

Shroff S.R. Rotary Institute of Chemical Technology

Ref: UPL University/SRICT/BOS/CO/2023-24/01

Date: 15/02/2024

Teaching Scheme for Fourth Year Bachelor of Computer Engineering Semester-VII (Computer Engineering) 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	CO2401	Machine Learning	3	0	2	5	4	70	30	20	30	150
2	Professional Core Course	CO2402	Compiler Design	2	0	2	4	3	70	30	20	30	150
3	Professional Elective Course		Professional Elective 5	2	0	2	4	3	70	30	20	30	150
4	Professional Elective Course		Professional Elective 6	3	0	2	5	4	70	30	20	30	150
5	Open Elective		Open Elective 4	2	0	2	4	3	70	30	20	30	150
6	Inplant Training	MH2401	Summer Internship	0	0	0	0	3	0	0	20	80	100
Total				12	0	10	22	20	Total			850	

Professional Elective 5			Professional Elective 6			Open Elective 4		
Sr. No	Code No.	Course Title	Sr. No	Code No.	Course Title	Sr. No	Code No.	Course Title
1	CO2403	Information Retrieval	1	CO2405	Software Testing & Quality Assurance	1	CO2407	Soft Computing
2	CO2404	Computer Vision	2	CO2406	Distributed Systems	2	CO2408	Cyber Forensics and Cyber Laws

(Established under Gujarat Private Universities Act, 2009)

Shroff S.R. Rotary Institute of Chemical Technology

Semester-VIII (Computer Engineering) 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	CO2409	Agile Development using UI/UX Design	3	0	2	5	4	70	30	20	30	150
2	Professional Elective Course		Professional Elective 7	3	0	0	3	3	70	30	0	0	100
3	Open Elective		Open Elective 5	2	0	2	4	3	70	30	20	30	150
4	Project	MH2402	Project	0	0	18	18	9	0	0	100	100	200
Total				8	0	22	30	19	Total			600	

Professional Elective 7			Open Elective 5		
Sr. No	Code No.	Course Title	Sr. No	Code No.	Course Title
1	CO2410	Virtual and Augmented Reality	1	CO2412	Natural Language Processing
2	CO2411	Cloud Computing	2	CO2413	Data Science

Shroff S.R. Rotary Institute of Chemical Technology

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: CO2401
Subject Name: Machine Learning

Semester: - VII

Type of course: Professional Core

Prerequisite: Programming and Data Structure, Algorithms, Probability and Statistics

Rationale: The objective of the course is to introduce the students with concepts of machine learning, machine learning algorithms and building the applications using machine learning for various domains

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P		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 Learning Problems, designing a learning system, Introduction to Machine Learning Techniques: Supervised Learning, Unsupervised Learning and Reinforcement Learning, Real life examples of Machine Learning, Life cycle of machine learning, Applications of machine learning algorithms, Issues and challenges with machine learning	6
2	Modelling and Evaluation: Selecting a Model: Predictive/Descriptive, Training a Model for supervised learning, model representation and interpretability, Evaluating performance of a model, Improving performance of a model.	9
3	Supervised Learning Distance-based methods, Nearest-Neighbors, Decision Trees, Linear	5

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2401
Subject Name: Machine Learning

	models: Linear Regression, Logistic Regression, Generalized, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Naïve Bayes classifier, Applications and challenges	
SECTION-B		
4	Unsupervised learning and Reinforcement Learning Introduction - Clustering Algorithms -K – Means – Hierarchical Clustering - Cluster Validity - Dimensionality Reduction –Principal Component Analysis – Recommendation Systems - EM Algorithm. Reinforcement Learning – Elements -Model based Learning – Temporal Difference Learning	11
5	Probabilistic Methods for learning Introduction -Naïve Bayes Algorithm -Maximum Likelihood -Maximum Apriori -Bayesian Belief Networks -Probabilistic Modelling of Problems -Inference in Bayesian Belief Networks – Probability Density Estimation - Sequence Models – Markov Models – Hidden Markov Model	3
6	Neural Network: Introduction to neural network, Types Neural Network Recent advancements and research trends Recent trends in various machine learning techniques, Use of machine learning techniques with cloud computing, IoT, Big data, blockchain, etc., Case study	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)

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2401
Subject Name: Machine Learning

Text Books:

1. Peter Flach: Machine Learning: The Art and Science of Algorithms that Make Sense of Data, Cambridge University Press, Edition 2012.
2. Machine Learning for Dummies, By John Paul Mueller and Luca Massaron, For Dummies, 2016.

Reference Books:

1. Machine Learning, Saikat Dull, S. Chjandramouli, Das, Pearson
2. Machine Learning with Python for Everyone, Mark Fenner, Pearson
3. Machine Learning, Anuradha Srinivasaraghavan, Vincy Joseph, Wiley
4. Machine Learning with Python, U Dinesh Kumar Manaranjan Pradhan, Wiley

List of Practicals:

1. Write a python program to import and export data using Pandas library functions
2. Demonstrate various data pre-processing techniques for a given dataset
3. Implement Simple and Multiple Linear Regression Models.
4. Develop Logistic Regression Model for a given dataset.
5. Develop Decision Tree Classification model for a given dataset and use it to classify a new sample.
6. Implement Naïve Bayes Classification in Python
7. Build KNN Classification model for a given dataset.
8. Build Artificial Neural Network model with back propagation on a given dataset.
 - a) Implement Random forest ensemble method on a given dataset.
 - b) Implement Boosting ensemble method on a given dataset.
9. Write a python program to implement K-Means clustering Algorithm
10. Build Artificial Neural Network model with back propagation on a given dataset.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2401
Subject Name: Machine Learning

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand basic applications and issues of Machine Learning
CO-2	Analyze various Machine Learning techniques and algorithm.
CO-3	Evaluate the various Supervised Learning algorithms using appropriate Dataset
CO-4	Evaluate the various Unsupervised Learning and Reinforcement algorithms using appropriate
CO-5	Recognize the characteristics of machine learning that makes it useful to real-world problems.
CO-6	Design and implement various machine learning algorithms in a range of real-world applications.

List of Open Source Software/learning website:

<https://www.udacity.com/course/intro-to-machine-learning--ud120.7>.

<https://www.coursera.org/learn/machine-learning-duke>

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2402
Subject Name: Compiler Design

Semester: - VII

Type of course: Professional Core

Prerequisite: Algorithms, Data Structures, Assembly Language Program, Theory of Computation, C/C++ Programming Skills

Rationale: Compiler Design is a fundamental subject of Computer Engineering. Compiler design principles provide an in-depth view of translation, optimization and compilation of the entire source program. It also focuses on various designs of compiler and structuring of various phases of compiler. It is inevitable to grasp the knowledge of various types of grammar, lexical analysis, YACC, FSM (Finite State Machines) and correlative concepts of languages

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Overview of the Compiler and its Structure: Language processor, Applications of language processors, Definition Structure-Working of compiler, the science of building compilers, Basic understanding of interpreter and assembler. Difference between interpreter and compiler. Compilation of source code into target language, Cousins of compiler, Types of compiler.	3
2	Lexical Analysis: The Role of the Lexical Analyser, Specification of Tokens, Recognition	4

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2402
Subject Name: Compiler Design

	of Tokens, Input Buffering, elementary scanner design.	
3	Syntax Analysis: Understanding Parser and CFG(Context Free Grammars), Left Recursion and Left Factoring of grammar Top Down and Bottom up Parsing Algorithms, Operator-Precedence Parsing, LR Parsers, Using Ambiguous Grammars, Parser Generators, Automatic Generation of Parsers.	6
SECTION-B		
4	Intermediate-Code Generation: Variants of Syntax Trees, Three-Address Code, Types and Declarations, Translation of Expressions, Type Checking Run-Time Environments: Source Language Issues, Storage Organization.	7
5	Code Generation and Optimization: Issues in the Design of a Code Generator, The Target Language, Addresses in the Target Code, Basic Blocks and Flow Graphs, Optimization of Basic Blocks, A Simple Code Generator.	2
6	Instruction-Level Parallelism: Processor Architectures, Code-Scheduling Constraints, Basic-Block Scheduling, Pass structure of assembler	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	30	20	05	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. Compiler Tools Techniques - A.V.Aho, Ravi Sethi, J.D.Ullman, Addison Wesley
2. The Theory and Practice of Compiler Writing - Trembley J.P. And Sorenson P.G. Mcgraw-Hill

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2402
Subject Name: Compiler Design

Reference Books:

1. Modern Compiler Design - Dick Grune, Henri E. BAL, Jacob, Langendoen, WILEY India
2. Compiler Construction - Waite W.N. And Goos G., Springer Verlag
3. Compiler Construction-Principles and Practices - D.M.Dhamdhare, Mcmillian
4. Principles of Compiler Design, V. Raghavan, McGrawHill

Sample List of Experiments:

1. Implementation of Finite Automata and String Validation
2. Introduction to Lex Tool.
3. Implement following Programs Using Lex
 - a. Generate Histogram of words
 - b. Ceasar Cypher
 - c. Extract single and multiline comments from C Program
4. Implement following Programs Using Lex
 - a. Convert Roman to Decimal
 - b. Check weather given statement is compound or simple
 - c. Extract html tags from .html file
5. Implementation of Recursive Descent Parser without backtracking
Input: The string to be parsed.
Output: Whether string parsed successfully or not. Explanation: Students have to implement the recursive procedure for RDP for a typical grammar. The production no. are displayed as they are used to derive the string.
6. Extract Predecessor and Successor from given Control Flow Graph
7. Introduction to YACC and generate Calculator Program
8. Implement a C program for constructing LL (1) parsing.
9. Implement a C program to implement LALR parsing.
10. Implement a C program to implement operator precedence parsing.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Acquire the knowledge about basic concepts; ability to apply automata theory and knowledge on formal languages.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2402
Subject Name: Compiler Design

CO-2	Exhibit role of various phases of compilation.
CO-3	Analyse ability to identify and select suitable parsing strategies for a compiler for various cases. Knowledge in alternative methods (top-down or bottom-up, etc...)
CO-4	Understand backend of compiler: intermediate code, Code optimization Techniques and Error Recovery mechanisms.
CO-5	Learn about the issues of run time environments and scheduling for instruction level parallelism.
CO-6	Observe Instruction-Level Parallelism.

List of Open Source Software/learning website:

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

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2403
Subject Name: Information Retrieval

Semester: - VII

Type of course: Professional Elective

Prerequisite: Knowledge of Machine Learning and Artificial Intelligence

Rationale: Learning about information retrieval is like learning how to find things quickly on the computer. It helps make search engines work better, organize information neatly, and understand what people say in everyday language. It's important for making technology easy to use, finding information fast, and being responsible online.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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 Information Retrieval Systems: Definition of Information Retrieval System, Objectives of Information Retrieval Systems, Functional Overview, Information Retrieval System Capabilities: Search Capabilities, Browse Capabilities, Miscellaneous Capabilities	4
2	Search Engines and Web Browsing: Search engine principles, Basics of web crawling, Indexing strategies and techniques, Challenges in web crawling and indexing, User Interfaces in Web Search, Query Processing and Parsing, Web Search Challenges and Future Trends	5
3	Information Retrieval Models: vector space models, probabilistic models, Machine Learning Approaches, Evaluation metrics, Feedback Mechanisms,	5

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2403
Subject Name: Information Retrieval

	Language Models, Relevance and Ranking, Advanced Models and Algorithms, Cross-Language Information Retrieval	
SECTION-B		
4	Indexing and Searching Techniques: Text indexing, tokenization, Boolean retrieval, Phrase and proximity searching, Query Processing, Ranked Retrieval, Term Weighting, Index Compression Techniques, Challenges in Indexing	5
5	Evaluation Metrics and Relevance Feedback: Measures for evaluating retrieval systems, Techniques for relevance feedback, Improving search results through user feedback	3
6	Applications and Ethics in Information Retrieval: Natural Language Processing (NLP) in retrieval, Purpose of Personalization and recommendation systems, Ethical and legal considerations	4

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
25	35	20	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. "Introduction to Information Retrieval" by Christopher D. Manning, Prabhakar Raghavan, and Hinrich Schütze
2. "Information Retrieval: Algorithms and Heuristics" by David A. Grossman, Ophir Frieder, and Douglas W. Oard
3. "Web Search Engine: Indexing Techniques" by Jai Prakash Pandey

Reference Books:

1. Robert Korfhage, "Information Storage & Retrieval", John Wiley & Sons.
2. Yates and Neto, "Modern Information Retrieval" Pearson Education.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2403
Subject Name: Information Retrieval

Practical List:

1. Write a program to demonstrate bitwise operation.
2. Implement Page Rank Algorithm.
3. Implement Dynamic programming algorithm for computing the edit distance between two.
4. Write a program to Compute Similarity between two text documents.
5. Write a map-reduce program to count the number of occurrences of each alphabetic character in the given dataset. The count for each letter should be case-insensitive (i.e., include both upper-case and lower-case versions of the letter; Ignore non-alphabetic characters).
6. Write a program to Compute Similarity between two text documents.
7. Write a program for Pre-processing of a Text Document: stop word removal.
8. Write a program for tkinter.
9. Write a program to implement simple web crawler.
10. Write a program to parse XML text, generate Web graph and compute topic specific page rank.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand the historical development and significance of Information Retrieval Systems, search capabilities, browse capabilities, and miscellaneous capabilities of IRS.
CO-2	Identify the primary objectives and miscellaneous capabilities of Information Retrieval Systems.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2403
Subject Name: Information Retrieval

CO-3	Analyze user interfaces in web search and their impact on user experience.
CO-4	Describe the functional overview of an IRS, including its role in managing and retrieving information.
CO-5	Recognize challenges associated with web crawling and indexing.
CO-6	Apply search techniques for retrieving relevant information from a given dataset.

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: CO2404
Subject Name: Computer Vision

Semester: - VII

Type of course: Professional Elective

Prerequisite: Calculus, Linear algebra, Probability, Programming knowledge

Rationale: : In this course students will learn basic principles of image formation, image processing algorithms and recognition from single or multiple images (video). This course emphasizes the core vision tasks of scene understanding and recognition. Applications to object recognition, image analysis, and image retrieval and object tracking will be discussed.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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	Overview of computer vision and its applications Image Processing, Computer Vision and Computer Graphics, What is Computer Vision - Low-level, Mid-level, High-level Image Formation and Representation: Imaging geometry, radiometry, digitization, cameras and Projections, rigid and affine transformation	5
2	Image Processing Pixel transforms, color transforms, histogram processing, histogram equalization, filtering, convolution, Fourier transformation and its	4

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2404
Subject Name: Computer Vision

	applications in sharpening, blurring and noise removal	
3	Feature detection: edge detection, corner detection, line and curve detection, active contours, SIFT and HOG descriptors, shape context descriptors, Morphological operations	4
SECTION-B		
4	Segmentation: Active contours, split & merge, watershed, region splitting, region merging, graph-based segmentation, mean shift and model finding, Normalized cut	4
5	Motion representation: the motion field of rigid objects; motion parallax; optical flow, the image brightness constancy equation, affine flow; differential techniques; feature-based techniques; regularization and robust estimation	5
6	Object recognition and shape representation: alignment, appearance-based methods, invariants, image Eigen spaces Applications: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application	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	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. Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011.
2. Computer Vision: Algorithms and Applications, R. Szeliski, Springer, 2011. 3
3. Introductory techniques for 3D computer vision, E. Trucco and A. Verri, Prentice Hall, 1998

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2404
Subject Name: Computer Vision

Reference Books:

1. Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.
2. Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall.
3. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley Longman, Inc., 1992. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982.
4. Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA). Springer, 2010
5. Image Processing, Analysis, and Machine Vision. Sonka, Hlavac, and Boyle. Thomson.
6. E. R. Davies, Computer & Machine Vision, Fourth Edition, Academic Press, 2012
7. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012
8. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.

List of Practicals:

1. Implementing various basic image processing operations in python/matlab/open-CV: Reading image, writing image, conversion of images, and complement of an image
2. Implement contrast adjustment of an image. Implement Histogram processing and equalization.
3. Implement the various low pass and high pass filtering mechanisms.
4. Convert Image from one color space to another as mentioned below BGR ↔ Gray and BGR ↔ HSV, BGR to YCbCr.
5. Use of Fourier transform for filtering the image.
6. Utilization of SIFT and HOG features for image analysis.
7. Performing/Implementing image segmentation

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2404
Subject Name: Computer Vision

8. Implement optical flow computation algorithm.
9. Demonstrate the use of optical flow in any image processing application.
10. Object detection and Recognition on available online image datasets

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand the basic image processing operations to enhance, segment the images.
CO-2	Identify basic image processing operations to enhance, segment the images.
CO-3	Analyze relevant features of the concerned domain problem.
CO-4	Create data analysis tools for scientific applications
CO-5	Apply the knowledge in solving high level vision problems like object recognition, image classification etc.
CO-6	Formulate To develop applications using computer vision techniques.

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: CO2405
Subject Name: Software Testing & Quality Assurance

Semester: - VII

Type of course: Professional Elective

Prerequisite: Knowledge of Software Engineering.

Rationale: To understand the need for in assessing the correctness, completeness, and quality of developed software, understanding the significance of software testing throughout the Software Development Life-Cycle is crucial. By exploring diverse testing types, creating effective test cases, and utilizing automated testing tools, students enhance their grasp of the testing process and improve software quality.

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 Basic of software testing & Terminology Software program and its objective, Software development techniques, top-down verses bottom-up approach, modular and structures programming. A brief introduction about object oriented approach. Basic software quality parameters and its metrics, Software Configuration Change and types of errors, Quality management models: ISO, SPICE, IEEE, CMM	6

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2405
Subject Name: Software Testing & Quality Assurance

2	Importance of Software Testing Software testing and its importance, software development life cycle verses software testing life cycle, Deliverables, version and error control	7
3	Testing Techniques and Strategy White-Box testing: Flow Graph notation, Cyclomatic Complexity, Graph matrices, control structure and loop testing. Black-Box testing: Functional Testing- Unit testing, Integration testing, System testing, Non-Functional Testing- Performance Testing, Load Testing, Stress Testing, Scalability Testing Equivalence partitioning, Boundary Value Analysis, Orthogonal Array testing.	8
SECTION-B		
4	Testing Tools Features of test tool, Guidelines for selecting a tool, Tools and skills of tester, Static testing tools, Dynamic testing tools, Advantages and disadvantages of using tools, Introduction to open source testing tool.	6
5	Test Planning & Documentation Development plan and quality plan objectives, Testing Strategy: -type of project, type of software, Test Management, Strategic Management, Operational Test Management, Managing the Test Team, Test Plans, Test Case, Test Data, Risk Analysis.	4
6	Defect Management and Test Reporting Defect Classification, Defect Management Process, Defect Management Tools, Defect life cycle, Defect Reporting, Test reporting, Qualitative and quantitative analysis, Fagan Inspection.	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

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2405
Subject Name: Software Testing & Quality Assurance

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

Text Books:

1. Software testing principles, Techniques and Tools by M.G.Limaye, Tata McGraw Hill.
2. Software testing by Ron Pattern, Tech Publications
3. Software Engineering- a practitioner's approach by Roger Pressman, McGraw Hill

Reference Books:

1. Software testing by Rex Black, Wrox Publications
2. Software testing techniques by Boris Bezier, Dreamtech Publications
3. Effective Methods for Software Testing by William E. Perry, Wiley Publications

List of Practicals:

1. Study of manual and automated Testing.
2. Study of open source testing tool.
3. Consider an automated banking application. The user can dial the bank from a personal computer, provide a six-digit password, and follow with a series of keyword commands that activate the banking function. Generate test cases for it.
4. Consider an application that is required to validate a number according to the following simple rules:
 1. A number can start with an optional sign.
 2. The optional sign can be followed by any number of digits.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering

Subject Code: CO2405

Subject Name: Software Testing & Quality Assurance

3. The digits can be optionally followed by a decimal point, represented by a period.
4. If there is a decimal point, then there should be two digits after the decimal.
5. Any number-whether or not it has a decimal point, should be terminated a blank.

Generate test cases to test valid and invalid numbers.

5. Study of Rest API testing using postman.
6. Study the performance testing using JMeter.
7. Study the selenium tool using java.
8. Study of Any Test Management Tool (QA Complete)
9. Create a test plan document for any application (e.g. Library Management System)
10. Automate the Test cases using Test Automation tool (using selenium tool).

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand Interpret and utilize software testing to develop quality software based on widely used software development.
CO-2	Identify Categorize and identify a list of testing methodologies to diagnose software for an effective software development process.
CO-3	Analyze Illustrate the use of open source software testing tools to review the system.
CO-4	Create development plan or quality plan for the software development.
CO-5	Apply Compose test cases from client's software requirements.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2405
Subject Name: Software Testing & Quality Assurance

CO-6	Formulate Recognize the importance of test planning to design effective test management process.
------	---

List of Open Source Software/learning website:

1. <https://nptel.ac.in/courses/106105150/>
2. https://www.tutorialspoint.com/software_testing/software_testing_qa_qc_testing.htm
3. <https://www.softwaretestinghelp.com/web-application-testing/>

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2406
Subject Name: Distributed System

Semester: - VII

Type of course: Professional Elective

Prerequisite: Data Structure and Algorithm, Operating System, Computer Network

Rationale: A distributed system is a system whose components are located on different networked computers, which communicate and coordinate their actions by passing messages to one another. The components interact with one another in order to achieve a common goal. Three significant characteristics of distributed systems are: concurrency of components, lack of a global clock, and independent failure of components. From this course, students may learn foundations of distributed systems, idea of peer to peer services and file system, and security issues in distributed system.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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	Fundamentals of Distributed System: Definition of a Distributed System, Goals of a Distributed System, Types of Distributed Systems, Basics of Operating System and Networking.	4
2	Basics of Architectures, Processes, and Communication: Architectures - Types of System Architectures, Self-Management in Distributed Systems;	8

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2406
Subject Name: Distributed System

	Processes - Basics of Threads, Virtualization, Roles of Client and Server, Code Migration; Communication - Types of Communications, Remote Procedure Calls, Message-Oriented Communication, Stream-Oriented Communication, Multicasting.	
3	Naming: Names, Identifiers, And Addresses, Flat Naming, Structured Naming, Attribute Based Naming Synchronization: Clock Synchronization, Logical Clocks, Mutual Exclusion, Global Positioning Of Nodes, Election Algorithms	7
SECTION-B		
4	Consistency, Replication and Fault Tolerance: Introduction To Replication, Data Centric Consistency Models, Client-Centric Consistency Models, Replica Management, Consistency Protocols, Basics of Fault Tolerance, Process Resilience, Reliable Client Server Communication, Reliable Group Communication, Distributed Commit, Recovery	8
5	Security: Introduction to Security- Security Threats, Policies, and Mechanisms, Design Issues, Basics of Cryptography, Secure Channels- Authentication, Message Integrity and Confidentiality, Secure Group Communication	5
6	Categories of Distributed System: Architecture, Processes, Communication, Naming, Synchronization, Consistency and Replication, Fault Tolerance, Security: Distributed Object-based System; Distributed File System; Distributed Web-based System; Distributed Coordination based System	7

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	20	20	10	05	00

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 of Engineering
Subject Code: CO2406
Subject Name: Distributed System

Text Books:

1. Distributed systems: principles and paradigms, Tanenbaum, A.S. and Van Steen, M., Prentice-Hall 2007...
2. Distributed operating systems: concepts and design, Sinha, P.K., PHI Learning Pvt. Ltd.. 1998.

Reference Books:

1. Distributed computing: principles and applications. Liu, M.L., Pearson Education Inc..2003.
2. Distributed algorithms. Lynch, N.A., Elsevier. 1996.
3. Distributed systems: concepts and design. Coulouris, G.F., Dollimore, J. and Kindberg, T., pearson education. 2005.

List of Practical:

Tools: CORBA, JAVA

1. Study of Client Server Application.
2. Write a Program to implement Concurrent Echo Client Server Application.
3. Write at least 2 Programs for Remote Procedure call.
4. Write at least 2 Programs for Remote Method Invocation.
5. Write the Programs for Thread Programming in JAVA.
6. Implement Network File System (NFS).
7. Creation of a BPEL Module and a Composite Application.
8. Implement CORBA file.
9. Study of Web Service Programming.
10. Study of open source key management tool.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2406
Subject Name: Distributed System

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand architecture and communication systems in Distributed Systems
CO-2	Identify synchronization and various election algorithms in Distributed Systems
CO-3	Analyze various consistency and replication protocols and methods
CO-4	Create and Recognize security threats
CO-5	Apply cryptography methods for security in Distributed Systems
CO-6	Formulate various types of Distributed Systems

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: CO2407
Subject Name: Soft Computing

Semester-VII

Type of course: Open Elective

Prerequisite: Knowledge of programming language

Rationale: The conventional methods of computing relying on analytical or empirical relations become time consuming and labor intensive to solve some complex problem. Soft computing techniques like Genetic Algorithms, Fuzzy logic and Artificial Neural Network can be applied effectively to solve complex problem. This subject gives understanding of various soft computing techniques.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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 Soft Computing Concept of computing systems, "Soft" computing versus "Hard", Major Areas of Soft Computing, Characteristics of Soft computing, Some applications of Soft computing techniques.	4
2	Fuzzy logic Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Defuzzification techniques, Fuzzy logic controller design, Fuzzy Classification, Some applications of Fuzzy logic.	6

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2407
Subject Name: Soft Computing

3	Neural Networks Basic Concept of Neural Network, Overview of Learning rules and activation functions, Single layer Perceptrons and Learning, Back Propagation networks- Architecture of Back propagation (BP) Networks; Backpropagation Learning.	4
SECTION-B		
4	Genetic Algorithms Basic Concepts of Genetic Algorithms (GA), Working Principle, Encoding methods, Fitness function, GA Operators- Reproduction; Crossover; Mutation, Convergence of GA, Multi-level Optimization, Real Life Problems.	4
5	Neural Network Based Fuzzy Systems Neural Realization of Basic Fuzzy Logic Operators, Neural Network Based Fuzzy Logic Inference, Neural Network Driven Fuzzy Reasoning, and Rule based Neural Fuzzy Modeling, Neural Fuzzy Relational Systems, NeuroFuzzy Controllers, and Recent Applications.	5
6	Artificial Neural Networks Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architectures, Training techniques for ANNs.	3

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	40	35	10	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 of Engineering
Subject Code: CO2407
Subject Name: Soft Computing

Text Books:

1. Neural Networks, Fuzzy Logic and Genetic Algorithms: Synthesis & Applications by S.Rajasekaran, G. A. Vijayalakshami, PHI.
2. Genetic Algorithms: Search and Optimization by E. Goldberg.
3. Neuro-Fuzzy Systems by Chin Teng Lin, C. S. George Lee, PHI.

Reference Books:

1. Soft Computing: Techniques and its Applications in Electrical Engineering" by S. N. Deepa and P. C. Swathi.
2. Soft Computing: Principles and Practices" by Deepa Kundur
3. Soft Computing: A Concise Guide" by J.S.R. Jang, Chuen-Tsai Sun, and E. Mizutani
4. Soft Computing and Intelligent Systems Design: Theory, Tools and Applications" by Fakhreddine Karray and Clarence de Silva.

List of Practicals:

1. Write a program in MATLAB to perform Union, Intersection and Complement operations.
2. Write a program in MATLAB to implement De-Morgan's Law.
3. Write a program in MATLAB to plot various membership functions.
4. Create a simple ADALINE network with appropriate no. of input and output nodes. Train it using delta learning rule until no change in weights is required. Output the final weights.
5. Train the autocorrelator by given patterns: $A_1=(-1,1,-1,1)$, $A_2=(1,1,1,-1)$, $A_3=(-1, -1, -1, 1)$. Test it using patterns: $A_x=(-1,1,-1,1)$, $A_y=(1,1,1,1)$, $A_z=(-1,-1,-1,-1)$.
6. Train the hetrocorrelator using multiple training encoding strategy for given patterns: $A_1=(000111001)$ $B_1=(010000111)$, $A_2=(111001110)$ $B_2=(100000001)$, $A_3=(110110101)$ $B_3(101001010)$. Test it using pattern A_2 .

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2407
Subject Name: Soft Computing

7. Implement Union, Intersection, Complement and Difference operations on fuzzy sets.
 Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations
8. Solve Greg Viot's fuzzy cruise controller using MATLAB Fuzzy logic toolbox
9. Solve Air Conditioner Controller using MATLAB Fuzzy logic toolbox
10. Implement TSP using GA.

Note: Practical can be carried out in SCILAB or C/C++/Java instead of MATLAB.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand the basic idea of modern engineering techniques which are useful for solving non-linear and complex functions that may come across dissertation/research work.
CO-2	Identify and solve various optimization problem.
CO-3	Analyze and understand different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.
CO-4	Create data analysis tools for scientific applications
CO-5	Apply various algorithms based on soft computing.
CO-6	Formulate soft computing techniques to solve engineering or real life problems.

List of Open Source Software/learning website:

1. Vlabs.iitb.ac.in
2. <https://nptel.ac.in/courses/106105175/>
3. <http://www.iitk.ac.in/kangal/codes.shtml>
4. <http://lancet.mit.edu/ga/dist/galibdoc.pdf>

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2408
Subject Name: Cyber Forensics and Cyber Laws

Semester: - VII

Type of course: Open Elective

Prerequisite: Understanding of digital logic, operating system concepts, Computer hardware knowledge

Rationale: With the rapid growth of internet users over the globe, the rate of cybercrime is also increasing. Nowadays, Internet applications become an essential part of every discipline with their variety of domain-specific applications. The basic objectives to offer this course as an open elective category to aware engineering graduates of every discipline to understand cybercrimes and their Operandi to analyze the attack.

Teaching and Examination Scheme:

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

Content:

Sr. No.	Content	Total Hrs.
SECTION-A		
1	Introduction: Understanding of forensic science, digital forensic, The digital forensic process, Scientific models. Cyber Forensics Fundamentals, Benefits of Forensics,	4
2	Cyber Security And Its Problem Intervention Strategies: Redundancy, Diversity and Autarchy, Cyber-Crime and The Legal Landscape Around the World, Need of Cyber Laws, Cyber Forensics Evidence and Courts, Legal Concerns and Private Issues.	4

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2408
Subject Name: Cyber Forensics and Cyber Laws

3	Digital Forensics Process Model: Introduction to cybercrime scene, Documenting the scene and evidence, maintaining the chain of custody, forensic cloning of evidence, Live and dead system forensic, Hashing concepts to maintain the integrity of evidence, Report drafting.	5
SECTION-B		
4	Cyber Forensics: Cyber Investigation - Procedure for Corporate High-Tech Investigations, Understanding Data Recovery Workstation and Software, Conducting and Investigations, Data Acquisition - Understanding Storage Formats and Digital Evidence, Determining the Best Acquisition Method, Acquisition Tools, Validating Data Acquisitions, Performing RAID Data Acquisitions, Remote Network Acquisition Tools	5
5	Cyber Laws: The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Cybercrime and Punishment, Private Ordering Solutions, Regulation and Jurisdiction For Global Cyber Security, Copyright Source of Risks, First Amendments, Data Losing, Cyber Ethics - Legal Developments, Cyber Security in Society,	4
6	Case Study: Current Cybercrimes and Cyber Forensics Tools- Software and Hardware Tools, Validating and Testing Forensic Software, effect of deep fake video crime and investigations by forensic department, Investigating Email Crime and Violations, Understanding E-Mail Servers and E-Mail Forensics Tool. Security in Cyber Laws Case Studies, General Law and Cyber Law-A Swift Analysis.	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	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)

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2408
Subject Name: Cyber Forensics and Cyber Laws

Text Books:

1. Computer Forensics: Incident Response Essentials, Warren G. Kruse II and Jay G. Heiser, 1st Edition, Addison Wesley, 2002.
2. Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Sunit Belapure and Nina Godbole, 1st Edition, Wiley India Pvt. Ltd, 2011.

Reference Books:

1. The basics of digital Forensics (Latest Edition) – The primer for getting started in digital forensics by John Sammons – Elsevier Syngress Imprint
2. Jonathan Rosenoer, “Cyber Law: The law of the Internet”, 1st Edition, Springer-Verlag, 1997.
3. B. Nelson, A. Phillips, F. Enfinger, C. Stuart, “Guide to Computer Forensics and Investigations, 2nd Edition, Thomson Course Technology, 2006, ISBN: 0-619-21706-5.
4. J. Vacca, “Computer Forensics: Computer Crime Scene Investigation”, 2nd Edition, Charles River Media, 2005, ISBN: 1-58450-389.

List of Practicals:

Experiments / Practical / Simulations would be carried out based on syllabus.

1. Introduction to various software tools related to cyber law and cyber forensics.
2. Study WIRESHARK tool for forensics
3. Study COFEE Tool for forensics
4. Practical based on disk forensics.
5. Practical based on network forensics.
6. Practical based on device forensics.
7. Practical based on email security.
8. Practical using forensic tools for image and video fraud.
9. Practical using on e-commerce related cyber-attacks.
10. Practical based on social network and online transactions related cyber threats.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2408
Subject Name: Cyber Forensics and Cyber Laws

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Describe Forensic science and Digital Forensic concepts
CO-2	Understand the basics of cyber law and cyber forensics with respect to Indian IT Act.
CO-3	Apply knowledge of cyber law to provide solutions to cyber security.
CO-4	Analyze various computer forensics technologies and systems.
CO-5	Evaluate and assess the methods for data recovery and digital evidence collection.
CO-6	Give solutions to real life problems using state of the art cyber forensics tools and techniques.

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: CO2409
Subject Name: Agile Development using UI/UX design

Semester: - VIII

Type of course: Professional Core

Prerequisite: Knowledge of basics of Design

Rationale: The aim of the UI/UX course is to provide students with the knowledge of user-centered design, user -centered methods in design, graphic design on screens, simulation and prototyping techniques, usability testing methods, interface technologies and user centered design in corporate perspective. The course is organized around a practical project with iterative design of a graphical user interface to organize information about users into useful summaries with affinity diagrams, to convey user research findings with personas and scenarios and to learn the skill of sketching as a process for user experience design. The students will be given exposure to wire framing and Prototyping software in the various UI/UX Design tools.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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 the UI What is User Interface Design (UI) -The Relationship Between UI and UX, Roles in UI/UX, A Brief Historical Overview of Interface Design, Interface	6

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering

Subject Code: CO2409

Subject Name: Agile Development using UI/UX design

	Conventions, and Approaches to Screen Based UI, Template vs Content, Formal Elements of Interface Design, Active Elements of Interface Design, Composing the Elements of Interface Design, UI Design Process, and Introduction to Zero UI interface Concept.	
2	Introduction to UX: UX Basics- Foundation of UX design, Good and poor design, Understanding Your Users, Designing the Experience Elements of user Experience, Visual Design Principles, Functional Layout, Interaction design, Introduction to the Interface.	7
3	UI/ UX Design Tools User Study- Interviews, writing personas: user and device personas, User Context, Building Low Fidelity Wireframe and High-Fidelity Polished Wireframe Using wire framing Tools, Creating the working Prototype using Prototyping tools, Sharing and Exporting Design	7
SECTION-B		
4	Interaction Design: Empathy, Human- and life-centered approach, Problem statement, Ideation, Prototyping, Testing; Design critiques.	6
5	Evaluation of interaction and experience: Usability; Usefulness; Guidelines for interaction development; Evaluating usability against the currently known guidelines.	5
6	Ideation and storyboarding: Mind maps; Thinking visually; Collaborative ideation– whiteboards, digital whiteboard tools (Google Jamboard, Mural, Miro, etc.); Synthesis of ideas; Evaluating ideas from the perspective of the medium; Use cases; Summarizing the idea into key use cases.	8

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2409
Subject Name: Agile Development using UI/UX design

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)

List of Books

1. A Project Guide to UX Design: For user experience designers in the field or in the making (2nd. ed.). Russ Unger and Carolyn Chandler. New Riders Publishing, USA, 2012
2. The Design for everyday thing by Don Norman.

Reference Books:

1. The Elements of User Experience: User-Centered Design for the Web and Beyond, Second Edition Jesse James Garrett, Pearson Education. 2011.
2. The Essential Guide to User Interface Design: An Introduction to GUI Design Principles and Techniques, Third Edition Wilbert O. Galitz, Wiley Publishing, 2007.

List of Practicals:

1. Identifying interface connectivity and establishing interface connectivity between two different program modules.
2. Understand front end and back end interfacing and implementation of both interfacing.
3. Identifying interaction design and functional layout. Practical implementation of interaction design and functional layout.
4. Identify and analyze "what is navigation design" and implementing of navigation design.(Using Figma Tool)
5. Create a working UI/UX prototype using prototyping tools.
6. Study and analysis of sharing and exporting the UI/UX design.
7. Study about custom control and operational control their working and tools used.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering

Subject Code: CO2409

Subject Name: Agile Development using UI/UX design

8. Study about implementation of information search module using UI/UX.
9. Study and analysis of navigation design and its implementation using Figma Tool.
10. Creating Social media advertisement using online tools and applications.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Focus will be on building the core skills required by anyone entering the field of design
CO-2	Students will build advanced skills in their area of study through further electives and start off their thesis project.
CO-3	Provide interdisciplinary and progressive knowledge of design but with a focused understanding of an area of specialization suited to the professional design practice.
CO-4	Conduct heuristic evaluations of your UX design
CO-5	Create an immersive UI by leveraging wireframes and interactive prototypes
CO-6	Build Real-world Websites from Scratch using HTML5 and CSS3

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2410
Subject Name: Virtual Reality & Augmented Reality

Semester: - VIII

Type of course: Professional Elective

Prerequisite: Knowledge of Computer Graphics

Rationale: To understand the need for Virtual Reality and Augmented Reality and advantages in the Meta world. To get a clear idea of various concepts of AR & VR techniques, their need, scenarios (situations) and scope of their applicability.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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 X-R (AR, VR, MR), modern experiences, historical perspective, Hardware, sensors, displays, software, virtual world generator, game engines	6
2	Geometry of Visual World: Geometric modeling, transforming rigid bodies, yaw, pitch, roll, axis angle representation, quaternions, 3D rotation inverses and conversions, homogeneous transforms, transforms to displays, look-at, and eye transform, canonical view and perspective transform, viewport transforms	7

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2410
Subject Name: Virtual Reality & Augmented Reality

3	Light and Optics: Interpretation of light, reflection, optical systems. Visual Perception: Photoreceptors, Eye and Vision, Motion, Depth Perception, Frame rates and displays	7
SECTION-B		
4	Tracking: Orientation, Tilt, Drift, Yaw, Lighthouse approach. Head Mounted Display: Optics, Inertial Measurement Units, Orientation Tracking with IMUs, Panoramic Imaging and Cinematic VR, Audio	6
5	Frontiers: Touch, Haptics, Taste, Smell, Robotic interfaces, Telepresence, Brain-machine interfaces	5
6	Introduction to Haptics:- Haptic Sensations- Kinesthetic and Tactile, Physiology of Human Touch, Overview of Haptic Interfaces, Applications of Haptics	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)

Text Books:

1. Shirley, M., (2016), Fundamentals of Computer Graphics, 4th Edition, CRC Press
2. LaValle, (2016), Virtual Reality, Cambridge University Press
3. Schmalstieg D, and Hollerer T. (2016). Augmented Reality: Principles & Practice, Pearson Education India

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2410
Subject Name: Virtual Reality & Augmented Reality

Reference Books:

1. Jerald,J., (2015), The VR Book: Human-Centered Design for Virtual Reality, Morgan & Claypool
2. Bowman,D.A., Kruijff,E., LaViola,J.J. and Poupyrev,I., (2014), 3D User Interfaces: Theory and Practice, 2nd Edition, Addison Wesley Professional

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Explain perceptual concepts governing augmented reality and virtual reality
CO-2	Identify and solve the issues of various augmented reality and virtual reality frameworks
CO-3	Design immersive experience using AR and VR Software
CO-4	Use the method of design thinking to come up with compelling ideas and prototypes
CO-5	Apply the known guidelines of usability and interaction (wrt to the medium) to create a frictionless user experience.
CO-6	Enable students to use knowledge of perceptual processes for interface design

List of Open Source Software/learning website:

1. Steven M. LaValle, Video Lectures,
<https://www.youtube.com/playlist?list=PLbMVogVj5nJSyt80VRXYC-YrAvQuUb6dh>

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2411
Subject Name: Cloud Computing

Semester: - VIII

Type of course: Professional Elective

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 C	Examination Marks				Total Marks
L	T	P		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: 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	4
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	8

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2411
Subject Name: Cloud Computing

	& 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	
3	Abstraction and Virtualization: Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hypervisors, 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	8
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	7
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.	6
6	Cloud Middleware: OpenStack, Eucalyptus, 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	6

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2411
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
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)

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, McGraw-Hill 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

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2411
Subject Name: Cloud Computing

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	Address 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=0151K000003qL84QAE>
2. technolamp.blogspot.com
3. www.intelligentedu.com/
4. NITTR Instructional Resources Videos

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2412
Subject Name: Natural Language Processing

Semester: - VIII

Type of course: Open Elective

Prerequisite: Theory of Computation

Rationale: There is an increasing demand of making the computing systems to be learning the natural languages. It should also able to process the different parts of natural languages and respond to the user in again natural language.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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 A computational framework for natural language, description of English or an Indian language in the frame work, lexicon, algorithms and data structures for implementation of the framework, Finite state automata, the different analysis levels used for NLP (morphological, syntactic, semantic, pragmatic, Recursive and augmented transition networks. Applications like machine translations.	6
2	Word level and syntactic analysis Word Level Analysis: Regular Expressions, Finite-State Automata, Morphological Parsing, Spelling Error Detection and correction, Words and Word classes, Part-of Speech Tagging. Syntactic Analysis: Context-	9

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2412
Subject Name: Natural Language Processing

	free Grammar, Constituency, Parsing-Probabilistic Parsing. Machine readable dictionaries and lexical databases, RTN, ATN.	
3	Semantic analysis Semantic Analysis: Meaning Representation, Lexical Semantics, Ambiguity, Word Sense Disambiguation. Discourse Processing: cohesion, Reference Resolution, Discourse Coherence and Structure. Knowledge Representation, reasoning.	5
SECTION-B		
4	Natural language generation Natural Language Generation (NLG): Architecture of NLG Systems, Generation Tasks and Representations, Application of NLG. Machine Translation: Problems in Machine Translation, Characteristics of Indian Languages, Machine Translation Approaches, Translation involving Indian Languages.	9
5	Information retrieval and lexical resources Information Retrieval: Design features of Information Retrieval Systems, Classical, Non-classical, Alternative Models of Information Retrieval, valuation Lexical Resources: World Net, Frame Net, Stemmers, POS Tagger.	5
6	Recent Trends in the Domain of Natural Language Processing Virtual Assistants, Sentiment Analysis, Multilingual Language Models, Named Entity Recognition, Language Transformers, Transfer Learning, Text Summarization, Semantic Search, Reinforcement Learning.	5

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	25	30	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 of Engineering

Subject Code: CO2412

Subject Name: Natural Language Processing

Text Book:

1. “Foundations of Statistical Natural Language Processing”. Authors: Christopher Manning and Hinrich Schuetze, 1999.
2. Natural Language understanding by James Allen, Pearson Education, 2002.
3. NLP: A Paninian Perspective by Akshar Bharati, Vineet Chaitanya, and Rajeev Sangal, Prentice Hall, 2016.

Reference Books:

1. An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition by Daniel Jurafsky and James H. Martin, Pearson Education, 2006.
2. Speech and Language Processing, Daniel Jurafsky and James H. Martin Second edition, Prentice Hall.
3. Statistical Language Learning, Charniack Eugene MIT Press.
4. Foundations of Statistical Natural Language Processing, Manning Christopher and Heinrich Schutze MIT Press.

List of Practicals:

1. Implement program to perform automatic word analysis.
2. Implement program to perform word generation.
3. Implement programs related to morphology.
4. Implement programs related to N-Grams, N-Grams Smoothing.
5. Implementation of Hidden Markov Models.
6. Write a Program to build POS Tagger.
7. Write a Program to build Chunker.
8. Develop a sentiment analysis model to determine the sentiment (positive, negative, or neutral) of a given text.
9. Implement a text classifier to categorize news articles, emails, or social media posts into predefined categories such as sports, politics, entertainment, etc.
10. Develop a program to remove common stopwords (e.g., "the", "is", "and") from text data to focus on meaningful content.

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering

Subject Code: CO2412

Subject Name: Natural Language Processing

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand fundamental mathematical models and algorithms in the field of natural language processing.
CO-2	Apply lexical, syntax and semantic analysis methods on textual data.
CO-3	Demonstrate concepts of processing the natural language on real world problems of speech recognition, automated question answering, text classification.
CO-4	Analyze and discuss the effects of electronic communication on our language
CO-5	Learn computational frameworks for natural language processing.
CO-6	Evaluate the performance of natural language processing methods.

List of Open Source Software/learning website:

1. [Vlabs.iitb.ac.in](http://vlabs.iitb.ac.in)
2. <https://nptel.ac.in/courses/106101060>
3. www.coursera.org

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2413
Subject Name: Data Science

Semester: - VIII

Type of course: Open Elective

Prerequisite: Data Structures, Basics of Probability and Statistics

Rationale: Data Science encompasses a variety of disciplines such as mathematics, computer science, statistics, and information science. Unlike specialists in these individual fields, a data scientist possesses a broad understanding across them all but may not have the depth of expertise of a specialist in any single area. This course aims to equip students with the skills to effectively perform computational analysis within their respective domains of expertise.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks				Total Marks
L	T	P		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 Data Science: Data acquisition, the data science process, tools used in data science, different types of data, and examples and applications of data science. Data collection and management: sources of data, data collection Data storage and management, multiple data sources methods.	6
2	Python database connectivity: database connectivity using Python, Python	8

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2413
Subject Name: Data Science

	libraries commonly used in data science. Introduction to Statistics: Statistical concepts, Descriptive statistics, Probability, Probability distribution, Sapling and Sapling techniques: CLT theorem.	
3	Data Analysis: Overview, understanding key terms and ideas, central tendencies and distributions, variance and distribution properties with arithmetic, Data cleaning, Data wrangling, feature engineering, EDA.	7
SECTION-B		
4	Data visualization: Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.	6
5	Current trends in data collection and analysis: Diverse visualization methods and application development approaches within data science. Dimensionality reduction: concept, rationale behind its use, and specific techniques such as Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA).	4
6	Introduction to Deep Learning: Lifecycle of Deep Learning, DL derived from human nervous system, Single Cell (perceptron) Multi cell perceptron Topology Weights & Biases, Build a NN from scratch (using numpy) Activation Function & its implementation.	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)

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2413
Subject Name: Data Science

Text Book:

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and presenting Data EMC Education Services Wiley

Reference Books:

1. Introduction to Data Science, Davy Cielen, Arno D B Meysman and Mohamed Ali, Manning, dreamtech press
2. Practical Data Science, Nina Zumwl and John Mount, Manning, dreamtech press
3. The Data Science Handbook, Field Cady, Wiley
4. Getting Started with Data Science, Murtaza, Haider, Pearson

Practical List:-

1. Explore Pandas, numpy, scikit learn, scipy library of given dataset
2. Python database connectivity.
3. Practice data series, data frames, data selection, sorting, searching and statistics with Pandas Python library.
4. Data Visualization in 2D plots using Matplotlib and Seaborn Python library.
 - Anatomy of Matplotlib plot
 - Plot creation (Bar chart, pie chart, scatter plot, etc.)
 - Saving, showing and clearing plots
5. Introduction to Power BI and Get started with Power BI, Prepare data for analysis and model data in Power BI.
6. Practical using concept EDA.
7. Practical on concept dimension reduction (PCA & LDA).
8. Perform data cleaning process using any data set.
9. Using image data, predict the gender and age range of an individual in Python. Test the data science model using your own image.
10. Implement activation function.

Course Outcomes:

Students will be able to:

Sr. No.	CO statement
CO-1	Understand the key concepts in data science

Shroff S.R. Rotary Institute of Chemical Technology

Bachelor of Engineering
Subject Code: CO2413
Subject Name: Data Science

CO-2	Design database connectivity of Python with various libraries
CO-3	Evaluate concept of data analysis
CO-4	Implement data visualization with various examples
CO-5	Describe concept of data collection and analysis and Dimensionality
CO-6	Prepare and learn concept of activation function

List of Open Source Software

- <https://www.edureka.co/blog/what-is-data-science>
- <https://intellipaat.com/blog/what-is-data-science>