com/technetwork/java/javaee/jsp/index.html

Bachelor in Engineering
Subject Code: CO2307
Subject Name: Computer Graphics

Semester: - V

Type of course: Open Elective

Prerequisite: Basic knowledge of C programming, Basic data structure & Concept of mathematics. (Geometry, Matrix and other field).
Rationale: Understanding of basic principles computer graphics followed by computer vision and its application in various field of engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Basics of Computer Graphics** Display devices, Primitive operations, Text mode and graphics mode, graphics functions, Shapes, colors, Co-ordinate systems; Applications of computer graphics; Raster scan display, Random scan display	4
2	**Generation of various geometrical shapes (Line, circle, and polygon)** Basic concepts in line drawing **Line drawing algorithms** DDA algorithms, Bresenham's algorithm. **Circle generating algorithms** DDA circle drawing algorithm, Bresenham's circle drawing algorithm, midpoint circle drawing algorithm. **Polygons** – Types of polygons, Polygon representation, inside –outside	6

Bachelor in Engineering
Subject Code: CO2307
Subject Name: Computer Graphics

	test, Polygon filling, Flood fill, scan-line algorithm.	
3	**Transformations** **2D transformation** Translation, Rotation, scaling, Reflection, shearing, transformation matrices, Homogeneous co-ordinate system. Rotation about an arbitrary point, scaling about fixed point. 3.3 Composite transformations. **3D Transformation** Scaling, rotation, translation, rotation about arbitrary axis etc. Yaw, Pitch, Roll about different axes.	**3**
SECTION-B		
5	**Windowing & Clipping** Viewing transformation, Normalization transformation **Line clipping** Cohen-Sutherland Line clipping algorithm, midpoint subdivision algorithm **Polygon clipping** Sutherland – Hodgeman Polygon clipping algorithm.	**5**
6	**Curves** Curve generation: Lagrange Interpolation curves,B-Spline, Bezier curves. **Projection** Different Parallel projection, Perspective Projection.	**4**
7	**Hidden Surfaces** Depth comparison, Z-buffer algorithm, Back face detection, BSP tree method, the Printer's algorithm, scan-line algorithm; Hidden line elimination, wire frame methods. **Color and Shading Models** Phong's shading model, Gouraud shading, Shadows and background, Color models, Photo-realistic rendering, Radiosity	**4**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**35**	**20**	**25**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor in Engineering
Subject Code: CO2307
Subject Name: Computer Graphics

Text Books:

1. Computer Graphics through C by Hearn & Beaker 5th Pearson
2. Computer Graphics Multimedia & Animation, 2nd PHI by Pakhira

Reference Books:

1. Computer Graphics with Virtual Reality System by Maurya, Wiley
2. Computer Graphics by Udit Agarwal Katson books.

List of Practical:

1. Implement DDA algorithm for line drawing.
2. Implement Bresennham's algorithm for line drawing.
3. Implement Mid-point circle drawing algorithm.
4. Implement Bresennham's algorithm of circle drawing.
5. Implement Flood fill algorithm for Polygon filling.
6. Implement scan-line algorithm for polygon filling.
7. Write Program for 2-D transformations -> scaling, Rotation.
8. Write Program for 2 D transformations shearing and Translation program.
9. Implement Cohen- Sutherland algorithm for line clipping.
10. Implement Sutherland-Hodgeman algorithm for polygon clipping.

Course Outcomes:
Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** the basic of computer graphics and to give the idea how a system can design geometrical shapes in taking basic parameters as input from user.
CO-2	**Analyze** the concepts of transformation of an object in real world those concepts to develop the transformation using any vehicle language.
CO-3	**Apply** different algorithm used for developing geometrical shapes.
CO-4	**Evaluate** the basics of windowing and clipping of different geometrical shapes.
CO-5	**Create** different curves collecting different parameters from users as input.
CO-6	**Demonstrate** the basics of projection and its application.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: IT2301
Subject Name: Blockchain Technology

Semester: - V

Type of course: Open Elective

Prerequisite: Basic knowledge of programming and computer networks

Rationale: Blockchain technology provides a secure, transparent, and decentralized way of storing and sharing data. It is widely used in cryptocurrencies, finance, supply chain, healthcare, and digital identity systems. This course introduces the fundamentals of blockchain, cryptography, consensus mechanisms, smart contracts, and real-world blockchain applications. Students will gain both theoretical understanding and practical exposure to blockchain platforms and tools.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
1	**Introduction to Blockchain Technology** Basics of blockchain, history and evolution, features of blockchain, centralized vs decentralized systems, types of blockchains (public, private, consortium), use cases and benefits.	5
2	**Blockchain Architecture** Blockchain: Architecture, Versions, Variants, Use cases, Life use cases of blockchain, Blockchain vs shared Database, Introduction to cryptocurrencies, Types, Applications.,	4

Bachelor of Engineering
Subject Code: IT2301
Subject Name: Blockchain Technology

3	**Introduction to Bitcoins** Bitcoins: Introducing Bitcoin, Bitcoin digital keys and addresses, Transactions, Blockchain mining. Alternative Coins. Limitations of Bitcoin.F	**4**
SECTION-B		
4	**Consensus Mechanisms** Need for consensus, Proof of Work (PoW), Proof of Stake (PoS), Delegated PoS, comparison of consensus algorithms.	**4**
5	**Smart Contracts and Ethereum** Introduction to smart contracts, Ethereum architecture, Ethereum Virtual Machine (EVM), basics of Solidity, writing and deploying simple smart contracts.	**5**
6	**Blockchain Applications and Security** Blockchain applications in finance, supply chain, healthcare, IoT, and governance, security issues and challenges in blockchain, attacks on blockchain, scalability and privacy concerns	**4**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**25**	**30**	**20**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Bachelor of Engineering
Subject Code: IT2301
Subject Name: Blockchain Technology

Text Books:

1. Blockchain Basics by Daniel Drescher, Apress, 2017
2. Blockchain Revolution by Don Tapscott and Alex Tapscott, Penguin, 2016

Reference Books:

1. Blockchain Developer's Guide by Brenn Hill, Samanyu Chopra and Paul Valencourt, 2018

List of Practical:

1. Study basic blockchain concepts and architecture.
2. Study about demonstration of hashing and digital signatures.
3. Create a simple blockchain structure program.
4. Study Bitcoin and Ethereum transactions.
5. Write and deploy a basic smart contract using Solidity.
6. Study on smart contracts using test networks.
7. Demonstrate wallet creation and transactions.
8. Analyze blockchain security issues.
9. Study real-world blockchain applications.
10. Study on a blockchain use case.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** fundamentals and architecture of blockchain technology.
CO-2	**Explain** cryptographic techniques and consensus mechanisms used in blockchain.
CO-3	**Analyze** different blockchain platforms and applications.
CO-4	**Identify** security challenges and limitations of blockchain systems.
CO-5	**Create** simple blockchain-based solutions for real-world problems.
CO-6	**Use** of fundamentals and architecture of blockchain technology.

Bachelor of Engineering
Subject Code: IT2301
Subject Name: Blockchain Technology

List of Open Source Software/learning website:

1. Ethereum Official Documentation: https://ethereum.org
2. Hyperledger Documentation: https://www.hyperledger.org
3. Solidity Documentation: https://docs.soliditylang.org

Bachelor of Engineering
Subject Code: MH2301
Subject Name: Contributor Personality Development Program – 1

Type of course: Work-Personality Development

Prerequisite: To keep open mind and will to learn humanity for oneself and society.

Rationale: The Contributor Program aims to accomplish the following outcomes in the lives of students–

- Improve the employability of students by giving them the right work ethic and thinking that employers are looking for.
- Build their confidence with which they can go into any job and contribute meaningfully.
- Improve their ability to engage better in the workplace and to be able to handle the challenges that come up there.
- Build their career-worthiness and help them develop into future-ready contributors with ability to navigate a career in a volatile, changing world.
- Widen their choices of career and success, so that they are able to open up more opportunities for themselves and take up unconventional career pathways.
- Enable them to recognize how they, as technical professionals, can participate and make a positive contribution to their communities and to their state.

Towards this goal, the Contributor Program has been designed to awaken and strengthen students from within, in terms of building positive self-esteem, increasing their confidence level and I-can attitude, improving their aspirations, giving them new methods of thinking, building their cognitive capacities, exposing them to the skills and practices associated with being contributors in the workplace (not mere employees).

The Program content is also designed to expose students to real-world workplace scenarios and sensitize them to some of the challenges faced in society around them, especially in the local communities around them and in their own state of Gujarat.

The Contributor Program syllabus has been evolved and fine-tuned over several years, (a) to address the changing need and contemporary challenges being faced by industry and what employers of today are looking for in the people they hire and (b) by working extensively with

universities and students building an appreciation of their challenges and concerns. At the core, the program is guided by the higher ideas and principles of practical Vedanta in work.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	1	0	2	50	30	00	20	100

Note:

- Weekly 2 hours of Classroom facilitated sessions are planned which include Solutioning and Self- discovery sessions.
- In addition, there will be individual/ team projects as part of Practical's. Students can do this on their own, with faculty as guide.

Note:

It is the responsibility of the institute heads that marks for PA of theory & ESE and PA of practical for each Students are entered online into the UPL University Portal at the end of each semester within the dates Specified by UPL University.

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**The Contributor Work Ideal** In this topic, students explore what is their "ideal" of work - is the ideal to be a "worker" or to be a "contributor"? For example, an employee who has the ideal of a "worker" goes to work to pass time, earn a living, get benefits; in contrast to an employee with the ideal of a "contributor" who wants to make a difference, get things done well, create value for the company. This enables students to transform their expectation of themselves in work	04 hrs Classroom engagement (including self-discovery/ solutioning sessions)

2	**Identity & Self-esteem** In this topic, students engage with the question "who am I?" or on what basis they define themselves. Is their identity defined by what others think of them (extrinsic self-esteem) or by what they think of themselves (intrinsic self-esteem)? Further, they discover positive identities that lead to intrinsic self-esteem, such as an I-can identity based on one's capacity and inner strength. This enables them to build confidence and self-esteem.	04 hrs Classroom engagement (including self-discovery/ solutioning sessions)
3	**Become a Creator of one's destiny** In a "victim stance", we see the career environment as full of difficulties and hurdles. We feel powerless or blame our circumstances for not having many opportunities. This makes us fearful of uncertainty and makes us settle for jobs where we remain mediocre. In this topic, students discover the "creator of destiny stance" to challenges and situations. This stance frees them to try out new things, open up new possibilities, take on responsibility, and see the opportunity hidden in their environment.	04 hrs Classroom engagement (including self- discovery/ solutioning sessions)
	SECTION-B	
4	**Achieving Sustainable Success** In this topic, students discover how to achieve sustainable or lasting success, by building one's "engine of success", making them success- worthy. Where their focus shifts to building one's "engine of success"rather than being on chasing the "fruits of success". This is important, because over a lifetime of work, all people go through ups and downs – where the fruits are not in their control. People who are focused on the fruits of success, fall prey to disappointment, loss in motivation, quitting too early, trying to find shortcuts – when fruits don't come. Whereas people focused on building their engine of success continue to contribute steadily, irrespective of whether fruits come or not. And with a strong engine of success, fruits come to them in time.	04 hrs Classroom engagement (including self- discovery/ solutioning sessions)

5	**Career Development Models** In this topic, students explore a range of diverse "career development models" and the possibilities for contribution each opens up to them (e.g. start-up career model, change-maker career model, etc.). This opens their mind to different and even unconventional career models possible, beyond the usual (such as "stable large company career model" where one gets an engineering degree, then MBA, then get a job in a large company). This frees them from a herd mentality when making career choices.	04 hrs Classroom engagement (including self- discovery/ solutioning sessions)
6	**Expanding contribution in every role** In this topic, students explore the many roles they can play in their life & discover the power they have to expand the contribution possible in any role. (E.g. role of student, role of manager, role of a project site engineer). So, the potential of a role is in the individual's hands. This opens their mind to an alternative way of career growth.	04 hrs Classroom engagement (including self- discovery/ solutioning sessions)

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
-		**20**			

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference resources:

A. Basic reference for both students and teachers

1. Contributor Personality Program textbook cum workbook developed by Illumine

2. Web-based ActivGuide™ for self-exploration of rich media resources to vividly understand many of the ideas, watch role models, learn from industry people, get reference readings – that help them enrich the understanding they gained in the class published by Illumine Foundation

B. Advanced reference for teachers

1. On Contributors, Srinivas V.; Illumine Ideas, 2011
2. Enlightened Citizenship and Democracy; Swami Ranganathananda, Bharatiya Vidya Bhavan, 1989
3. Eternal Values for a Changing Society – Vol I-IV, Swami Ranganathananda; Bharatiya Vidya Bhavan
4. Karma Yoga, Swami Vivekananda; Advaita Ashrama
5. Vivekananda: His Call to the Nation, Swami Vivekananda; Advaita Ashrama
6. Six Pillars of Self Esteem, Nathaniel Branden; Bantam, 1995
7. Mindset: The New Psychology of Success, Carol S. Dweck; Random House Publishing Group, 2007
8. Lasting Contribution: How to Think, Plan, and Act to Accomplish Meaningful Work, Tad Waddington; Agate Publishing, 2007
9. Why not?: how to use everyday ingenuity to solve problems big and small, Barry Nalebuff, Ian Ayres; Harvard Business School Press, 2003
10. The value mindset: returning to the first principles of capitalist enterprise (Ch 8 & 9); Erik Stern, Mike Hutchinson; John Wiley and Sons, 2004
11. The Power of Full Engagement: Managing Energy, Not Time, is the Key to High Performance and Personal Renewal, Jim Loehr, Tony Schwartz; Simon and Schuster, 2003
12. Creating Shared Value, Michael E. Porter and Mark R. Kramer; Harvard Business Review; Jan/Feb2011, Vol. 89 Issue 1/2
13. The Speed of Trust: The One Thing That Changes Everything, Stephen M. R. Covey, Rebecca,R. Merrill, Stephen R. Covey; Free Press, 2008
14. The Courage to Meet the Demands of Reality, Henry Cloud; HarperCollins, 2009
15. Responsibility at work: how leading professionals act (or don't act) responsibly, Howard Gardner; John Wiley & Sons, 200

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Students will be able to recognize & appreciate two alternative ideals of work – "worker" and "contributor".
CO-2	Students will be able to recognize & appreciate alternative ways in which they could define themselves & their identity – that will lead to building intrinsic self-esteem and confidence in oneself.
CO-3	Students will be able to recognize & appreciate the way people approach challenges and situations; and how it frees individuals to take on challenges and open up Opportunities.
CO-4	Students will be able to differentiate between two alternative approaches to success - 'building one's engine of success' and 'chasing the fruits of success'Lead to sustainable or lasting success in the long run.
CO-5	Students will be able to recognize & appreciate different career models and their Value; to help them make more informed career-related choices.
CO-6	Students will be able to recognize & appreciate how one can expand the contribution possible in any role, thereby opening up an alternative way of career Growth to them.

Bachelor of Engineering
Subject Code: IT2302
Subject Name: Cloud Computing

Semester: - VI

Type of course: Professional Core

Prerequisite: Operating system, Computer Network, Virtualization, Software Engineering approaches

Rationale: This course aims students to understand the hardware, software concepts and architecture of cloud computing. Students realize the importance of Cloud Virtualization, Abstractions and Enabling Technologies.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction**: Cloud Computing basics, cloud service models, cloud deployment models, Layers and Types of Clouds, Cloud Infrastructure Management, Challenges and Applications, Virtualization of Computing, Storage and Resources, Cloud Services: IaaS, PaaS and SaaS	3
2	**Software as a Service (SaaS):** Evolution of SaaS, Challenges of SaaS Paradigm, SaaS Integration Services, SaaS Integration of Products and Platforms. Infrastructure As a Services (IaaS): Introduction, Background & Related Work, Virtual Machines Provisioning and Manageability, Virtual Machine Migration Services, VM Provisioning and Migration in Action. **Platform As a service (PaaS):** Integration of Private and Public Cloud, Technologies and Tools for Cloud Computing, Resource Provisioning services Tools for Cloud Computing, Resource Provisioning services	5

Bachelor of Engineering
Subject Code: IT2302
Subject Name: Cloud Computing

3	**Abstraction and Virtualization:** Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hyper visors, Understanding Machine Imaging, Porting Applications, Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Virtual Machine Provisioning and Migration in Action, Provisioning in the Cloud Context, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management, Virtualization for Data Center Automation	**5**
	SECTION-B	
4	**Cloud Infrastructure and Cloud Resource Management:** Architectural Design of Compute and Storage Clouds, Layered Cloud Architecture Development, Design Challenges, Inter Cloud Resource Management, Resource Provisioning and Platform Deployment, Global Exchange of Cloud Resources. Emerging Cloud Management Standards	**5**
5	**Cloud Security:** Security Overview, Cloud Security Challenges and Risks, Software-as-a-Service Security, Cloud computing security architecture: Architectural Considerations, General Issues, Securing the Cloud and Data, Application Security, Virtual Machine Security, Identity and Presence, Autonomic Security Establishing Trusted Cloud computing, Access control, Autonomic Security Storage Area Networks, Disaster Recovery in Clouds.	**4**
6	**Cloud Middleware:** OpenStack, Eucaluptus, Windows Azure, CloudSim, EyeOs, Aneka, Google App Engine **Cloud Based Case-Studies**: Overview of Cloud services, Designing Solutions for the Cloud, Implement & Integrate Solutions, Emerging Markets and the Cloud, Tools for Building Private Cloud: IaaS using Eucalyptus, PaaS on IaaS - AppScale.	**4**

Bachelor of Engineering
Subject Code: IT2302
Subject Name: Cloud Computing

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**40**	**25**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Cloud Computing: Principles and Paradigms, Rajkumar Buyya, James Broberg, Andrzej M Goscinski, Wiley publication
2. Cloud Computing Bible, Barrie Sosinsky, Wiley-India.

Reference Books:

1. Cloud Application Architectures: Building Applications and Infrastructure in the Cloud, George Reese, O'Reilly Publication.
2. Cloud Computing Explained: Implementation Handbook for Enterprises, John Rhoton, Recursive Press.
3. Cloud Computing: A Practical Approach, Toby Velte, Anthony Velte, McGrawHill Osborne Media.
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India.
5. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, Tim Mather, Subra Kumara swamy, ShahedLatif, O'Reilly Media.
6. Cloud Computing for Machine Learning and Cognitive Applications, Kai Hwang, The MIT Press, Cambridge, London
7. Distributed and Cloud Computing, by Kai Hwang, Jack Dongarra, Geoffrey C. Fox, Morgan Kaufmann, ELSEVIER

Bachelor of Engineering
Subject Code: IT2302
Subject Name: Cloud Computing

List of Practicals:

1. Study and comparison of Traditional Computing, Grid Computing, and Cloud Computing models.
2. Study of Cloud Deployment Models – Public, Private, and Hybrid Cloud with real-world examples.
3. Study and comparison of Cloud Service Models – IaaS, PaaS, and SaaS.
4. Deployment of a simple web application using a Platform as a Service (PaaS) platform.
5. Installation of a virtualization tool (VirtualBox/VMware) and creation of a Virtual Machine.
6. Study and comparison of Full Virtualization and Para-Virtualization techniques.
7. Demonstration of Virtual Machine operations such as snapshot, cloning, and migration.
8. Design and analysis of layered Cloud Architecture for a sample cloud application.
9. Study and implementation of basic Cloud Security concepts such as authentication and access control.
10. Case study of cloud services: Amazon EC2, S3, VPC, IAM, and CloudWatch.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Compare** the strengths and limitations of cloud computing.
CO-2	**Identify** the architecture, infrastructure and delivery models of cloud Computing.
CO-3	**Apply** suitable virtualization concept.
CO-4	**Choose** the appropriate cloud player, Programming models and approach.
CO-5	**Addr**ess the core issues of cloud computing such as security, privacy and interoperability.
CO-6	**Study** different tools for implementing cloud in Real-time scenario.

List of Open Source Software/learning website:

1. https://www.awsacademy.com/servlet/servlet.FileDownload?file=0151K000003qL84Q AE
2. technolamp.blogspot.com
3. www.intelligentedu.com/
4. NITTR Instructional Resources Videos

Bachelor of Engineering
Subject Code: CO2310
Subject Name: Artificial Intelligence

Semester: - VI

Type of course: Professional Core

Prerequisite: Basic knowledge of computer programming, Algebra, Linear Algebra, Trigonometry, Statistics.

Rationale: Students will learn the basic concepts and techniques of Artificial Intelligence. They should be able to develop AI algorithms for solving practical problems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction Artificial Intelligence and its Applications** Introduction to Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Natural Language Possessing. Artificial Intelligence Techniques, Level of models, criteria of success, advantages, and limitations of AI	7
2	**Problem Solving Techniques** State space search, control strategies, heuristic search, problem and characteristics, production system characteristics., Generate and test, Hill climbing, best first search, A* search, Constraint satisfaction problem, Mean-end analysis, Min-Max Search, Alpha-Beta Pruning, Additional	7

Bachelor of Engineering
Subject Code: CO2310
Subject Name: Artificial Intelligence

	refinements, Iterative Deepening	
3	**Knowledge representation and Inference** Propositional logic, Using Predicate Logic: Representing facts, Inference methods – Resolution, Forward Reasoning, Backward Reasoning	**6**
	SECTION-B	
4	**Knowledge Representation Schemes and Reasoning** Mapping between facts and representations, Approaches to knowledge representation, procedural vs declarative knowledge, forward vs. Backward reasoning, Matching, conflict resolution, non-monotonic reasoning, Default reasoning, statistical reasoning, fuzzy logic Weak and Strong filler structures	**7**
5	**Planning** The Planning problem, planning with state space search, planning graphs, planning with propositional logic, Hierarchical planning, conditional planning, Continuous and Multi Agent planning **Basics of Machine Learning** Basic Types of Data in Machine Learning, Exploring Structure of Data, Data Quality and Remediation, Data Preprocessing, Unsupervised vs Supervised Learning, Application of Unsupervised Learning	**6**
6	**Expert system** Introduction Architecture and types of Expert Systems, Expert system shell. **Neural Networks:** Introduction to neural network, Activation functions, Architectures, Perceptron, Multilayer Perceptron with Backpropagation	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Bachelor of Engineering
Subject Code: CO2310
Subject Name: Artificial Intelligence

Text Books:

1. A Classical Approach to Artificial Intelligence by M.C. Trivedi, Khanna Book Publishing, 2019.
2. Artificial Intelligence: A modern approach by Stuart Russel, Pearson Education, 2010.

Reference Books:

1. Artificial Intelligence, 3rd Edition, by Elaine Rich, Kevin Knight and Shivashankar B Nair, McGraw Hill
2. Artificial Intelligence and Machine learning by Vinod Chandra S.S. and AnandHarindran S. PHI

List of Practical:

1. Write a program to conduct uninformed search strategies.
2. Write a program to conduct informed search strategies.
3. Write a program to conduct min - max algorithm.
4. Write a program of depth first search.
5. Write a program to construct a Best first search (for 8 puzzle problem or Water Jug problem or any AI search problem).
6. Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem)
7. Write a program to Implement A* Algorithm.
8. Write a program to solve traveling salesman problems.
9. Write a program to implement Tic-Tac-Toe game problem.
10. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets

Course Outcomes:

Student will be able to:

Sr. No.	CO statement
CO-1	**Understand** the basic concepts and techniques of Artificial Intelligence.

Bachelor of Engineering
Subject Code: CO2310
Subject Name: Artificial Intelligence

CO-2	**Apply** AI algorithms for solving practical problems
CO-3	**Describe** human intelligence and AI
CO-4	**Study** and use various types of logic and knowledge representation schemes
CO-5	**Evaluate** and compare algorithms based on different metrics and parameters.
CO-6	**Construct** methods of game playing, types of expert system.

List of Open-Source Software/learning website:

1. https://www.edx.org/course/artificial-intelligence-ai
2. https://www.udemy.com/course/artificial-intelligence-az

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2311
Subject Name: Advance Technologies

Semester: - VI

Type of course: Professional Elective

Prerequisite: Knowledge of web technology.

Rationale: The aim of this course is to teach the students the concepts, technologies and techniques for creating large-scale distributed software system using service-oriented computing and cloud applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Web Technology** Hypertext Markup Language and its components, HTML tags and attributes, Text formatting tags, List tags, Image tags, HTML tables, HTML Forms, Document Object Model (DOM), Cascading Style Sheets – Inline Style, Embedded Style, External Style Sheet, Imported Style Sheet, Ruleset, @ rule, Contextual Selector, Attribute Selector, CSS Properties, JavaScript - Data types, Operators, Variables, length, substring, Conditional Statements - if, Loops - for, & Functions, HTML DOM and JavaScript - Finding HTML Elements, Changing HTML elements, DOM events.	5

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2	**Events Handlers & Forms in Java Script** Define Events, Events in JavaScripts, Event Handlers, this keyword, Event handlers in JavaScripts, Emulating Events in java scripting, onLoad and onUnload Event Handlers, Web-Hopping with window.open(), Resetting Event Handlers.	**4**
3	**Messaging & Timing Events in Java Script** Alert Box: syntax & its example, Confirm Box: syntax & its example, Prompt Box: syntax & its example, Line Breaks: syntax & its example, JavaScript Timing Events, setInterval() Method, window.clearInterval() method, setTimeout() Method, window.clearTimeout() method.	**4**
	SECTION-B	
4	**XML and Ajax** XML – Declaration, Root Element, Child Elements, Element Attributes, Entity References, Comments, Ajax – XML HTTP Request Object, Sending Ajax requests, Handling Ajax Responses, Adding Ajax Functionality in JavaScript, Adding Ajax Functionality to a Web Page	**4**
5	**Introduction to Node JS** Introduction to Node JS, What is Node JS, Node.js Process Model, Advantages of Node JS , Traditional Web Server Model, Functions, Buffer, Module, Working in REPL, Node JS Console, What is NPM, Installing Packages Locally.	**4**
6	**Introduction to jQuery** Why jQuery, features of jQuery library, Adding jQuery to web pages: Downloading jQuery & jQuery CDN, jQuery Syntax & jQuery Selectors, jQuery Event Methods & their syntaxes, jQuery Effects: Hide and Show, Fading, Sliding, Animation, stop(), jQuery HTML: get & set content: text(), html(), and val(), jQuery - AJAX: Introduction, load(), get() and post() Methods.	**5**

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Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**35**	**25**	**30**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Book:

1. Web Programming, building internet applications, Chris Bates 2nd edition, by WILEY Dreamtech.
2. HTML5 in Action by Rob Crowther, Joe Lennon, Ash Blue & Greg Wanish Publisher: Manning Publications.

Reference Book:

1. An Introduction to WEB Design and Programming by Wang-Thomson
2. Internet and World Wide Web – How to program by Dietel and Nieto PHI/ Pearson Education Asia.

List of Practicals:

1. Develop static pages (using Only HTML) of an online bookstore. The pages should resemble: www.amazon.com. The website should consist of the following pages.
   a) Home page
   b) Registration and user Login
   c) User Profile Page
   d) Books catalog
   e) Shopping Cart
   f) Payment By credit card
   g) Order Conformation
2. Validate the Registration, user login, user profile and payment by credit card pages using JavaScript.

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3. Design the following static web pages required for an online bookstore web site.
   i. Registration Page
   ii. Cart Page
4. Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
5. Create and save an XML document on the server, which contains 10 users information. Write program, which takes User Id as an input and returns the user details by taking the user information from the XML document.
6. Write an XML file which will display the Book information which includes the following: Title of the book, Author Name, ISBN number, Publisher name, Edition and Price. Validate the above document using DTD and XML Schema.
7. Write an XML file which will display the Book information which includes the following: Title of the book, Author Name, ISBN number, Publisher name, Edition and Price. Validate the above document using DTD and XML Schema.
8. Write a program to get the selected value and currently selected text of a dropdown box using jQuery.
9. Design an online registration form for any application and validate it using jQuery.
10. Develop a web application which involves database operations using NodeJS.

Course Outcomes:

Student will be able to:

Sr. No.	CO statement
CO-1	**Create** the fundamental ideas and standards underlying Web Service Technology.
CO-2	**Understand** the major frameworks allowing to develop web services and clouding applications and assess their suitability for specific usage scenarios.
CO-3	**Apply** solution to complex problems using appropriate method, technologies, frameworks, web services and content management
CO-4	**Evaluate** technology-enabled assessment and evaluation strategies.
CO-5	**Analyze** web-based application using suitable client side and server-side web technologies.
CO-6	**Remember**, describe, and apply emerging technologies in teaching and learning environments

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2312
Subject Name: .Net Programming

Semester: - VI

Type of course: Professional Elective

Prerequisite: Knowledge of Computer

Rationale: The .NET platform has evolved quickly to become a robust technology platform for enterprise application development and systems integration. It is a very popular platform these days being used to develop web sites/ web-based applications.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
2	0	2	3	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to .Net Architecture** Introduction to .NET Framework Architecture, Program Execution in .NET, CLR structure, Assemblies, creating strong named assemblies, putting DLL in GAC, Garbage Collection, DLL Hell, Side by Side Execution, Debugging.	5
2	**Object Oriented Programming in C#** Creating Class, declaring variables and methods, Access modifiers, Constructors, Abstract Class, Partial Class, Inheritance, Method overloading, method overriding, Anonymous method, Properties, Indexers, Exception Handling	4

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3	**Building GUI with C# and Database** Connectivity using ADO.NET GUI: Working with C# windows applications, working with common form controls, Visual Inheritance, Creating MDI Form, Event handling. ADO.NET: Overview of ADO.NET framework, working with SQL server database, Managed Provider, Dataset, working with data source, Connected and disconnected architecture, Binding data with Datagrid, Binding data with Crystal Report.	**4**
SECTION-B		
4	**Web and ASP.NET Controls** Web Server, HTTP/HTTPS Protocol, ASP.NET Benefits, ASP.NET Page Layout, Life Cycle, HTML Server Controls, Web Server Controls, Validation Controls, Introduction to AJAX	**4**
5	**Master Page, Theme and State Management, Web Service** Master page and theme, Different methods to preserve state in ASP.NET, Creating and consuming web service. Getting Started with ASP.NET MVC What is MVC Architecture? What is ASP.NET MVC? Learning Model, View, Controller. Advantages of MVC. Application configuration files	**5**
6	**Basics of Cloud Computing** The cloud, cloud computing, and the cloud Optimized stack, Microsoft Azure C# library to create a storage container, ASP.NET web application that uses the storage container.	**4**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**25**	**25**	**20**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Bachelor of Engineering
Subject Code: CO2312
Subject Name: .Net Programming

Text Book:

1. Recipes: A Practical Solution Asp.Net Mvc 5 by Nimit Joshi.

Reference Books:

1. A learner's guide to Real world programming with C# and .NET core 4th edition, by Andrnew Stellman and Jennifer Greene-
2. Pro C# 9 with .NET 5: Foundational Principles and Practices in Programming 10th ed. Edition by Andrew Troelsen (Author), Phillip Japikse .

List of Practicals:

1. Implement Overloading and Overriding, constructor and Destructor in C#.
2. Write a program for Arithmetic Calculator using Windows Application.
3. Implement Windows Form based application using controls like menus, dialog and tool tip, dropdown, radio and selection button etc.
4. Implement concepts of Inheritance, visual inheritance and Interface in widows form application.
5. Use Dataset, Data Reader, XML Reader & Data Sources (SQL, Object & XML) with Any Windows or Web Application.
6. Use Data Controls like Data List, Grid View, Detail View, Repeater and List Bound Control.
7. Implement web application using ASP.NET with web controls with validation controls.
8. Create a Web application that illustrates the use of themes and master pages with Site-Map.
9. Implement the concept of state management in a web application.
10. Implement code in ASP.NET that creates and consumes Web service by any web application.

Bachelor of Engineering
Subject Code: CO2312
Subject Name: .Net Programming

Course Outcomes:

Student will be able to:

Sr. No.	CO statement
CO-1	**Understand** C# and the .NET framework namespace contents.
CO-2	**Implement** the console and GUI applications using C# .Net.
CO-3	**Synthesize** various navigation techniques for integrating web pages within the site
CO-4	**Demonstrate** the design of dynamic web page using ASP.NET controls which interact with databases.
CO-5	**Construct** and implement cookies and sessions as state management techniques and create a basic cloud-based application.
CO-6	**Examine** basics of cloud computing.

List of Open-Source Software/learning website:

1. Vlabs.iitb.ac.in
2. https://nptel.ac.in
3. www.coursera.org

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: IT2303
Subject Name: Mobile Application with Flutter

Semester: - VI

Type of course: Professional Elective

Prerequisite: Knowledge of C++ and Java

Rationale: With the rapid growth of smartphones, mobile applications have become an integral part of everyday life. Flutter is a modern, open-source UI toolkit by Google that enables developers to build high-performance, cross-platform mobile applications using a single codebase. This course introduces students to Flutter and Dart programming, covering UI design, state management, navigation, data handling, and integration with device features. The subject emphasizes hands-on development of real-world mobile applications following industry best practices.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction** Introduction to Flutter, Advantages of Flutter, Flutter architecture, Flutter SDK and tools, Installation and setup, Introduction to Dart language	7
2	**Dart Programming Fundamentals** Dart syntax and structure, Variables and data types, Operators and expressions, Control statements, Functions, Object-Oriented Programming in Dart.	6

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Subject Name: Mobile Application with Flutter

3	**Flutter Basics and UI Design** Flutter project structure, Widgets and widget tree, Stateless and Stateful widgets, Layout widgets, Material Design widgets, Styling widgets	**7**
	SECTION-B	
4	**Navigation, State Management and User Interaction** Navigation and routing, Passing data between screens, Forms and user input handling, State management concepts, Introduction to Provider, Handling gestures and events	**7**
5	**Data Handling and Integration** Working with assets and resources, Local storage using SharedPreferences, Working with JSON data, REST API integration using HTTP package, Error handling	**6**
6	**Database Concepts** SQLite, Cloud Fire store, Internalization on Flutter, Using intl Package-Testing on Flutter, Types of Testing- Widget Testing	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**30**	**20**	**30**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Flutter in Action, By Eric Windmill, 2020
2. Beginning App Development with Flutter: Create Cross-Platform Mobile Apps, By Rap Payne, 2019

Reference Books:

1. Flutter Succinctly By Ed Freitas, 2019

Bachelor of Engineering Subject
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Subject Name: Mobile Application with Flutter

2. AHMED ROOPA R YAVAGAL, Mc GrawHill.

List of Practical:

1. Install Flutter SDK and set up development environment.
2. Write Dart programs demonstrating variables, data types, and control structures.
3. Create a basic Flutter application using Stateless and Stateful widgets.
4. Design UI layouts using Row, Column, Container, and Material widgets.
5. Implement navigation between multiple screens in Flutter.
6. Handle user input using forms and validation.
7. Implement state management using setState() or Provider.
8. Integrate REST API and parse JSON data.
9. Use local storage for data persistence.
10. Develop a Mini Project using Flutter covering UI design, data handling, navigation, and deployment

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** various Python data structures to effectively manage various types of data.
CO-2	**Apply** Dart programming concepts for mobile application development.
CO-3	**Analyze** applications of various operations for python libraries in data science
CO-4	**Use** navigation and state management techniques in Flutter applications.
CO-5	**Apply** data handling techniques including API integration and local storage.
CO-6	**Create** real-world mobile applications using Flutter following the complete development lifecycle.

List of Open Source Software/learning website:

1. A tour of the Dart language (https://dart.dev/guides/language/language-tour)
2. Flutter Docs (https://flutter.dev/docs)
3. https://github.com/flutter

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: IT2304
Subject Name: Data Visualization using Python

Semester: - VI

Type of course: Professional Elective

Prerequisite: Knowledge of Python, Charts, Data Science

Rationale: This course is offered for understanding the principles and techniques of data visualizations through various libraries and tools.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Preparing Environment and Knowing Your Data** Installation of Python with matplotlib, Import and export of data with different sources, Cleaning up data from outliers, Smoothing the noise in real-word data	6
2	**Data Visualization using Python Libraries** Overview of Python visualization ecosystem: Matplotlib, Seaborn, Plotly, and Pandas Visualization. Plot customization: axis, grids, titles, legends, color palettes, and styles. Visual types: line, bar, pie, histogram, boxplot, scatter, heatmap, pairplot, and time series plots.	7
3	**Visualizations with Matplotlib and Seaborn** Basic plotting and customization with Matplotlib: bar, line, and stacked charts, histograms, scatter plots, polar plot and other chart. Seaborn : heatmaps, pairplots, and boxplots.	6

Bachelor of Engineering
Subject Code: IT2304
Subject Name: Data Visualization using Python

	SECTION-B	
4	**Interactive Visualizations** Interactive plots using **Plotly**, **Bokeh**, and **Dash**. Building interactive dashboards using Plotly Dash. Creating animations and dynamic plots. Integrating multiple plots and subplots. Visualization of geographic data using **Folium** and **Geopandas**.	**6**
5	**Data Visualization using Power BI** Overview of Power BI, installation, and interface. Connecting to various data sources (Excel, CSV, SQL, Web, etc.). Data transformation using Power Query Editor. Designing visuals: charts, tables, maps, and slicers. Introduction to DAX (Data Analysis Expressions).	**8**
6	**Integrating Python with Power BI and Dashboard Development** Embedding Python scripts in Power BI for data processing and advanced visualizations. Designing interactive dashboards combining Python and Power BI visuals. Sharing and publishing dashboards to Power BI Service. Case studies and industry applications.	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**35**	**30**	**15**	**05**	**05**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. Python Data Visualization Cookbook - Igor Milovanovi, Packt Publishing Limited
2. Communicating Data with Tableau: Designing, Developing, and Delivering Data Visualizations - Ben Jones, O'Reilly Media

Bachelor of Engineering Subject
Code: IT2304
Subject Name: Data Visualization using Python

Reference Books:

1. Core Python Programming - R. Nageswara Rao, Dreamtech Press
2. Beautiful Visualization - Julie Steele, Noah Iliinsky, O'ReillyData Science From Scratch: First Principles with Python by Joel Grus, O'Reilly Publication

List of Practical:

1. Introduction to data visualization concepts and Python setup for visualization.
2. Perform data loading and cleaning using Pandas and NumPy.
3. Create basic plots using Matplotlib: line, bar, and scatter plots.
4. Use Seaborn for statistical visualizations such as heatmaps, pairplots, and boxplots.
5. Develop interactive visualizations using Plotly and Dash.
6. Create geographic maps using Folium or Geopandas.
7. Connect datasets in Power BI and perform transformations using Power Query.
8. Create interactive dashboards and apply DAX functions in Power BI.
9. Integrate Python scripts for advanced analytics and visualization in Power BI.
10. Develop an Integrated Data Visualization Dashboard using Python and Power BI – including data cleaning, visualization, and dashboard publishing.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Explore** the environment and datasets for visualization tasks.
CO-2	**Learn** various Python libraries used for static and interactive visualizations.
CO-3	**Explore** various data visualization techniques using Matplotlib.
CO-4	**Create** interactive dashboards using Plotly, Bokeh, and Dash to create
CO-5	**Understand** Clean, process, and visualize datasets effectively using Python and Power BI.
CO-6	**Apply** the basic concept of Power BI to develop dashboards.

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Subject Name: Data Visualization using Python

List of Open Source Software/learning website:

1. Official Python Documentation: https://docs.python.org
2. Matplotlib Tutorials - https://matplotlib.org/stable/tutorials/index.html
3. Power BI Tutorials - https://www.tutorialspoint.com/power_bi/index.htm

Bachelor of Engineering
Subject Code: CO2315
Subject Name: Big Data Analytics

Semester: - VI

Type of course: Open Elective

Prerequisite: Some prior knowledge about SQL, Data Mining, and DBMS would be beneficial.

Rationale: Provide an overview of exciting and growing field of big data analytics**.** Enchase the programming skills using big data technologies such as map reduce, NoSQL, Hive, Pig, Kafka, and Spark**.**

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to Big Data and Hadoop** Introduction to Big Data, Big Data characteristics, Types of Big Data, Traditional vs. Big Data, Big Data Applications. Hadoop architecture: HDFS, YARN 2, YARN Daemons. Hadoop Ecosystem.	5
2	**HDFS and Map Reduce**: **HDFS** HDFS architecture, Features of HDFS, Rack Awareness, HDFS Federation, Map Reduce the Map Task, The Reduce Task, Grouping by Key, Partitioner and Combiners, Detail of Map Reduce Execution. **Algorithm Using Map Reduce** Matrix and Vector Multiplication by Map Reduce, Computing Selection and Projection by Map Reduce, and Computing Grouping and Aggregation	9

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Subject Code: CO2315
Subject Name: Big Data Analytics

	by Map Reduce**.**	
3	**NoSQL** Introduction to NoSQL, No SQL Business drivers, NoSQL Data architecture patterns: key value stores, Column family Stores, Graph Stores, Document Stores. **NoSQL to manage big data** Analyzing big data with shared nothing architecture, choosing distribution master slave vs. peer to peer overview, HBASE data model, and Read Write architecture.	**6**
	SECTION-B	
4	**Hadoop Ecosystem** HIVE and PIG,HIVE: background, architecture, warehouse directory and meta-store, HIVE query language, loading data into table, HIVE built-in functions, joins in HIVE, Partitioning. **HiveQL and PIG** querying data, sorting and aggregation, background, architecture, PIG Latin Basics, PIG execution, modes, PIG processing – loading and transforming data, PIG built-in functions, filtering, grouping, sorting data Installation of PIG and PIG Latin commands.	**9**
5	**Apache Kafka** Kafka Fundamentals, Kafka architecture, **Apache Spark** Spark Basics, Working with RDDs in Spark, Spark Framework, aggregating Data with Pair RDDs, Writing and Deploying Spark Applications, Spark SQL and Data Frames.	**5**
6	**Cluster Mining Frequent item sets** Market Based Model, Apriori Algorithm, Handling Large Data Sets in Main Memory, Limited Pass Algorithm, and Counting Frequent item sets in a Stream, Clustering Techniques: Hierarchical, K-Means, Frequent Pattern based Clustering Methods.	**5**

Bachelor of Engineering
Subject Code: CO2315
Subject Name: Big Data Analytics

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**30**	**20**	**30**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Books:

1. HADOOP: The definitive Guide, Third Edition by Tom White,O Reilly 2012, ISBN: 978-1-449-31152-0
2. Hadoop in Action, First Edition, by Chuck Lam, Dreamtech Press 2016, ISBN: 13 9788177228137.

Reference Books:

1. Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics by Bill Franks, Wiley, 2012.
2. Beginner's Guide for Data Analysis using R Programming by Jeeva Jose, Khanna Book Publishing House, 2019.

List of Practicals:

1. Set up the Configuration of Hadoop System Using Cloudera.
2. Execute following Hadoop commands with detail explanation. (cp, rmr, dus, stat, put, get, mkdir),
3. Write a program in Map Reduce for Intersection and WordCount operation.
4. Write a program in MapReduce for Grouping and Aggregation and Union operation.
5. Query the sample Database using MongoDB querying commands (CRUD Operations).
   a) Create collection

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b) Insert document
c) Delete Document
d) Update Document.

6. Execute HiveQL: Select Where, Select Order By, Group By, Joins with explanation.
7. Execute the HIVE Built-In Operators. (Arithmetic, Relational, Logical).
8. Execute RDD Transformation operation in Apache Spark. Minimum 5 operations.
9. To install and run PIG and then write PIG Latin Script to sort, group, join, project and filter your data.
10. Execute Word Count and Char count operation in Apache Spark. Execute map, groupby, orderby operations on same dataset.

Course Outcomes:

Student will be able to:

Sr. No.	CO statement
CO-1	**Understand** the key issues in big data management and its associated application for business decision.
CO-2	**Create** problem solving and critical thinking skills in fundamental enabling techniques like Map Reduce.
CO-3	**Evaluate** problem solving and critical thinking skills in fundamental enabling techniques like NoSQL, Hadoop Ecosystem.
CO-4	**Remember** Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics
CO-5	**Analyze** RDD and Data Frame to create Application in Spark.
CO-6	**Apply** appropriate techniques and tools to solve big data problems

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2316
Subject Name: Image Processing

Semester: - VI

Type of course: Open Elective

Prerequisite: Knowledge of Fourier transform, Probability theory & Good programming skills.

Rationale: This is fundamental course of computer vision. This course will strengthen fundamental knowledge about digital image processing techniques. Digital image processing is used in almost all engineering fields and wide range of applications in industrial automation, medical, agriculture, security, entertainment, education and many more.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
1	**Digital Image Fundamentals** Light and Electromagnetic spectrum, Components of Image processing system, Image formation and digitization concepts, Neighbours of pixel adjacency connectivity, regions and boundaries, Distance measures, Applications.	8
2	**Image Enhancements** In spatial domain: Basic gray level transformations, Histogram	10

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Bachelor of Engineering
Subject Code: CO2316
Subject Name: Image Processing

	processing, Using arithmetic/Logic operations, smoothing spatial filters, Sharpening spatial filters. In Frequency domain: Introduction to the Fourier transform and frequency domain concepts, smoothing frequency-domain filters, Sharpening frequency domain filters.	
3	**Image Restoration** Various noise models, image restoration using spatial domain filtering, image restoration using frequency domain filtering, Estimating the degradation function, Inverse filtering.	**5**
SECTION-B		
4	**Colour Image Processing** Colour fundamentals, Colour models, Colour transformation, Smoothing and Sharpening, Colour segmentation.	**6**
5	**Wavelet and Multi-resolution Processing** Image pyramids, Multi-resolution expansion, wavelet transform.	**4**
6	**Image Compression and Segmentation** Introduction, Image compression model, Error-free compression, Lossy compression. Detection of discontinuities, Edge linking and boundary detection, thresholding.	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Text Book:

1. Image Processing by Anamitra Nimbalkar.

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Subject Code: CO2316
Subject Name: Image Processing

Reference Books:

1. Digital Image Processing, Second Edition by Rafel C. Gonzalez and Richard E. Woods, Pearson Education
2. Digital Image Processing by Bhabatosh Chanda and Dwijesh Majumder, PHI
3. Fundamentals of Digital Image Processing by Anil K Jain, PHI

List of Practicals:

1. Write program to read and display digital image using SCILAB
   a. Become familiar with SCILAB Basic commands 5 Colour Image Processing: Colour Fundamentals, Colour Models, Pseudo-colour image processing.
2. To write and execute image processing programs using point processing method
   a. Obtain Negative image
   b. Obtain Flip image
3. To write and execute programs for image arithmetic operations
   a. Addition of two images
   b. Subtract one image from other image
4. To write and execute program for geometric transformation of image
   a. Translation
   b. Scaling
   c. Rotation
   d. Shrinking
   e. Zooming
5. To understand various image noise models and to write programs for image restoration
   a. Remove Salt and Pepper Noise
   b. Minimize Gaussian noise
6. Write and execute programs to remove noise using spatial filters
   a. Understand 1-D and 2-D convolution process
7. Write and execute programs to remove noise using spatial filters
   a. Use 3x3 Mask for low pass filter and high pass filter
8. Write and execute program for image morphological operations erosion and dilation.

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Subject Name: Image Processing

9. Write and execute programs for image frequency domain filtering
   a. Apply FFT on given image
   b. Perform low pass and high pass filtering in frequency domain
   c. Apply IFFT to reconstruct image
10. To write and execute program for wavelet transform on given image and perform inverse wavelet transform to reconstruct image.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** the basic image enhancement techniques in spatial & frequency domains
CO-2	**Analyze** the various kind of noise present in the image and how to restore the noisy image.
CO-3	**Create** the basic multi-resolution techniques and segmentation methods.
CO-4	**Apply** these concepts for image handling in various fields.
CO-5	**Propose** morphological operations on given image.
CO-6	**Identify** the methods of image compressing and segmenting.

List of Open Source Software/learning website:

1. MATLAB with image processing toolbox.
2. Scilab (SIP) ACTIVE LEARNING ASSIGNMENTS:
3. http://fossee.in/
4. www.scilab.in

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor in Engineering
Subject Code: CO2317
Subject Name: Internet of Things

Semester: - VI

Type of course: Open Elective

Prerequisite: Knowledge of Computer

Rationale:

Understanding core technology, applications, sensors used and IOT architecture along with the industry perspective. Principles and operations of different types of sensors commonly used on mobile platform will be taught in a manner that by the end of the course the students will be able to design and implement real time solutions using IOT.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Introduction to IoT** Introduction of IoT, Difference between Embedded device and IoT device, Properties of IoT device, IoT Ecosystem, IoT Decision Framework, IoT Solution Architecture Models, Major IoT Boards in Market	6
2	**Setting Up Raspberry/Arduino to Create Solutions** Explore Raspberry Pi, setting up Raspberry Pi, showing working of Raspberry Pi using SSH Client and Team Viewer, Understand Sensing	7

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	actions, Understand Actuators and MEMS	
3	**Communication Protocols used in IoT** Types of wireless communication, Major wireless short range communication devices, properties, comparison of these devices (Bluetooth, WIFI, ZigBee, 6LoWPAN), Major wireless Long-range communication devices, properties, comparison of these devices (Cellular IoT, LPWAN)	**7**
4	**IoT Applications** Industrial Internet 4.0, Applications such as Smart home, wearables, smart city, smart grid, connected car, connected health (digital health, telehealth, telemedicine), smart retail	**7**
5	**Sensors** Applications of various sensors: Google Maps, Waze, WhatsApp, Ola Positioning sensors: encoders and accelerometers, Image sensors: cameras	**6**
6	**Global Positioning Sensors** GPS, GLONASS, IRNSS, Galileo and indoor localization systems, Motion & Orientation Sensors: Accelerometer, Magnetometer, Proximity Sensor, Gyroscope Calibration, noise modeling and characterization and noise filtering and sensor data processing. Privacy &Security	**6**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**30**	**20**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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Subject Name: Internet of Things

Text Books:

1. Internet of Things (A Hands-on Approach), 1st Edition, by Vijay Madisetti and Arshdeep Bahga, VPT, 2014
2. Rethinking the Internet of Things: A Scalable Approach to Connecting Everything, 1stEdition, by Francis da Costa Apress Publications, 2014
3. Getting Started with the Internet of Things by CunoPfister, O Reilly Media, 2011

Reference Book:

1. The Internet of Things – Key applications and Protocols by Olivier Hersent, David Boswarthick, Omar Elloumi and Wiley, 2012 (for Unit2).
2. From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence",Jan Ho¨ ller, VlasiosTsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand. David Boyle and Elsevier, 2014.
3. Architecting the Internet of Things,Dieter Uckelmann, Mark Harrison, Michahelles and Florian (Eds), Springer,2011.

List of Practicals:

1. Familiarization with Arduino/ Raspberry Pi and perform necessary software installation.
2. To interface LED/ Buzzer with Arduino/ Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
3. To interface Push button/ Digital sensor (IR/LDR) with Arduino/ Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/ Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using Arduino/ Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/ Raspberry Pi and write a program to print temperature and humidity readings on it.
7. To interface Bluetooth with Arduino/ Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.
8. To interface Bluetooth with Arduino/ Raspberry Pi and write a program to turn LED ON/OFF when 1/0 is received from smartphone using Bluetooth.

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9. Write a program on Arduino/ Raspberry Pi and write a program to upload temperature and humidity data to thingspeak cloud.
10. Write a program on Arduino/ Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** core technology, applications, sensors used and IOT architecture along with the industry perspective.
CO-2	**Learn** Arduino/ Raspberry's working and implementation.
CO-3	**Practice** various communication protocols used in IoT.
CO-4	**Examine** various IOT technologies in real-life applications.
CO-5	**Analyze** various sensors.
CO-6	**Create** global positioning sensors in different systems.

List of Open-Source Software/learning website:

1. Vlabs.iitb.ac.in
2. https://nptel.ac.in
3. www.coursera.org

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2318
Subject Name: Cyber Security

Semester: - VI

Type of course: Open Elective

Prerequisite: Basic knowledge of Computer

Rationale: This course provides the basis for understanding the fundamental issues surrounding the protection of information assets. The course's goal is to give students an overview of the topic of cyber security and assurance. Cyber Security is an area of study that investigates the possibilities of safe internet activity and how to safeguard oneself and, eventually, society against such attacks.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.
1	**Introduction** Introduction to Cyber Security, Importance and challenges in Cyber Security, Cyberspace, and Cyber threats, Cyber warfare, CIA Triad, Cyber Terrorism, Cyber Security of Critical Infrastructure, Cyber security -Organizational Implications.	6
2	**Hackers And Cyber Crimes** Types of Hackers, Hackers and Crackers, Cyber-Attacks and Vulnerabilities, Malware threats, Sniffing, Gaining Access, Escalating	7

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Subject Code: CO2318
Subject Name: Cyber Security

	Privileges, Executing Applications, Hiding Files, Covering Tracks, Worms, Trojans, Viruses – Backdoors.	
3	**Fundamentals of Ethical Hacking and Social Engineering** Ethical Hacking Concepts and Scopes - phases of ethical hacking, Enterprise Information Security Architecture, Vulnerability Assessment and Penetration Testing, Types of Social Engineering, Scanning and enumeration, Insider Attack, Preventing Insider Threats, Social Engineering Targets and Defense Strategies. Virtual LAN	**7**
SECTION-B		
4	**Network Defense and Countermeasures** Automated Security Assessment Tools (OpenVAS, Nessus), IDS, Honeypots and Firewalls, Cryptographic Attacks and Defenses. Password Cracking and Brute-Force Tools – John the Ripper, Pwdump, Firewalls and Packet Filters, VPN.	**7**
5	**Web Application Vulnerabilities** Owasp Top 10 web application security, Application Inspection tools – Zed Attack Proxy, Sqlmap, DVWA.	**7**
6	**Introduction about Cyber Laws** Classification of cybercrimes and its examples, The legal perspectives, Cybercrime and the Indian ITA 2000, Global Perspective on Cybercrimes.	**5**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	**25**	**30**	**10**	**5**	**5**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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Subject Code: CO2318
Subject Name: Cyber Security

Text Books:

1. The Ethical Hacker's Handbook, Fourth Edition by Gray Hat Hacking
2. Anti-Hacker Tool Kit (Indian Edition) by Mike Shema, Publication Mc Graw Hill.

Reference Books:

1. Cyber Security- Understanding Cyber Crimes, Computer Forensics and Legal Perspective", by Nina Godbole, Sunit Belapure, Wiley Publication.
2. Computer Security: Concept, Issues and Implementation by Alfred Basta and Wolf Halton.

List of Practicals:

1. Introduction Virtualization Environment configuration and Cyber Lab setup (Kali, VM ware and Oracle VirtulBox).
2. Information Gathering using NMAP framework and study about port scanning.
3. Understand packet capturing tool wireshark or Ethercap and analysis of those packets.
4. Using open port information perform MITM(Man In The Middle) attack using arpspoof, urlsnarf, dsniff, dnsspoof.
    a. Interruption
    b. Interception
5. BASIC configuration of Intrusion Detection System: Snort.
6. Network vulnerability assessment using OpenVAS/Necuss Framework.
7. Demonstrate automated SQL injection with SqLMap.
8. Demonstrate Application Injection using Zed Attack Proxy.
9. Perform web application testing using DVWA.
    a. Perform Manual SQL injection
    b. XSS using DVWA
10. Perform brute force attack using John the RIPPER.

Bachelor of Engineering
Subject Code: CO2318
Subject Name: Cyber Security

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	**Understand** importance of Cyber Security.
CO-2	**Explore** various types of cyber-attacks.
CO-3	**Evaluate** penetration testing and analyzing vulnerability assessment techniques.
CO-4	**Illustrate** protection from the outside world, evaluate and secure Network and IT systems.
CO-5	**Implement** various web application inspection tools.
CO-6	**Learn** cyber laws and how to protect themselves.

List of Open Source Software/learning website:

1. vlabs.iitb.ac.in
2. https://nptel.ac.in/courses/
3. Cryptool - https://www.cryptool.org/en/
4. Wireshark - https://www.wireshark.org/download.html

Type of course: Work-Personality Development

Prerequisite: To keep open mind and will to learn humanity for oneself and society.

Rationale: The Contributor Program aims to accomplish the following outcomes in the lives of students–

- Improve the employability of students by giving them the right work ethic and thinking that employers are looking for.
- Build their confidence with which they can go into any job and contribute meaningfully.
- Improve their ability to engage better in the workplace and to be able to handle the challenges that come up there.
- Build their career-worthiness and help them develop into future-ready contributors with ability to navigate a career in a volatile, changing world.
- Widen their choices of career and success, so that they are able to open up more opportunities for themselves and take up unconventional career pathways.
- Enable them to recognize how they, as technical professionals, can participate and make a positive contribution to their communities and to their state.

Towards this goal, the Contributor Program has been designed to awaken and strengthen students from within, in terms of building positive self-esteem, increasing their confidence level and I-can attitude, improving their aspirations, giving them new methods of thinking, building their cognitive capacities, exposing them to the skills and practices associated with being contributors in the workplace (not mere employees).

The Program content is also designed to expose students to real-world workplace scenarios and sensitize them to some of the challenges faced in society around them, especially in the local communities around them and in their own state of Gujarat.

The Contributor Program syllabus has been evolved and fine-tuned over several years, (a) to address the changing need and contemporary challenges being faced by industry and what employers of today are looking for in the people they hire and (b) by working extensively with universities and students building an appreciation of their challenges and concerns. At the core, the program is guided by the higher ideas and principles of practical Vedanta in work.

Bachelor of Engineering
Subject Code: MH2302
Subject Name: Contributor Personality Development Program – II

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
1	1	0	2	50	30	00	20	100

Content:

Sr. No.	Content	Total Hrs.
	SECTION-A	
1	**Finding Solutions** The market environment in which organizations are operating, is becoming increasingly dynamic and uncertain. So, employers are increasingly seeking out people who can innovate and figure out solutions in the face of any challenge (unlike in the past when it was the people who were most efficient and productive, who were valued by organizations). At the heart of innovation lies this way of thinking of "finding solutions" rather than "seeing problems or roadblocks". Students learn how to build this way of thinking, in this topic.	04 hrs Classroom engagement (including self-discovery/ solutioning sessions)
2	**Creating Value** Companies are also looking for employees who do not just work hard, or work efficiently or productively - but those who will make a valuable difference to the fortunes of the company. This difference may come from innovation, but it may also come from focusing on the right things and identifying what really matters – both to the company and to the customers. In this topic, students learn how to build this capability.	04 hrs Classroom engagement (including self-discovery/ solutioning sessions)

3	**Engaging deeply** The environment we live in is becoming increasingly complex because more and more things are getting interconnected, new fields are emerging, technologies are rapidly changing, capabilities and knowledge one is trained in will become fast obsolete. In such a scenario, the student's ability to quickly understand and master what is going on, dive deep, get involved in any area, rapidly learn new capabilities that a job demands, is important. Engaging deeply is a core way of thinking that can help them in this. In this topic, students learn how to engage deeply.	04 hrs Classroom engagement (including self-discovery/ solutioning sessions)
	SECTION-B	
4	**Enlightened self-interest & collaboration at work** The changing nature of work in organizations and in the global environment is increasingly demanding that people work more collaboratively towards shared goals and more sustainable goals. A key to working successfully when multiple stakeholders are involved is "thinking in enlightened self-interest". In this topic, students learn how to develop this way of thinking (going beyond "narrow self-interest").	04 hrs Classroom engagement (including self-discovery/ solutioning sessions)
5	**Human-centered thinking & Empathy** In this topic, students explore a human-centric approach to work – where the ability to recognize and respond to other people (whether they are users or customers or team members) as a human being with human needs and difficulties, is essential. This is at the heart of user-centric design of products and solutions, at the heart of genuine customer- centricity in services, and of any successful interaction with other people.	04 hrs Classroom engagement (including self-discovery/ solutioning sessions)
6	**Trust Conduct** The biggest currency in a sustainable career is "trust" i.e. being trusted by team members, bosses, and customers. When we are trusted, people listen to us, they are willing to give us the chance to grow, give us the space to make	04 hrs Classroom engagement (including self-discovery/ solutioning sessions)

	mistakes, and work seamlessly with each other without always having to "prove ourselves". In this topic, students learn how to demonstrate conduct that builds the trust of people.	

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
-	**20**	**20**	**20**	**20**	**20**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference resources:

A. Basic reference for both students and teachers

1. Contributor Personality Program textbook cum workbook developed by Illumine
2. Web-based ActivGuide™ for self-exploration of rich media resources to vividly understand many of the ideas, watch role models, learn from industry people, get reference readings – that help them enrich the understanding they gained in the class published by Illumine Foundation

B. Advanced reference for teachers

1. On Contributors, Srinivas V.; Illumine Ideas, 2011
2. Enlightened Citizenship and Democracy; Swami Ranganathananda, Bharatiya Vidya Bhavan, 1989
3. Eternal Values for a Changing Society – Vol I-IV, Swami Ranganathananda; Bharatiya Vidya Bhavan
4. Karma Yoga, Swami Vivekananda; Advaita Ashrama
5. Vivekananda: His Call to the Nation, Swami Vivekananda; Advaita Ashrama
6. Six Pillars of Self Esteem, Nathaniel Branden; Bantam, 1995
7. Mindset: The New Psychology of Success, Carol S. Dweck; Random House Publishing Group, 2007
8. Lasting Contribution: How to Think, Plan, and Act to Accomplish Meaningful Work, Tad Waddington; Agate Publishing, 2007

9. Why not?: how to use everyday ingenuity to solve problems big and small, Barry Nalebuff, Ian Ayres; Harvard Business School Press, 2003
10. The value mindset: returning to the first principles of capitalist enterprise (Ch 8 & 9); Erik Stern, Mike Hutchinson; John Wiley and Sons, 2004
11. The Power of Full Engagement: Managing Energy, Not Time, is the Key to High Performance and Personal Renewal, Jim Loehr, Tony Schwartz; Simon and Schuster, 2003
12. Creating Shared Value, Michael E. Porter and Mark R. Kramer; Harvard Business Review; Jan/Feb2011, Vol. 89 Issue 1/2
13. The Speed of Trust: The One Thing That Changes Everything, Stephen M. R. Covey, Rebecca R. Merrill, Stephen R. Covey; Free Press, 2008
14. The Courage to Meet the Demands of Reality, Henry Cloud; HarperCollins, 2009
15. Responsibility at work: how leading professionals act (or don't act) responsibly, Howard Gardner; John Wiley & Sons, 2007

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Students will be able to recognize & appreciate the thinking required to find solutions in the face of any challenge.
CO-2	Students will be able to recognize & appreciate different types of value that can be created and the different ways to create value for others.
CO-3	Students will be able to recognize & appreciate how to engage deeply, and its need, value, payoffs and consequences in different contexts.
CO-4	Students will be able to differentiate between 'enlightened self-interest' and 'narrow self-interest' & appreciate the payoffs/ consequences of both when working with multiple stakeholders.
CO-5	Students will be able to recognize & appreciate the human side of situations or interactions or projects that will help them develop a more human-centric approach/ response to work.
CO-6	Students will be able to recognize & appreciate conduct which builds trust of people in contrast to conduct which breaks trust of people - in teams / organization & the value of trust conduct in various situations.