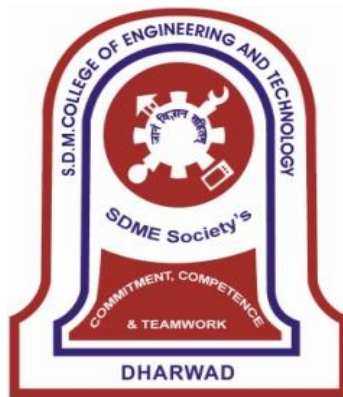# Academic Program: UG

Academic Year 2023-24

Department of
Information Science and Engineering

V & VI Semester B.E.

Syllabus

SHRI DHARMASTHALA MANJUNATHESHWARA COLLEGE OF

ENGINEERING & TECHNOLOGY,

DHARWAD – 580 002

(An Autonomous Institution Approved by AICTE & Affiliated to VTU, Belagavi
Accredited by NBA under Tier-1(July 2018-June 2021)**)**

Ph: **0836-2447465Fax: 0836-2464638 Web:** www.sdmcet.ac.in

SDM College of Engineering & Technology, Dharwad

It is certified that the scheme and syllabus for V & VI semester B.E. in Information Science & Engineering is recommended by the Board of Studies of Information Science & Engineering Department and approved by the Academic Council, SDM College of Engineering & Technology, Dharwad. This scheme and syllabus will be in force from the academic year 2023-24 till further revision.

Chairman BoS &HoD   Principal

Department of Information Science & Engineering
*(**Our motto:** Innovation through Information Technology)*

College Vision and Mission

Vision

To develop competent professionals with human values

Mission

- To have contextually relevant Curricula.
- To promote effective Teaching Learning Practices supported by Modern Educational Tools and Techniques.
- To enhance Research Culture
- To involve Industrial Expertise for connecting classroom content to real life situations.
- To inculcate Ethics and impart soft-skill leading to overall Personality Development.

QUALITY POLICY:

In its quest to be a role model institution, committed to meet or exceed the utmost interest of all the stake holders.

CORE VALUES:

Competency

Commitment

Equity

Team work and Trust

DEPARTMENT VISION AND MISSION

Vision:

To develop competent Information Technology Engineers having complete

knowledge and skills in contemporary Information Technology practices.

Mission:

- To develop contemporary curriculum in information technology delivered
- To provide facilities for relevant research and expose students to the best
- To inculcate the best moral values and professional ethics in students

Program Educational Objectives (PEOs):
- Develop into Information Technology Professionals with expertise in providing solutions to Information Engineering problems
- Pursue higher studies with the sound knowledge of basic concepts and skills in basic science, humanities and Information Technology disciplines
- Exhibit professionalism and team work by providing the environment for exploring current technology trends through collaborative and complementary work ethics

POs and PSOs

PO 1.Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO 2.Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO 3.Design/Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4.Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5.Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6.The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7.Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8.Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9.Individual and Team work: Function effectively as an individual and as a member or leader in diverse teams and individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10.Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11.Project Management and Finance: Demonstrate knowledge and understanding of the engineering and knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO 12. Life-long Learning: long learning: Recognize the need for and have the Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PSO-13 An ability to develop logical reasoning, coding skills, analysis and mathematical modeling.

PSO-14 An ability to modify, debug, test and adapt software modules for varied applications.

V Semester Scheme

| Course Code | *Course Category | Course Title | Teaching | | Examination | | | | |
| | | | L-T-P (Hrs./Week) | Credits | CIE | Theory(SEE) | | | Practical (SEE) | |
					Max. Marks	**Max Marks	Duration in Hrs.	Max. Marks	Duration in Hrs.
21UHUC560	HU	Management, Entrepreneurship and IPR	3 - 0 - 0	3	50	100	3	-	-
21UISC500	PC	Data Base Management System	3 - 0 - 0	3	50	100	3	-	-
21UISC501	PC	Software Engineering	2 - 2 - 0	3	50	100	3	-	-
21UISC502	PC	Web Programming	3 - 0 - 0	3	50	100	3	--	--
21UISE5XX	PE	Program elective - 1	3 - 0 - 0	3	50	100	3	--	--
21UISL503	PC	Data Base Management System Laboratory	0 - 0 - 2	1	50	--	--	50	2
21UISL504	PC	Web Programming Laboratory	0 - 0 - 2	1	50	--	--	50	2
21UAEE560	AE	Statistical Tools for Engineers	2 - 0 - 0	2	50	50	2	--	--
21UISL505	PC	Minor Project-1	0 - 0 - 2	1	50	--	--	--	--
21UISL506	PC	Internship-I	Minimum 2 weeks	1	50	--	--	--	--
		Total	**16- 2 -6**	**21**	**500**	**550**		**100**	

* BS- Basic science ES- Engineering Science HU- Humanities, languages and Management AE- Ability enhancement course PC- Program core

** Semester End Examination conducted for 100 marks will be reduced to 50 marks 21UAEE5 - X: "–" is the number assigned to the department. 1- CV, 2-CSE, 3-CH, 4-EE, 5-EC, 6-ISE and 7-ME (Assuming departments offer different Ability Enhancement course for their students).

Program Elective - 1			
21UISE510	Advanced Data Structures	21UISE512	Operations Research
21UISE511	Human Computer Interaction	21UISE513	Dev-Ops

VI Semester Scheme

Course Code	*Course Category	Course Title	Teaching		Examination					
					CIE	Theory (SEE)			Practical (SEE)	
			L-T-P (Hrs./Week)	Credits	Max. Marks	**Max. Marks	Duration in Hrs.	Max. Marks	Duration In Hrs.
21UISC600	PC	Computer Networks	3 - 0 - 0	3	50	100	3	-	-
21UISC601	PC	Machine Learning	2 - 2 - 0	3	50	100	3	-	-
21UISC602	PC	Object Oriented Modeling and Design Patterns	3 - 0 - 0	3	50	100	3	-	-
21UISE6XX	PE	Program Elective-2	3 - 0 - 0	3	50	100	3	-	-
21UISE6XX	PE	Program Elective-3	3 - 0 - 0	3	50	100	3	-	-
21UISO6XX	OE	Open Elective-1	3 - 0 - 0	3	50	100	3	--	--
21UISL603	PC	Computer Networks Laboratory	0 - 0 - 2	1	50	--	--	50	2
21UISL604	PC	Internet of Things Laboratory	0 - 0 - 2	1	50	--	--	50	2
21UISL605	PC	Minor Project-2	0 - 0 - 3	1	50	--	--	50	2
21UHUL606	HU	Soft skills and Aptitude	0 - 0 - 2	1	50	--	--	--	--
		Total	17- 2 -9	22	500	600		150	

* BS- Basic science ES- Engineering Science HU- Humanities, languages and Management AE- Ability enhancement course PC- Program core

** Semester End Examination conducted for 100 marks will be reduced to 50 marks

Program Electives				Open Electives	
Program Elective-2		**Program Elective-3**			
21UISE610	System Software	21UISE620	Advanced Data Base Management System	21UISO630	Object Oriented Programming with C++
21UISE611	User Interface Design	21UISE621	Software Testing	21UISO631	Software Engineering
21UISE612	Artificial Intelligence	21UISE622	Digital Image Processing	21UISO632	Human Computer Interaction

V Semester

21UHUC560   Management Entrepreneurship and IPR   (3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): Management, Entrepreneurship is a theory course at undergraduate V semester level. The objective of this course is for the students to learn and understand the spirit of management, entrepreneurship, the various agencies involved in funding of startup companies.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Explain** fundamental management functions of a manager, planning and decision making processes.	8	9	-
CO-2	**Describe** the organizational structure, staffing and leadership process.	-	6	12
CO-3	**Explain** the concept of Entrepreneurship and Entrepreneurship development Process.	-	10	11
CO-4	**Describe** the objectives of Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur.	-	-	11
CO-5	**Explain** the Intellectual Property Rights and differentiate among Patents, Copyright, Designs and Trademarks.	8	-	12

PO's	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	-	-	-	-	-	2.0	-	3.0	2.0	2.0	1.0	1.0	-	-

Contents:

Unit-I

Management: Introduction, Definition, Importance, Nature and Characteristics of Management, Management Functions, Roles of Manager, Levels of Management, Managerial Skills, Management & Administration, Management as a Science, Art & Profession.

Planning: Nature, Importance and Purpose of Planning, Types of Plans, Steps in Planning, Limitations of Planning, Decision Making, Meaning, Types of decisions, Steps in decision making. **08 Hrs.**

Unit-II

Organizing and Staffing: Introduction, Meaning, Nature and Characteristics of Organization – Process of Organization, Principles of Organization, Departmentalization, Committees – meaning, Types of Committees, Centralization Vs Decentralization of Authority and Responsibility, Span of Control, Nature and Importance of Staffing, Process of Selection and Recruitment.

Directing and Controlling: Introduction, Meaning and Nature of Directing- Leadership Styles, Motivation Theories, Communication – Meaning and Importance, Coordination- Meaning and Importance, Techniques of Coordination. Controlling – Meaning, Steps in Controlling. **08 Hrs.**

Unit-III

Social Responsibilities of Business: Introduction, Meaning of Social Responsibility, Social Responsibilities of Business towards Different Groups, Social Audit, Business Ethics and Corporate Governance.

Entrepreneurship: Introduction, Definition of Entrepreneur, Importance of Entrepreneurship, concepts of Entrepreneurship, Characteristics of successful Entrepreneur, Classification of Entrepreneurs, Comparison between Entrepreneur and Intrapreneur, Myths of Entrepreneurship, Entrepreneurial Development models, Entrepreneurial development cycle, Problems faced by Entrepreneurs and capacity building for Entrepreneurship. **08 Hrs.**

Unit-IV

Modern Small Business Enterprises: Role of Small Scale Industries, Concepts and definitions of SSI Enterprises, Government policy and development of the Small Scale sector in India, Growth and Performance of Small Scale Industries in India, Sickness in SSI sector, Problems for Small Scale Industries, Impact of Globalization on SSI, Impact of WTO/GATT on SSIs, Ancillary Industry and Tiny Industry.
Institutional Support for Business Enterprises: Introduction, Policies & Schemes of Central– Level Institutions, State-Level Institutions. **08 Hrs.**

Unit-V

Intellectual Property Rights :Introduction Meaning and forms of intellectual property right, Copyright : Meaning of copyright, content of copy right, ownership and rights, Period of copyright, assignment and relinquishment of copyright, license, infringement of copy right, fair use, offenses and penalties.

Patents: Concept of patent, patentable inventions, procedure for obtaining patent, rights and obligations of patent holders, infringements and remedies, offenses and penalties. **Industrial Designs**: Definition of design, procedure for registration, rights conferred by registration. Trademarks.   **07 Hrs.**

Reference Books:

1) P.C. Tripathi, P.N.Reddy, "Principles of Management", 6/e, McGraw-Hill Education, 2008.
2) Harold Koontz, Heinz Weihrich," Essentials of Management", 10/e, McGraw Hill Education, 2016.
3) Poornima M. Charantimath, "Entrepreneurship Development and Small Business Enterprises", 2/e, Pearson Education, 2013.
4) Vasant Desai, "Dynamics of Entrepreneurial Development and Management", 4/e,Himalaya Publishing House, 2001.
5) N.V.R. Naidu, T. Krishna Rao ,"Management and Entrepreneurship", 1/e, I.K International Publishing House Pvt. Ltd. 2009,
6) Daniel L. Babcock, Lucy C. Morse, Managing Engineering and Technology, 6/e, PHI, India, 2014.
7) N.K. Acharya, "Intellectual Property Rights", Asia Law House, Hyderabad, 6/e,2012.
8) Kompal Bansal & Parshit Bansal, "Fundamentals of IPR for Beginners", 1/e, BS Publications, 2016

21UISC500	Database Management System	(3-0-0-) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): The main objective of this course is to provide students with the background to design, implement, and use database management systems.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the basics of DBMS.	-	-	1
CO-2	**Design** Entity Relationship Diagrams.	-	3	2
CO-3	**Analyze** the basics of relational model and Formulate data retrieval queries in relational algebra.	-	13	14
CO-4	**Analyze** and **Formulate** data retrieval queries in Structured Query Language (SQL).	13	-	-
CO-5	**Design** a database using the normal forms.	3	-	-

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	1	1	2.5	2	-	-	-	-	-	-	-	-	2.5	1

Contents:

Unit-I

Introduction to Databases:
Databases and Database Users: An Example, Characteristics of the   Database Approach, Actors on the Scene, Advantages of Using the DBMS Approach, A Brief History of Database Applications, When Not to Use a DBMS.

Database System Concepts and Architecture: Data Models, Schemas, and Instances, Three-Schema Architecture and Data Independence, Database **Languages** and Interfaces, The Database System Environment.

08 Hrs.

Unit-II

The Relational Data Model and SQL
The Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions, and Dealing with Constraint Violations.

The Relational Algebra and Relational Calculus: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra

08 Hrs.

Unit-III

SQL Structured Query Language: Basic SQL, SQL Data Definition and Data Types, Specifying Constraints in SQL, Basic Retrieval Queries in SQL, INSERT, DELETE, and UPDATE Statements in SQL, Additional Features of SQL

More SQL: Complex Queries, Triggers, Views, and Schema Modification: More Complex SQL Retrieval Queries, Specifying Constraints as Assertions and Actions as Triggers, Views (Virtual Tables) in SQL.

08 Hrs.

Unit-IV

Conceptual Modeling and Database Design
Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design, A Sample Database Application, Entity Types, Entity Sets, Attributes, and Keys, Relationship Types, Relationship Sets, Roles, and Structural Constraints, Weak Entity Type, Refining the ER Design for the COMPANY Database, ER Diagrams, Naming Conventions, and Design Issues.

Basics of Functional Dependencies and Normalization for Relational Databases : Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form

08 Hrs.

Unit-V

Transaction Processing, Concurrency Control, and Recovery
Introduction to Transaction Processing Concepts and Theory: Transaction and System Concepts Desirable Properties of Transactions Concurrency Control Techniques.

Database Recovery Techniques: Recovery Concepts, NO-UNDO/REDO Recovery Based on Deferred Update , Recovery Techniques Based on Immediate Update, Shadow Paging, The ARIES Recovery Algorithm ,Database security.

07 Hrs.

Reference books:
1) Elmasri and Navathe: "Fundamentals of Database Systems",6/e, Pearson Education, 2011.
2) Silberschatz, Korth and Sudharshan, "Data Base System Concepts", 5/e, Mc-GrawHill, 2006.
3) C.J.Date, A. Kannan, S. Swamynatham, "An Introduction to Database Systems", 8/e, Pearson Education, 2006.

4) Raghu Ramakrishnan and Johannes Gehrke,"Database Management
Systems",3/e, McGraw-Hill, 2008

21UISC501	Software Engineering	(2-2-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs):

Student should understand the need for a process of software development complexity of system development, types of systems and quality requirements, analysis of any problem domain and formulation of requirements and assessment of quality, contemporary modeling, designing, development and validation techniques, fundamental aspects of software testing techniques.

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the need for Software Engineering and software process.	1	-	12
CO-2	**Analyze** the system to be automated for identifying the software requirements.	-	2	-
CO-3	**Design** High-level and Low-level design of an application from the identified software requirements.	10	3	-
CO-4	**Apply** the methods of test generation from requirements and structural testing.	-	4	13,14
CO-5	**Adapt** software testing techniques.	-	13,14	10

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.0	2.0	2.0	-	-	-	-	-	2.0	-	1.0	1.5	1.5

Pre-requisites: 1.Basics of Computer Programming

Contents:

Unit-I

Overview FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems. Critical Systems: A simple safety critical system; System dependability; Availability and reliability. **Software Processes:** Models, Process iteration,

Process activities; The Rational Unified Process; Computer Aided Software Engineering.

6L+1T Hrs.

Unit-II

Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document. **Requirements Engineering Processes**: Feasibility studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

6L+2T Hrs.

Unit-III

Software Design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.
Object Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution. UI Design Issues. Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance.

7L+1T Hrs.

Unit-IV

Basics of Software Testing: Human Errors and Testing; Software Quality; Requirements, Behavior and Correctness. **Software testing**: System testing; Component testing; Test case design; Test automation. **Testing Techniques:** Test Generation from Predicates, Statement testing, Branch Testing, Condition Testing, Path Testing, Procedural Call Testing, Data Flow Testing.

6L+2T Hrs.

Unit-V

Structural (White Box) Testing: Definition-Use pairs, Definition-Use associations; Data flow testing criteria; Data flow coverage with complex structures; The infeasibility problem. **Fault Based Testing**: Overview, Assumptions in fault based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis.**Black Box Testing:** Introduction, Functional testing, Integration testing, System testing, Acceptance testing, Adhoc testing, Regression testing, Smoke testing; The Test-Selection Problem; Equivalence Partitioning; Boundary Value Analysis; Category-Partition Method, Cause-Effect Graphing.

8L+0T Hrs.

Reference Books:
1) Ian Somerville, "Software Engineering",8/e, Pearson Education, 2012.
2) Rogers S Pressman, "Software Engineering: A Practitioners Approach",7/e, MCGrawHill, 2007.
3) Shari Lawrence Pfleeger, Joanne m Atlec , "Software Engineering theory and Practice" , 3/e, Pearson Education, 2006.

4) Waman S Jawadekar, "Software Engineering Principles and Practice", Tata McGraw Hill, 2004.

5) Foundations of Software Testing - Aditya P Mathur, Pearson Education, 2008

6) Software Testing and Analysis Process Principles and Techniques – Mauro Pezze, Michal Young, Wiley India, 2008

21UISC502	Web Programming	(3-0-0) 0

Contact Hours: 39

Course Learning Objectives (CLOs):

Students should be able to write object-oriented code for a given problem applying the Java language features. Students should understand the World Wide Web, HTML5 tags, Java Scripts, Servlets, PHP and should be able to develop web applications.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Design** and **create** static web pages using HTML.	5	2,3,13,14	12
CO-2	**Develop** the web pages styled using Cascading Style Sheets	-	2,3,13,14	5,12
CO-3	**Learn** to validate the HTML form data using JavaScript and handle the events	-	2,3	12,13,14
CO-4	**Develop** web database applications using PHP and MySQL database.	2,5	1,3	12,13,14
CO-5	**Understand** the future of Web and its associated trending technologies.	-	1,12	5,12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	2.0	2.3	2.0	-	2.0	-	-	-	-	-	-	1.0	1.5	1.5

Pre-requisites: Knowledge on any programming language

Contents:

Unit-I

Web and HTML: Introduction to World Wide Web, HTML5, XML, Document Object Model

08 Hrs.

Unit-II

CSS: What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling, Layouts, Responsive Design, CSS Frameworks.

08 Hrs.

Unit-III

Java Script : Basics, Strings, Arrays, Functions, Objects in JavaScript, Events and Event Handling

AJAX: Basics, Synchronous and asynchronous communication

08 Hrs.

Unit-IV

PHP: Introduction, Applications of PHP, Embedding PHP into HTML, Language syntax, Variables, Data types, Operators, Loops, Arrays, Built-in functions, Form handling

Database access with PHP and MySQL: Connecting to MySQL, Selecting a database with built-in functions in PHP, Executing SQL queries, Displaying the result with mysql_fetch_row and mysql_fetch_array functions

08 Hrs.

Unit-V

Web 2.0 : JSON, Web Services - SOAP and RESTful
Semantic Web : Overview and applications

07 Hrs.

Reference Books:

1) Robert W. Sebesta, "Programming the World Wide Web", 8/e, Pearson Education.

2) Nicholas C Zakas et al, "Professional AJAX", 2/e, Wrox

21UISL503   Database Management System Laboratory   (0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs): The major objective of this lab is to provide a strong formal foundation in database concepts, technology and practice to the participants, to groom them into well-informed database application developers. Rather than imparting isolated knowledge/experience fragments in each of concepts, technology and practice, the course will aim at achieving a good blend of the three. The overriding concern, therefore, is to include just enough concepts and theory to motivate and enrich the practical component, and to include technology component to maximize the relevance of the course to the industry without sacrificing the long-term objectives of rigor and foundational strength that can withstand the vagaries of technological advance.

Course Outcomes(COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs (13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Design and implement** a database schema for a given problem-domain.	3,13,14	1,2	12
CO-2	**Analyze** the given database and **apply** the normalization.	13,14	1,2,3	12
CO-3	**Demonstrate** SQL, DML/DDL commands.	5,13,14	4	12
CO-4	**Design and build** a GUI using a GUI building tool.	5,13,14	3	12
CO-5	**Develop** solutions for real life problems by working in teams.	6,7,13,14	10,11,12	8,9

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	2.0	2.0	2.33	2.0	3.0	3.0	3.0	1.0	1.0	2.0	2.0	1.2	3.0	3.0

Pre-requisites:

1. Basic Programming Language
2. Logical reasoning

Contents:

PART-A

1. Analyze the given data and implement the following

2. Create the database
3. Design ER models and tables
4. Create constraints/ inserting the records
5. Write queries in SQL using DDL,DML commands
6. Write queries using aggregate functions, group by, having clause/union, intersect, minus
7. Subqueries returning single/multiple rows
8. Co-related sub queries
9. Joins,Views

PART-B

Design and implement a real-world database application in the form of a project

Reference books/manual:
1) Elmasri and Navathe: "Fundamentals of Database Systems",7/e, Pearson Education, 2011.
2) Raghu Ramakrishnan and Johannes Gehrke,"Database Management Systems",3/e, McGraw-Hill, 2011
3) Silberschatz, Korth and Sudharshan, "Data Base System Concepts", 5/e, Mc- GrawHill, 2008.
4) C.J.Date, A. Kannan, S. Swamynatham, "An Introduction to Database Systems", 8/e, Pearson Education, 2006.

21UISL504	Web Programming Laboratory	(0-0-2)

Contact Hours: 26

Course Learning Objectives (CLOs): Student should understand the Structure of WWW, should be able to develop and deploy simple web applications using HTML5 tags, Java Scripts, PHP, MySQL and AJAX.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1,12)/ PSO (1,2,3)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Design** and **develop an** interactive web application using JavaScript and HTML with CSS.	5	1,2,13,14	8,12

CO-2	**Design** and **develop** dynamic web application using server side scripting and Database connectivity	5	1,2,13,14	8,12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	2.0	2.0	-	-	3.0	-	-	1.0	-	-	-	1.0	2.0	2.0

Prerequisites:

Knowledge on any programming language

Contents:
1. Programs on HTML, CSS
2. Programs on JavaScripts : Validation, event handling
3. Programs on PHP and MySQL
4. Programs on AJAX

Reference Books:
1) Robert W. Sebesta, "Programming the World Wide Web", 8/e, Pearson Education.
2) Nicholas C Zakas et al, "Professional AJAX", 2/e, Wrox

21UAEE560	**Statistical tools for Engineers**	**(2-0-0) 2**

Contact Hours: 26

Course Learning Objectives: This course is designed for individuals who have little to no prior experience with R programming. It covers the basics of R and Python, data manipulation, data visualization, and basic statistical analysis

Course Outcomes:

Description of the Course Outcome: At the end of the course the student will be able to:	**Mapping to POs(1-12)/ PSOs(13-14)**		
	Substantial Level (3)	**Moderate Level (2)**	**Slight Level (1)**
CO-1 **Understand** the fundamental syntax of R.	1		
CO-2 **Demonstrate** the concepts of vectors arrays and functions by		13	14

	writing R Code			
CO-3	**Demonstrate** the variety of data formats by importing into R using R Studio		13	14
CO-4	**Plot** and **analyze** graphs in Statistics in R Programming and Python Programming		2	5,13
CO-5	**Demonstrate** the different functions in SPSS Statistical tool		13	5,14

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.0			1.0								1.75	1.0

Course Contents:

Unit-I

Introduction to R: Introduction to R and RStudio, Basic R syntax and data types, Variables and data objects, Basic arithmetic operations.

Data Structures: Vectors, Matrices and arrays, Lists, Data frames

05 Hrs.

Unit-II

Data Import and Export : Reading and writing data files (CSV, Excel, etc.), Working with data from external sources

Data Manipulation: Subsetting and indexing, Data cleaning and transformation , Combining data frames

05 Hrs.

Unit-III

Data Visualization with ggplot2: Introduction to ggplot2 , Creating scatter plots, bar charts, and histograms, Customizing plots and adding labels.

Visualization with Matplotlib: Introduction to Numpy and Pandas in Python ,Simple Line Plots, Simple Scatter Plots, Visualizing Errors, Density and Contour Plots, Histograms, Customizing Plot Legends, Customizing Color bars, Multiple Subplots, Text and Annotation, Customizing Ticks, Customizing Matplotlib: Configurations and Style sheets, Three-Dimensional Plotting in Matplotlib

05 Hrs.

Unit-IV

Basic Statistical Analysis: Descriptive statistics, Hypothesis testing (t-tests, chi-square tests), Correlation and regression analysis.

05 Hrs.

Unit-V

Introduction to SPSS: Four Windows of SPSS, Uses of SPSS in business, Sorting File, Split File, Compute File, Recode File and Select Cases.

06 Hrs.

Problem Statements

1. Implement R variables and constants in R programming to take inputs from user.

2. Implement the arithmetic operations such as Sum, Mean and Product of Vector Using R Programming.

3. Find mean, mode, median, quartiles, standard deviation and Variance

   of following data

   12, 13, 14, 17, 18, 18.

4. Find mean, mode, median, quartiles, standard deviation and Variance with the help of reading data from Excel file.

5. Python program to illustrate Correlation.

6. Refer the following student data and compare two students performance in "Data Structures" subject. All tests are conducted for 30marks.

TEST	1	2	3	4	5	6	7	8	9	10
AAA	27	28	26	30	25	26	20	25	24	30
BBB	25	27	25	15	24	30	21	30	23	30

7. Refer the following student data and two students performance using multiple bar graph

AAA	90	55	40	65
BBB	85	62	54	20

8. Program to illustrate multiple histograms using matplotlib and ggplot.

9. Program to illustrate 3D Line using matplotlib and ggplot.

10. Python program to illustrate subplots in matplotlib

11. Python program to illustrate Colorbars in matplotlib

12. Python program to Demonstrate Numpy aggregate functions using following data.

   1,3,3,4,5,6,5,6

Reference Books:

1. Jones, O., Maillardet.R.and Robinson, A (2014).Introduction to scientific programming and simulation Using R.Chapman & Hall/CRC, The R Series
2. Michel J.Crawley,"Statistics: An Introduction using R", Second edition, Wiley 2015
3. https://www.cuchd.in/usb/business-management/brochure/Predictive-Analysis-Lab-

Manual.pdf
4. Hadley Wickham and Garrett Grolemund, "R for Data Science" .
5. V.K.Jain, "Data Science and Analytics".
6. *Jake VanderPlas.,*"Python Data Science Handbook, *Essential Tools for Working with Data".*

21UISL505	Minor Project - I	(0-0-2) 1

Contact hours: 26

Course Learning Objectives (CLOs):

Understand programming language concepts, and object-oriented concepts. Plan, analyze, design and implement a software project. Demonstrate independent learning. Demonstrate the ability to locate and use technical information from multiple sources. Demonstrate an understanding of professional ethics. Participate in a class or project team. Demonstrate the ability to communicate effectively in speech. Demonstrate the ability to communicate effectively in writing. Learn to work as a team and to focus on getting a working project done on time with each student being held accountable for their part of the project. Learn about and go through the software development cycle with emphasis on different processes - requirements,

design, and implementation phases. Gain confidence at having conceptualized, designed, and implemented a working, medium sized project with their team.

Course Outcomes(COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1,12)/PSOs(13, 14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Apply** problem solving and programming skills for identified problem statement.	2, 13	1	14
CO-2	**Design** the system for an identified requirement	3	4	1
CO-3	**Analyze and Incorporate** the changes in the development cycle.	4, 2	13	1, 14
CO-4	**Demonstrate** an ability to work in a team	9	-	11
CO-5	**Demonstrate** an ability to present the work carried out both in written and oral form.	10	-	11

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO	PO9	PO	PO	PO	PSO	PSO

								8		10	11	12	13	14
Mapping Level	1.33	3.0	3.0	2.5	3.0	-	-	-	3.0	3.0	-	-	2.5	1.0

Prerequisites:

Any Programming Language

Guidelines for Conduction

Spirit of The Course: To ensure that undergraduates can successfully apply the knowledge they have gained through a project, demonstrates the practical application of principles learnt in different courses and enables students to integrate material learnt at different stages of the curriculum up to the 4th semester; also appreciating the need for domain knowledge for certain applications, and that this may necessitate study within that domain.

1. Students Form a Team. Size of the team can vary from 2 to 3. With genuine explanation of bigger or smaller is team is allowed.
2. Guide for this course is a must and will be chosen by team itself by interacting with faculty or the guide can give a problem statement and guide the batch.
3. In consultation with Guide, Team will prepare the project plan and its specific outcomes, which Team promises/declares to accomplish.
4. Project Report: A Course closure document outlining the problems, specifications, including the survey of literature, various results obtained, solutions and the problems faced deviation from the promised milestones, testing report, user manual, appendix reference etc is expected to be produced by each team of project.
5. Demonstration, seminar, quiz,tests,Viva-Voce, publications, Reports can be used for the evaluation.

Assessment:

CIE - Minimum 2 reviews of the project + any other relevant components

Note:

1. There can be designated Committee to monitor this process of Mini Project.
2. An Internal Guide is allotted per group who guides and monitors the project progress.
3. Course Outcomes (2 or more) are to be written per project and should map to following Program Outcomes and Program Specific Outcomes. Internal Guide can include other POs apart from the ones mentioned above if those POs are deemed suitable by them.

21UISL506	Internship-I	4 weeks – 3

Contact Hours: 4 weeks

Course Learning Objectives (CLOs): The internship module aims to provide the student with a practice-oriented and hands-on working experience in the real world or industry, and to enhance the student's learning experience i.e. to integrate theory and practice. It gives an opportunity to develop a right work attitude, self-confidence, interpersonal skills and ability to work as a team in a real organizational setting. Also, to further develop and enhance operational, customer service, competency in specific areas related to student's area of career interest, skills in research, analysis and other life-long knowledge and skills in a real-world work environment. Through Internship, students can get pre-employment training and the company or organization can assess the performance of the student and offer the student an employment opportunity after his/her graduation, if it deems fit.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs (13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Solve** real life challenges in the workplace by analyzing work environment and conditions, and selecting appropriate skill sets acquired from the course.	1, 2	4	12
CO-2	**Communicate and collaborate** effectively and appropriately with different professionals in the work environment.	5,10	8	6,7,11,12
CO-3	**Demonstrate** critical thinking, problem-solving skills and creativity and innovation by analyzing underlying issue/s to challenges.	1,2,3,4,5,13,14	6,7,8	12
CO-4	**Demonstrate** the application of knowledge and skill sets acquired from the course and workplace in the assigned job function/s.	1,2,3,4,5,13,14	6,7,8	12
CO-5	**Demonstrate** an ability to work as a professional in a heterogeneous team environment.	9,10,11	8	12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	3.0	3.0	2.66	3.0	1.66	1.66	2.0	3.0	3.0	2.0	1.0	3.0	3.0

The students are to undergo internship in Private industries/R&D organizations/Centers of Excellence/Laboratories of Reputed Institutions/Govt. & Semi Govt. organizations, PSUs, construction companies, entrepreneurial organizations, inter departments within the college etc. to get exposure to the external world for a period of 4 weeks in the summer vacation after IV sem and before start of V semester. The students are to prepare a report on the internship work carried out. The internal faculty shall monitor the student and award CIE marks. There is a SEE in which the student shall present his work before a panel of examiners consisting of HoD, Guide and one faculty member during V semester. The performance shall be communicated to the COE office and the same shall reflect in the V semester grade card.

| 21UISE510 | Advanced Data Structures | (3-0-0) 3 |

Contact Hours: 39

Course Learning Objectives (CLOs):

It introduces students to a number of highly efficient algorithms and data structures for fundamental computational problems across a variety of areas. Students are also introduced to techniques such as amortized complexity analysis.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1,12)/ PSO (1,2,3)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Describe and illustrate** different operations on binary search trees,and disjoint sets and also perform amortized analysis on few data structures.	2,13	-	12,14
CO-2	**Demonstrate** operations like Union, find minimum, extract minimum and delete on mergeable heaps.	2,13	-	14
CO-3	**Describe and illustrate** operations like searching, insertion, and deletion, traversing on red-black tree data structure.	-	2,13	14
CO-4	**Describe and Demonstrate the** working of fundamental graph algorithms and sorting networks.		2,13	12,14
CO-5	**Describe**, **Analyze** and **illustrate** hashing, collision resolution, various string matching algorithms.	2,13		12,14

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	-	2.6	-	-	-	-	-	-	-	-	-	1.0	2.6	1.0

Prerequisites:
1. Data structures
2. Knowledge of any programming language

Unit-I
Binary Search Tree : Definition and various operations performed on BST.Disjoint sets / union-find:Disjoint Set Operations, Linked list representation of disjoint sets, Disjoint-set forests, Analysis of union by rank with pathcompression.
Amortised analysis : Aggregate analysis, the accounting method, the potential method, dynamic table.

08 Hrs.

Unit-II
Binomial Heaps: Binomial trees and binomial heaps, operations on binomial heaps
Fibonacci Heaps: Structure of Fibonacci heaps, Mergeable – heap operations, decreasing a key and deleting a node.

08 Hrs.

Unit-III
Red Black Trees: Properties, Rotations, Insertion, Deletion, Augmented Data structure, Dynamic order statistics, retrieving an element with a given rank, Augmenting a data structure, Interval trees.

07 Hrs.

Unit-IV
Graph Algorithms: Maximum Flow: Flow Networks, The Ford-Fulkerson method.
Sorting Networks: Comparison Networks, The zero-one principle, Abitonic sorting network, A merging network, A sorting network.

07 Hrs.

Unit-V
Hash Table Representation: hash functions, collision and collision resolution techniques.
String Matching: The naïve string-matching algorithm, The Rabin–Karp algorithm, String matching with finite automata, The Knuth-Morris-Pratt algorithm.

09 Hrs.

Reference Books:
1) Cormen T.H et al, "Introduction to Algorithms", 4/e , MIT Press, April 2022.
2) J. Kleinberg and E. Tardos," Algorithm Design", 2/e, Addison-Wesley,2006.

21UISE511	Human Computer Interaction	(3-0-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): Human Computer Interaction is offered as an elective subject for undergraduate students at V semester level. The main objective is make a student understand and learn the foundations of Human Computer Interaction, to become familiar with the design technologies for individuals and persons with disabilities and to learn the guidelines for user interface.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Design** Effective dialog for HCI.	1	-	12,13,14
CO-2	**Design** effective HCI for individuals and persons with disabilities.	2,5	3	12,13,14
CO-3	**Apply** Theories & concepts associated with effective work design for real world application.	1	2,5	12,13,14
CO-4	**Explain** the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites**.**	1	2	12
CO-5	**Develop** meaningful user interface.	1,3	5	12,14

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.33	2.5	-	2.0	-	-	-	-	-	-	1.0	1.0	1.0

Contents:

Unit - I

Introduction to HCI : Objective & Overview , Definition of HCI , Nature of the field, HCI Discipline, History evolution of the field, Evolution of HCI- Major milestones.
The Human: I/O channels, Memory, Reasoning and problem solving, The Computer: Devices, Memory, processing and networks, Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity- Paradigms.

08 Hrs.

Unit - II

Design & Software Process: Interactive Design: Basics process, scenarios, navigation, screen design, Iteration and prototyping. HCI in software process: Software life cycle, usability engineering, Prototyping in practice, design rationale. Design rules: principles, standards, guidelines, rules. Evaluation

Techniques, Universal Design.

08 Hrs.

Unit - III
Models and Theories: HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements, Communication and collaboration models, Hypertext, Multimedia and WWW.

08 Hrs.

Unit – IV
Mobile Ecosystem: Platforms, Application frameworks, Types of Mobile Applications: Widgets, Applications, Games, Mobile Information Architecture. Mobile Design: Elements of Mobile Design, Tools.

08 Hrs.

Unit – V
Web Interface Design: Designing Web Interfaces, Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.

07 Hrs.

References:
1) Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, —Human Computer Interaction‖, 3/e, Pearson Education, 2004 (UNIT I, II & III)
2) Brian Fling, —Mobile Design and Development‖, 1/e, O'Reilly Media Inc., 2009 (UNIT – IV)
3) Bill Scott and Theresa Neil, —Designing Web Interfaces, 1/e, O'Reilly, 2009. (UNIT-V)
4) Helen Sharp, Jennifer Preece, Yvonne Rogers – Interaction Design Beyond Human Computer Interaction, 5/e, Wiley , 2019.
5) Gerard Jounghyun Kim, Human Computer Interaction- Fundamentals and practices, 1/e, CRC press, Taylor & Francis group, Auerbach Publications, 2015.

21UISE512	Operations Research	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):
Understanding the mathematical importance of development of model in a particular optimization model for the issue and solving it.

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Course Outcomes(COs):

Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/ PSOs (13-14)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1 **Analyse** and **apply** the impact OR in formulation of Linear Problem and solve using	1	2	

	Graphical method				
CO-2	**Apply** Simplex method to solve the Linear problem with the inclusion of Artificial Variable and Duality. Analyse the sensitivity of an LP	1	3	2,13	
CO-3	**Design** and apply the optimal solution to Transportation and Assignment problem	2	3	1,14	
CO-4	**Design** the solution to a 2-person zero sum game with or without saddle point	2	3	1,13,14	
CO-5	**Design** a network for PERT and CPM and project scheduling	2	3	1,5,13	

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	1.8	2.75	2.0		1.0								1.0	1.0

Pre-requisites:

Engineering Mathematics

Contents:

Unit-I

Introduction: The Origins of Operations, The Nature of Operations Research, The Impact of Operations Research

Introduction to Linear Programming (LP): Prototype Example The Linear Programming Model, Examples of LP Model Formulation, Graphical solutions method for LP problems

07 Hrs.

Unit-II

Simplex method- simplex algorithm, Artificial variable techniques: Two-phase method, Big-M method. Duality in LP , Sensitivity analysis in LP

08 Hrs.

Unit-III

Transportation problem – Formulation-Optimal solution, unbalanced transportation problem**-** Degeneracy.

Assignment problem- Formulation-Optimal solution, – Variants of Assignment problem- Travelling salesman problem.

08 Hrs.

Unit-IV

Theory of Games: Introduction- Two-Person Zero-Sum Games Pure Strategies (Minimax and Maximin Principles): Games with Saddle Point Terminology- Solution of games with saddle points and without saddle points Mixed Strategies: Solution Methods Games without Saddle Point: Graphical method

08 Hrs.

Unit-V

Project Management: Basic Differences Between PERT and CPM , Phases of Project Management, PERT/CPM Network Components and Precedence Relationships, Critical Path Analysis, Project Scheduling with Uncertain Activity Times.

08 Hrs.

Reference Books:
1) J.K Sharma, "Operations Research- Theory and Applications", 6/e, Trinity Press
2) Hillier & Libemann ," Introduction to OR" , 9/e. McGraw Hill Higher Education
3) H. Taha, "Introduction to OR" , PHI
4) NVS Raju , "Operations Research",3/e, SMS Education

21UISE513	DevOps	(3-0-0) 3

Contact Hours: 39

Course learning objectives (CLO): Student will be able to introduce dev ops concepts and architecture of Dev ops, analyze Building the code and deployment

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/PSOs(13-14)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1 **Understand** the need and significance of Dev ops	2	5	3
CO-2 **Understand** analysis of layers in Dev ops and its effect on software architecture	2	1	10
CO-3 **Design** and development of solutions using Dev ops code	3	2	14
CO-4 **Deployment** of code to practical problems using Dev ops tools	4	5	12
CO-5 **Analysis** of workflow issues and their tracking	5	2	13

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	2.0	2.2	2.0	2.0	2.3	-	-	-	-	1.0	-	-	1.0	1.0

Prerequisites:
1. Linear algebra
2. Statistics and probability

Contents:

Unit-I
Introduction: Introduction to DevOps and Continuous Delivery, Introducing DevOps, Howfast is fast? The Agile wheel of wheels Beware the cargo cult Agile fallacy, DevOps and ITIL. The DevOps process and Continuous Delivery – an over view. The developers, The revision control system, The build server, Theartifact repository, Package managers, Test environments, Staging/ production, Release management, Scrum, Kanban, and the delivery pipeline, Wrapping up –a complete example, Identifying bottlenecks.

07 Hrs.

Unit-II
DevOps Architecture: How DevOps Affects Architecture, Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns. The principle of cohesion, Coupling, Back to the monolithic scenario, Apractical example, Three-tier systems, The presentation tier, The logic tier, Thedata tier, Handling database migrations, Rolling upgrades, Hello world inLiquibase, The changelog file, The pom.xml file, Manual installation, Micro services, Interlude – Conway's Law, How to keep service interfaces forward compatible, Micro services and the data tier, DevOps, architecture, and resilience.

08 Hrs.

Unit-III
Building the code : Why do we build code?, The many faces of build systems, The Jenkins buildserver, Managing build dependencies, The final artifact, Cheating with FPM,Continuous Integration, Continuous Delivery, Jenkins plugins, The host server,Build slaves, Software on the host, Triggers, Job chaining and build pipelines, A look at the Jenkins filesystem layout, Build servers and infrastructure ascode, Building by dependency order, Build phases, Alternative build servers, Collating quality measures, About build status visualization, Taking build errorsseriously, Robustness.

08 Hrs.

Unit-IV
Deploying the Code: Why are there so many deployment systems? Configuring the base OS, Describing clusters, Delivering packages to a system, Virtualization stacks, Executing code on the client ,A note about the exercises, The Puppet master and Puppet agents, Ansible, PalletOps, Deploying with Chef, Deploying with SaltStack, Salt versus Ansible versus Puppet versus PalletOps execution models, Vagrant, Deploying with Docker, Comparison tables, Cloud solutions, AWS,Azure

08 Hrs.

Unit-V

Issue Tracking: What are issue trackers used for? Some examples of workflows and issues, What do we need from an issue tracker?, Problems with issue tracker proliferation, All the trackers, Bugzilla, Trac, Redmine, The GitLab issue tracker, Jira. Introducing the IoT and DevOps, The future of the IoT according to the market, Machine-to-machine communication, IoT deployment affects software architecture, IoT deployment security, Okay, but what about DevOps and theIoT again? A hands-on lab with an IoT device for DevOps.

08 Hrs.

Reference books:

1) The DevOps Hand Book, Gene Kim, Jez Humble, Patric Debois & John Wills.
2) The Practical Guide to Enterprise DevOps and Continuous Delivery, Julian Fish.

VI Semester

21UISC600	Computer Networks	(3-0-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): The course is designed to expose the students to build an understanding of the fundamental concepts of computer networking. The course focuses on to Familiarize the student with the basic taxonomy and terminology of the computer networking area. It also introduces

the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/ PSOs(13-14)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1 Explain the Uses Of Computer Networks, layered architecture and their significance		1	12
CO-2 Illustrate the various applications of The Data Link Layer, Medium Access Control Sub layer	2	1, 13	14
CO-3 Comprehend the concepts of network layer, Transport layer for both connection-less and connection-oriented circuits.	1	2, 3,13	14
CO-4 Implement the different application layer protocols.	2, 13	4	5,14
CO-5 Analyze different applications for internet usage in application layer.	2, 13		1,14

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	2.2	2.8	-	2.0	1.0	-	-	-	-	-	-	-	2.5	1.0

Contents:

Unit-I
Introduction: Uses Of Computer Networks, Network Hardware, Network Software reference Models, Example Networks
The Data Link Layer: Data Link Layer Design Issues, Error Detection and Correction Elementary Data Link Protocols, Sliding Window Protocols, Example Data Link Protocols.

08 Hrs.

Unit-II
The Medium Access Control Sub layer: The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless Lans,Data Link Layer Switching.

07 Hrs.

Unit-III
The Network Layer: Network Layer Design Issues, Routing Algorithms, Congestion Control Algorithms, Quality of Service, Internetworking, The Network Layer in The Internet.

08 Hrs.

Unit-IV
The Transport Layer: The Transport Service, Elements Of Transport Protocols, Congestion Control Algorithms, The Internet Transport Protocols: UDP, The Internet Transport Protocols: TCP, Performance Issues.

08 Hrs.

Unit-V
Application Layer: DNS--The Domain Name System, Electronic Mail, The World Wide Web, Real time Audio and Video, Content Delivery and Peer-To-Peer.

08 Hrs.

Reference Books:
1) Andrew S. Tanenbaum, David J. Wetherall, University of Washington, "Computer Networks", Pearson, 5/e, 2011.
2) Behrouz Forouzan, "Data Communications and Networking", 4/e, McGraw Hill,2006.
3) Alberto Leon-Garcia, Indra Widjaja "Communication Networks**",**2/e, Tata McGraw-Hill Education India, 2004.
4) Behrouz Forouzan, "TCP/IP Protocol Suite", 3/e,McGraw Hill, 2005.

21UISC601	Machine Learning	(2-2-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):
This course provides an introduction to the fundamental concepts in machine learning and popular machine learning algorithms. It covers various issues related to the application of machine learning algo rithms, hypothesis space, overfitting, bias and variance, cross-validation. It focuses on standard learning

algorithms, an introduction to Bayesian learning and the naïve Bayes algorithm and neural networks with an introduction to Deep Learning.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Describe** the basics of Machine Learning, its classifications and **Illustrate** data preprocessing techniques.	1	2	-
CO-2	**Illustrate** the working of algorithms on classifications, clustering and reinforcement learning	1,2,13	3,5	12,14
CO-3	**Demonstrate** Recommendation Machine Learning algorithms for given data set.	1, 2,13	3, 5	12,14
CO-4	**Illustrate** the techniques of Artificial Neural Network and Predictive Analytics.	1	2, 3, 5,13	12,14
CO-5	**Compare** Machine Learning & Deep learning techniques for real world applications.	1	2	

POs	PO1	PO2	PO3	PO4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.5	3.0	-	2.0	-	-	-	-	-	-	1.0	2.66	1.0

Pre-requisites:
1. Basic programming skills (in Python)
2. Basics of probability & statistics

Contents:

Unit-I

Introduction to AI, ML and DL: Definition of Machine Learning, Artificial Intelligence and Deep Learning, Comparison between AI, ML and DL, Types of Machine Learning tasks- Supervised, Unsupervised, Semi-supervised and Reinforcement Learning, Stages in Machine Learning.

Data preprocessing – Building a proper data set for different machine learning tasks.

8THrs.

Unit-II

Types of Classification and Clustering Methods in Machine Learning: Introduction.
Learning Techniques in Machine Learning: Supervised Learning (Classification & Regression), Unsupervised Learning (Clustering & Dimensionality Reduction) Reinforcement Learning.

(5T+4Tutorial)Hrs.

Unit-III

Recommender system: Introduction to the concept, Content-Based and Collaborative Filtering, Dimensionality Reduction, Matrix Factorization, Evaluating Recommender System.

(**4T+3Tutorial) Hrs.**

Unit-IV

Artificial Neural Network: Introduction, Neural Network representation, Perceptrons, Back propagation algorithm. Predictive Analytics-EnsembleTechniques**.**

(5T+3Tutorials)Hrs.

Unit-V

Deep learning: Introduction and its applications, Machine Learning Applications across Industries (ex: Healthcare, Retail, Financial Services, Manufacturing & Hospitality).

07 Hrs.

Reference Books:
1) Tom M Mitchell, "Machine Lerning",1/e, McGraw Hill Education, 2017.
2) EthemAlpaydın, "Introduction to Machine Learning", 2/e, MIT press, 2015.
3) AurÈlienGÈron, "Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools and Techniques to Build Intelligent Systems", 1/e, Shroff/O'Reilly Media, 2017.
4) Trevor Hastie, Robert Tibshirani, Jerome Friedman, "The Elements of Statistical Learning", 2/e, Springer series in statistics, 2017.
5) Dietmar Jannach, Markus Zanker, Alexander Felfernig, and Gerhard Friedrich, Cambridge University Press, 2011.

21UISC602	Object Oriented Modeling and Design Patterns	(3-0-0)3

Contact Hours: 39

Course Learning Objectives (CLOs):

This course makes students to know the process of object oriented system modeling, design patterns and tools used in the industry to enable them to construct software system using various standards and techniques.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Apply** the fundamental object orientation concept in solving problem by indentifying classes, objects, their properties association	1,2	3	12,13
CO-2	**Analyze** the problem scenario and **model** the system using UML diagrams	1,2	3,5	12,13,14
CO-3	**Illustrate** the concepts of interaction models and Design patterns and its importance in solving object oriented design problems.	1	2,3	12,13
CO-4	**Describe** the design pattern catalogs. Apply structural patterns to solve design problems.	1,2	3	12
CO-5	**Construct** design solutions by using behavioral patterns.	1,2	-	12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.8	2.0		2.0							1.0	1.0	1.0

Pre-requisites:
1. Exposure to basics of object oriented Programming Terminologies
2. Software Engineering

Contents:

Unit I

Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence fousefulness of OO development; OO modeling history. Modeling as Design Technique*:* Modeling; abstraction; The three models. Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance.

08 Hrs.

Unit II
Advanced Class Modeling, State Modeling, Advanced State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips. State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips, Nested state diagrams; Nested states; Signal generalization; Concurrency

08 Hrs.

Unit III

Interaction Modeling:. Interaction Modeling: Use case models; Sequence models;Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models what is a design pattern? describing design patterns, the catalog of design pattern, organizing the catalog, how design patterns solve design problems, how to select a design pattern, how to use a design pattern. A Notation for Describing Object-Oriented Systems

08 Hrs.

Unit VI
Design Pattern Catalog: Abstract Factory Builder Factory Method Prototype Singleton Structural patterns, Adapter, bridge, composite, decorator, facade, flyweight, proxy.

08 Hrs.

Unit V
Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, Memento, Observer, State, Template Method. A Case Study: Designing a Document Editor.

07 Hrs.

Reference Books:
1)   Michael Blaha, James Rumbaugh,"Object-Oriented Modeling and Design with UML", 2 /e, Pearson Education, 2005.
2)   Ali Bahrami, "Object oriented systems development", McGrawHill, 1999.
3)   Booch, G., Rumbaugh and Jacobson, "The Unified Modeling Language User Guide", 2/e, Pearson, 2005
4)   Erich Gamma, Richard Helan, Ralph Johman, John Vlissides, Design Patterns, Pearson Publication, 2013.

21UISL603	Computer Networks Laboratory	(0-0-2) 1

Contact Hours: **26**

Course Learning Objectives (CLOs): To provide students with a theoretical and practical base in computer networks issues. Student will be able purse his study in advanced networking courses.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/ PSOs(13-14)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1 Demonstrate the working of different concepts of networking using sockets in C or C++.	13	1, 2	12, 14
CO-2 Implement and **analyze** networking protocols in NS2 / NS3	5	1, 2	-
CO-3 Implement network applications using sockets and network protocols.	5,13,14	7,8	6,12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	2.0	2.0	-	-	3.0	1.0	2.0	2.0	-	-	-	1.0	3.0	2.0

Prerequisites:
1. Data Communication
2. Computer networks
PART-A (USING Cisco Packet Tracer/NS2/NS3 Simulator)
1. Simple network using only two End Devices (Nodes)
2. Simple network using only two End Devices (Nodes) with Network Device (Switch)
3. Simple network using only two End Devices (Nodes) with Network Device (Router)
4. Simulation of different network topologies and routing algorithms.

PART-B (Using Sockets)
Write a C/C++/Java Program to demonstrate different networking concepts and routing algorithms using Sockets
Reference books:
1) Behrouz Forouzan, "Data Communications and Networking", 4/e, McGrawHill,2006
2) Fred Halsall ,"Computer Networking and the Internet" 5/e, Addison Wesley, 2005

21UISL604	Internet of Things Laboratory	(0-0-2) 1

Contact Hours: 26

Course Learning Objectives (CLOs): Students will be exposed to the concepts of Internet of Things, Cloud Computing principles and techniques. They also learn to use open source tools for handling large data.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/PSOs(13-14)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1 **Illustrate** the concept of Internet of Things	1, 5	2	12
CO-2 **Interpret** the basic concepts of Cloud Computing for IoT	1, 5	2	12
CO-3 **Conceptualize** and design efficient and effective technique for Internet of Things.(Using Think Speak/ /open source tool)	1, 5	2, 3	8, 10, 12
CO-4 **Identify** appropriate techniques and tools to solve actual Internet of Things problems	1	2, 3, 5	6, 10,13,14

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.0	2.0	-	2.75	1.0	-	1.0	-	1.0	-	1.0	1.0	1.0

Prerequisites:
1. Knowledge of Cloud Computing.
2. Knowledge of Programming languages (Python).

List of Programs:
1. LED Control Using Arduino Board
2. Potentiometer and IR Sensor Interfacing With Arduino
3. Controlling Two Actuators Using Arduino
4. Creation of Things Speak Account

5. Actuator Controlling Through Cloud
6. DHT11sensor Data to Cloud
7. IoT Based Air Pollution Control System
8. TDS Sensor Interfacing With Arduino

21UISL605	Minor Project - II	(0-0-3) 1

Contact Hours: 39

Course Learning Objectives (CLOs): Though the Specific objectives of this course depends on the Project chosen, below are the generic objectives of this course:

Course Outcomes(COs):

Description of the course outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Apply** problem solving and programming skills for identified problem statement.	2, 13	1	14
CO-2	**Design** the system for an identified requirement	3	4	1
CO-3	**Analyze** and **Incorporate** the changes in the development cycle.	4, 2	13	1, 14
CO-4	**Use** modern tools for realizing the solution.	5		14
CO-5	**Demonstrate** an ability to present the work carried out both in written and oral form in a team	10		11

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	1.33	3.0	3.0	2.5	3.0	-	-	-	3.0	1.0	-	-	2.5	1.0

Prerequisites: Knowledge of

a) Software Engineering concepts
b) Any Programming Language

Guidelines for Conduction

Spirit of The Course: To ensure that undergraduates can successfully apply the knowledge they have gained through a project, demonstrates the practical application of principles learnt in different courses and enables students to integrate material learnt at different stages of the curriculum up to the 5thsemester; also appreciating the need for domain knowledge for certain applications, and that this may necessitate study within that domain.

1. Students Form a Team. Size of the team can vary from 2 to 3 . With genuine explanation bigger or smaller is team is allowed.
2. Students can choose industry mentors to mentor their project or department will allocate industry mentors according to their expertise.
3. Guide for this course is a must and will be chosen by team itself by interacting with faculty or Faculty can give a problem statement and guide the batch.
4. In consultation with Guide, Team will prepare the project plan and its specific outcomes, which Team promises/declares to accomplish.
5. Synopsis should be prepared in consultation with the respective guides and industry mentors.
6. Project Report: A Course closure document outlining the problems, specifications, including the survey of literature, various results obtained, solutions and the problems faced deviation from the promised milestones, testing report, user manual, appendix reference etc is expected to be produced by each team of project.
7. Demonstration, Viva-Voce, publications, Reports can be used for the evaluation.
8. There can be designated Committee to monitor this process of Mini Project.

Assessment:

CIE - Minimum 3 reviews of the project + any other relevant components. CIE is assessed for 50 marks. Out of 50 marks; Guide will assess for 25 marks (based on reviews) and the coordinator will assess for 25 marks (based on synopsis and report)

SEE – SEE exam and Project Demonstration + any other component as decided by Project Coordinator and HoD

Note:

1. There can be designated Committee to monitor this process of Mini Project.
2. An Internal Guide is allotted per group who guides and monitors the project progress.
3. Course Outcomes (2 or more) are to be written per project and should

map to following Program Outcomes and Program Specific Outcomes. Internal Guide can include other POs apart from the ones mentioned below if those POs are deemed suitable by them.

4. Industry, society, etc., Interactions are required as part of Project.
5. At the end of the course, students are required to submit a mini-project report.

| 21UHUL606 | Soft skills and Aptitude | (0-0-2) 1 |

Contact Hours: **26**

Course Learning Objectives (CLOs): This is included with the objectives of improving the communication skills, proficiency in English language and aptitude ability of the student to enhance the employability.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/ PSOs(13-14)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1 Explain the significance of communication in the profession.		10	
CO-2 Use the English language with proficiency		10	12
CO-3 Solve Aptitude related problems		9	12
CO-4 Demonstrate the competency in the placement activities.		9	

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	-	-	-	-	-	-	-	-	2.0	2.0	-	1.0	-	-

Contents:
Training on communication skills, proficiency in English language and aptitude ability involving the internal and external resource.

Evaluation:
Both the internal and external resource persons shall be engaged in imparting the related knowledge and shall have only CIE as the evaluation component. There shall be one test conducted at the end for 25 marks in Aptitude testing and there shall be one presentation by the student for 25 marks or any other suitable testing components. The arrangement for CIE evaluation is to be done by the department and maintain the relevant documents.

21UISE610	System Software	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

To view some of the major tasks of the system software of a computer system, focusing on internal working of the hardware and software interface of a typical system

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1,12)/ PSO (13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Describe** the architecture of hypothetical machines and data structures used for assembler design	1	-	-
CO-2	**Design**, **analyze** and **implement** one pass, two pass or multi pass assembler.	3	2, 4	13,14
CO-3	**Design** and **analyze** loaders, linkers and various options in designing.	3	2, 4	13,14
CO-4	**Design** and **analyze** macro processors	3	2, 4	13,14
CO-5	**Illustrate** the various phases of compilers	1	-	13

POs	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.0	3.0	2.0	-	-	-	-	-	-	-	-	1.0	1.0

Prerequisites: 1. Computer Organization
                   2. Knowledge of Programming

Contents:

Unit-I

Machine Architecture and Assemblers : Introduction, System Software and Machine Architecture, Simplified Instructional Computer (SIC) - SIC

Machine Architecture, SIC/XE Machine Architecture, SIC Programming Examples. Basic Assembler Function - A Simple SIC Assembler, Assembler Algorithm and Data Structures

08 Hrs.

Unit-II

Assemblers M/c Dependent and Independent Features : Program Relocation. Machine Independent Features - Literals, Symbol-Definition Statements, Expression, Program Blocks, Control Sections and Programming Linking. **Assembler Design options** Assembler Design Operations - One-Pass Assembler, Multi-Pass Assembler.

08 Hrs.

Unit-III

Loaders and Loader Design options : Basic Loader Functions - Design of an Absolute Loader, A Simple Bootstrap Loader Machine-Dependent Loader Features - Relocation, Program Linking, Algorithm and Data Structures for a Linking Loader. Machine-Independent Loader Features-Automatic Library Search, Loader Options. Design Options - Linkage Editor, Dynamic Linkage, Bootstrap Loaders.

08 Hrs.

Unit-IV

Macro Processor: Basic Macro Processor Functions - Macro Definitions and Expansion, Macro Processor Algorithm and Data Structures, Machine-Independent Macro Processor Features - Concatenation of Macro Parameters, Generation of Unique Labels, Conditional Macro Expansion, Keyword Macro Parameters, Macro Processor Design Options – Recursive Macro Expansion, General-Purpose Macro Processors, Macro Processing Within Language Translators.

08 Hrs.

Unit-V

Compilers: Intermediate Code generation : Basic compiler functions-grammars, lexical analysis, Syntactic analysis,: Revisited. Intermediate Code generation - Three address code, Types and Declarations, Translation of expressions.

07 Hrs.

Reference Books:
1) Leland L. Beck and D. Manjula, "System Software", 3/e, Pearson Education, 2012.
2) Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman,

"Compilers- Principles, Techniques and Tools", 2/e, Addison-Wesley, 2008.

3) D. M. Dhamdhere, "System Programming and Operating Systems", 2/e, Tata McGraw Hill, 2008.

4) John J. Donovan, "System Programming", 2/e, Tata McGraw Hill, 2004.

| 21UISE611 | User Interface Design | (3-0-0) 3 |

Contact Hours: 39

Course Learning Objectives (CLOs):

User Interface design is a course offered as an elective subject at the undergraduate level for VI semester students. The objective of this course is for the students to learn the basic principles of user interface design. The goal of user interface designer is to make the user's interaction as simple and efficient as possible, in terms of accomplishing users goals. On learning this they should be able to deploy the knowledge of UID principles, design concepts and related methodologies, be familiar with the design technologies for individuals, apply theories and concepts associated with effective work design to real-world application.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs (13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Describe** the Characteristics of Graphics User Interface and the Principles of User Interface Design.	1	-	12
CO-2	**Explain** the User Interface Design Process, standards, Structures of menus and basic business functions.	2,5	3	12,13,14
CO-3	**Illustrate** the components of web Systems and text boxes.	1	2,5	12,13,14
CO-4	**Describe** the use of multimedia Systems and its accessibility.	1	2	12
CO-5	**Summarize** the concepts of Windows layout and visualization.	1,3	5	12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14

Mapping Level	3.0	2.33	2.5	-	2.0	-	-	-	-	-	-	1.0	1.0	1.0

Pre-requisites: Knowledge of Software Engineering

Contents:

Unit-I

Introduction: Human–Computer Interface, Characteristics of Graphics Interface, Direct Manipulation Graphical System, Web User Interface, Popularity, Characteristic & Principles.

08 Hrs.

Unit-II

Human Computer Interaction: User Interface Design Process, Obstacles, Usability, Human Characteristics In Design, Human Interaction Speed, Business Functions, Requirement Analysis, Direct and Indirect Methods.
Basic Business Functions, Design Standards, System Timings, Human Consideration In Screen Design, Structures Of Menus, Functions Of Menus, Contents Of Menu, Formatting, Phrasing The Menu, Selecting Menu Choice, Navigating Menus, Graphical Menus.

08 Hrs.

Unit-III

Windows: Introduction, Characteristics, Components, Presentation Styles, Types, Managements, Organizations, Operations, Web Systems, Device, Based Controls Characteristics, Screen, Based Controls, Operate Control, Text Boxes, Selection Control, Combination Control, Custom Control, Presentation Control.

08 Hrs.

Unit-IV

Multimedia: Text For Web Pages –Effective Feedback–Guidance & Assistance, Internationalization– Accessibility–Icons–Image–Multimedia–Coloring.

08 Hrs.

Unit-V

Windows Layout– **Test**: Prototypes, Kinds of Tests, Retest, Information Search, Visualization, Hypermedia, WWW– Software Tools.

07 Hrs.

Reference Books:

1) Ben Shneiderman, Plaisant, Cohen, Jacobs, "Designing the User Interface", 5/e, Pearson Education, 2010.
2) JeniferT idwell, "Designing Interfaces Patterns for effective design",

2/e,O'Reilly Media, 2010.

3) Jesse James Garrett, "The Elements of User Experience: User–Centered Design for the Web and Beyond", 2/e, Pearson Education, 2011.

4) Wilbert O. Galitz, "The Essential Guide to User Interface Design –An Introduction to GUI Design Principles and Techniques", 2/e, Wiley Dream Tech, 2011.

21UISE612	Artificial Intelligence	(3-0-0) 3

Contact Hours:39

Course Learning Objectives (CLOs):

Artificial Intelligence is an elective course offered at undergraduate level for VI semester. The objective is to provide foundation in artificial intelligence techniques for planning with an overview of the wide spectrum of different problems including their underlying theory and their applications.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Identify** and **formulate** appropriate AI methods for solving a problem.	1	-	12,13,14
CO-2	**Design** the logic for knowledge representation and reasoning in AI based systems.	1	2, 5	12,13,14
CO-3	**Formalize** a given problem in the language/framework of different AI methods.	1, 2	3, 5	12
CO-4	**Apply** different machine learning technique to solve problems in uncertainty domain.	1	2, 3, 5	12,13,14
CO-5	**Compare** different AI learning algorithms in terms of design issues, computational complexity, and assumptions.	1, 2	3, 5	12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO	PO	PO	PSO	PSO

										10	11	12	13	14
Mapping Level	3.0	2.5	2.0	-	2.0	-	-	-	-	-	-	1.0	1.0	1.0

Contents:

Unit-I

Artificial Intelligence: Introduction: What is AI Foundations of Artificial Intelligence History of Artificial Intelligence The state of Art. **Intelligent Agents:** Agent and Environments Good Behavior The Nature of Environments The Structure of Agents.

Problem-solving: Problem-solving agent searching for solution Uniformed search strategies. **Informed Search and Exploration:** Informed search strategies Heuristic functions Online Search agents and unknown environment. **Constraint Satisfaction problems:** Alpha-Beta pruning.

08 Hrs.

Unit-II

Logical Agents: Knowledge-based agents, The wumpus world; Logic, propositional logic; Reasoning patterns propositional logic, Effective propositional interference; Agent based on propositional logic. **First-Order Logic:** Representation revisited, Syntax and semantics of first order logic, Knowledge engineering in first order logic.

Interference in First-Order Logic: Propositional verses first-order interference, Unification and lifting.

08 Hrs.

Unit-III

Knowledge Representation: Ontological engineering, Categories and object, Action situations and events, Mental events and mental objects, The internet shopping world, Reasoning system for categories, Reasoning with default information, Truth maintenance system. **Planning:** The planning problems, Planning with state-space search, Planning graphs, Planning with propositional logic.

08 Hrs.

Unit-IV

Uncertainty: Acting under uncertainty; Inference using full joint distributions, Independence, Bayes's rile and its use.

Probabilistic Reasoning: Representing knowledge in an uncertain domain, The semantic of Bayesian networks, Efficient representation of

conditional distribution, Exact interference in Bayesian network.

08 Hrs.

Unit-V

Learning: Forms of learning; Inductive learning, Learning decision tree, Ensemble learning, Computational learning theory.

07 Hrs.

Reference Books:

1) Stuard Russell and Peter Norvig, Artificial Intelligence. A Modern Approach, 2/e, Prentice Hall, Inc., 2013.
2) Deepak Khemani, A First Course in Artificial Intelligence, McGraw Hill Education (India), 2013.
3) Stefan Edelkamp and Stefan Schroedl. Heuristic Search: Theory and Applications, Morgan Kaufmann, 2011.
4) Elaine Rich, Kevin Knight, Artificial Intelligence, 3/e, Tata McGraw Hill,2009.
5) Pamela McCorduck, Machines Who Think: A Personal Inquiry into the History and Prospects of Artificial Intelligence, A K Peters/CRC Press; 2/e, 2004.

21UISE620	Advanced Database Management Systems	(3-0-0) 3

Contact Hours : 39

Course Objectives:
Define parallel and distributed databases and its applications. Show applications of Object Oriented database. Explain basic concepts, principles of intelligent databases. Utilize the advanced topics of data warehousing and mining. Infer emerging and advanced data models.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/ PSOs(13-14)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1 **Describe** Relational Database Concepts and the real world data using object oriented database.	1	2	-

CO-2	**Choose** the appropriate high performance database from amongst parallel and distributed databases.	1,2	-	12
CO-3	**Illustrate** the different data mining and data warehouse applications.	1,2	-	12
CO-4	**Illustrate** enhanced data models for some advanced applications.	1	-	2
CO-5	**Write** PL/SQL codes to solve different database problems.	1,2,13,14	3,5,6	7,8,12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.4	2.0	-	1.5	2.0	1.0	1.0	-	-	-	1.0	3.0	3.0

Pre-requisites:
Database Management Systems, SQL.

Contents:

Unit-I

Review of Relational Data Model and Relational Database Constraints: Relational model concepts; Relational model constraints and relational database schemas; Update operations, anomalies, dealing with constraint violations, Types and violations.

Object and Object-Relational Databases: Overview of Object-Oriented Concepts – Objects, Basic properties. Advantages, examples, Abstract data types, Encapsulation, class hierarchies, polymorphism, examples, Complex objects; Identity, structure etc. Object model of ODMG, Object definition Language ODL; Object Query Language OQL;.

07 Hrs.

Unit-II

Parallel Databases : Architectures for parallel databases; Parallel query evaluation; Parallelizing individual operations; Parallel query optimizations;

Distributed Database Concepts: Distributed Database Concepts, Data Fragmentation, Replication, and Allocation Techniques for Distributed Database Design, Overview of Concurrency Control and Recovery in Distributed Databases, Overview of Transaction Management in Distributed Databases,Query Processing and Optimization in Distributed Databases, Types of Distributed Database Systems, Distributed Database Architectures, Distributed Catalog Management.

07 Hrs.

Unit-III
Data Mining Concepts: Overview of Data Mining Technology, Association Rules, Classification, Clustering, Approaches to Other Data Mining Problems, Applications of Data Mining, Commercial Data Mining Tools

Overview of Data Warehousing and OLAP: Introduction, Definitions, and Terminology, Characteristics of Data Warehouses, Data Modeling for Data Warehouses, Building a Data Warehouse, Typical Functionality of a Data Warehouse, Data Warehouse versus Views, Difficulties of Implementing Data Warehouses.

08 Hrs.

Unit-IV
Enhanced Data Models for Some Advanced Applications: Active Database Concepts and Triggers, Temporal Database Concepts, Spatial Database Concepts, Multimedia Database Concepts, Introduction to Deductive Databases.

Introduction to Information Retrieval and Web Search: Information Retrieval (IR) Concepts, Retrieval Models, Types of Queries in IR Systems, Text Preprocessing, Inverted Indexing, Evaluation Measures of Search Relevance, Web Search and Analysis. Trends in Information Retrieval.

08 Hrs.

Unit-V
PL/SQL: Basics, Cursors, Exceptions, Subprograms, Packages.

09 Hrs.

Reference Books:
1) Elmasri and Navathe: Fundamentals of Database Systems, Pearson Education, 2013.
2) Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 3/e, McGraw-Hill, 2013.
3) Abraham Silberschatz, Henry F. Korth, S. Sudarshan: Database System Concepts, 6/e, McGraw Hill, 2010.

| 21UISE621 | Software Testing | (3-0-0)3 |

Contact Hours:39

Course Learning Objectives (CLOs):
Explain different testing techniques.Differentiate the various testing techniques. Apply suitable technique for designing of flow graph. Analyze the problem and derive suitable test cases.

Course Outcomes (COs):

Description of the Course Outcome:	Mapping to POs(1-12)/ PSOs(13-14)

At the end of the course the student will be able to:		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Explain** the significance of software testing and quality assurance in software development	1		12
CO-2	**Apply** the concepts of software testing to assess the most appropriate testing method.	2		
CO-3	**Analyze** the importance of testing in software development	2	13	
CO-4	**Evaluate** the suitable testing model to derive test cases for any given software		3, 13,14	12
CO-5	**Develop** appropriate document for the software artefact.	3		12

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	3.0	2.5									1.0	2.0	2.0

Pre-requisites:
1. Exposure to basics of object oriented Programming Terminologies.
2. Software Engineering.

Contents:

Unit-I

Basics of Software Testing: Basic definitions, Software Quality , Requirements, Behaviour and Correctness, Correctness versus Reliability, Testing and Debugging, Test cases, Insights from a Venn diagram, Identifying test cases, Test-generation Strategies, Test Metrics, Error and fault taxonomies , Levels of testing, Testing and Verification, Static Testing.

Problem Statements: Generalized pseudocode, the triangle problem, the NextDate function, the commission problem, the SATM (Simple Automatic Teller Machine) problem, the currency converter, Saturn windshield wipe

08 Hrs.

Unit-II

Functional Testing: Boundary value analysis, Robustness testing, Worst-case testing, Robust Worst testing for triangle problem, Nextdate problem and commission problem, Equivalence classes, Equivalence test cases for the

triangle problem, NextDate function, and the commission problem, Guidelines and observations, Decision tables, Test cases for the triangle problem, NextDate function, and the commission problem, Guidelines and observations. **Fault Based Testing:** Overview, Assumptions in fault based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis.

08 Hrs.

Unit-III

Structural Testing: Overview, Statement testing, Program testing, Condition testing, Path testing - DD paths, Test coverage metrics, Basis path testing, guidelines and observations, Dataflow testing: Definition-Use testing, Slice-based testing, Guidelines and observations.

08 Hrs.

Unit-IV

Levels of Testing: Traditional view of testing levels, Alternative life-cycle models, The SATM system, Separating integration and system testing. Integration Testing: A closer look at the SATM system, Decomposition-based, call graph-based, Pathbased integrations.

08 Hrs.

Unit-V

System Testing: Threads, Requirement Specification, Finding Threads, Structural strategies for thread tesing, SATM test threads System testing guidelines, ASF testing example. Interaction Testing: Context of interaction, A taxonomy of interactions, Interaction, composition, and determinism, Client/Server Testing

07 Hrs.

Reference books:
1) Paul C. Jorgensen, "Software Testing, A Craftsman's Approach", 3/e, Auerbach Publications, 2008.
2) Aditya P Mathur, "Foundations of Software Testing", Pearson Education, 2008.
3) Mauro Pezze, Michal Young: Software Testing and Analysis – Process, Principles and Techniques, Wiley India, 2009
4) Software testing Principles and Practices – Gopalaswamy Ramesh, Srinivasan Desikan, 2/e, Pearson, 2007
5) Software Testing – Ron Patton, 2/e, Pearson Education, 2004.

21UISE622	Digital Image Processing	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs): Students will be exposed to the concepts of Digital Image Processing principles and techniques like Image enhancement, segmentation, representation and applications.

Course Outcomes (COs):

Description of the course outcome: At the end of the course the student will be able to:	Mapping to POs(1-12)/PSOs(13-14)		
	Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1 Describe the basic principles of Digital Image Processing for various applications	1	-	12
CO-2 Describe Image enhancement techniques both in spatial and frequency domain	1	-	12
CO-3 Apply the image restoration techniques	1, 2	5, 13	12,14
CO-4 Apply mathematical approaches to extract the characteristic features of image. **Demonstrate** different segmentation techniques	1, 2	5, 13	12,14
CO-5 Design and **develop** techniques for image compression and recognition	1, 2	5, 13	12,14

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	3.0	-	-	2.0	-	-	-	-	-	-	1.0	2.0	1.0

Pre-requisites:
1. Statistics and probability
2. Programming Language

Contents:

Unit-I
Fundamentals: Need for DIP- Fundamental steps in DIP – Elements of visual perception -Image sensing and Acquisition – Image Sampling and Quantization – Imaging geometry, discrete image mathematical characterization

08 Hrs.

Unit-II

Image Enhancement : Spatial Domain- Basic relationship between pixels- Basic Gray level Transformations – Histogram Processing – Smoothing spatial filters- Sharpening spatial filters. **Frequency Domain**-Smoothing frequency domain filters- sharpening frequency domain filters Homomorphic filtering

08 Hrs.

Unit-III

Image Restoration: Overview of Degradation models – Unconstrained and constrained restorations-Inverse Filtering, Wiener Filter.

08 Hrs.

Unit-IV

Feature Extraction: Detection of discontinuities – Edge linking and Boundary detection- Thresholding- -Edge based segmentation-Region based Segmentation-matching- Advanced optimal border and surface detection- Use of motion in segmentation. Image Morphology – Boundary descriptors- Regional descriptors.

08 Hrs.

Unit-V

Image Compression and Recognition: Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

07 Hrs.

Reference books:
1) Rafel C Gonzalez and Richard E Woods, "Digital Image Processing", 3/e, Pearson Education.
2) Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", 2/e, Thomoson Learning, Brooks/Cole.
3) Anil K Jain, "Fundamentals of Digital Image Processing", Prentice-Hall of India Pvt. Ltd.
4) B.Chanda, D Dutta Majumder, "Digital Image Processing and Analysis", Prentice-Hall, India.

21UISO630	Object Oriented Programming with C++	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

Understand the fundamentals of object-oriented programming in C++, including defining classes, invoking member methods, using class libraries, etc. Students will be able to handle exceptions in the programs using appropriate mechanisms.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs (1-12)/ PSOs (13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the concepts of object-oriented programming, C++ language constructs and **design** classes for any given problem.	1, 2	3, 13	12
CO-2	**Illustrate** and **apply** dynamic memory management, constructors and destructors.	1	13	12
CO-3	**Illustrate** and **implement** inheritance and dynamic polymorphism.	1, 2	3, 13	12
CO-4	**Apply** the concepts of stream handling in programming and **implement** operator overloading.	1, 2	13	12
CO-5	**Design** templatefunctionsand **use** exception handling mechanisms.	3	1, 2	12,13

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	2.8	2.75	2.33	-	-	-	-	-	-	-	-	1.0	1.8	-

Pre-requisites: Basic programming skills

Contents:

Unit-I

Introduction to C++: A Review of Structures, Procedure- Oriented Programming Systems, Object-Oriented Programming Systems, Comparison of C++ with C, Console Input/Output in C++, Variables in C++, Reference Variables in C++, Function Prototyping, Function Overloading, Default Values for Formal Arguments of Functions, Inline Functions.

Class and Objects: Introduction to Classes and Objects Member Functions and

Member Data, Objects and Functions, Objects and Arrays. Namespaces, Nested Classes.   **08 Hrs.**

Unit-II

Dynamic Memory Management: Introduction, Dynamic Memory Allocation, Dynamic Memory Deallocation, The set new _ handler () function.

Constructors and Destructors: Constructors – Zero argument constructor, Parameterized constructors, Copy constructor, Destructors   **08 Hrs.**

Unit-III

Inheritance: Introduction to Inheritance, Base Class and Derived Class Pointers, Function Overriding, Base Class Initialization, The Protected Access Specifier, Deriving by Different Access Specifiers, Different Kinds of Inheritance, Order of Invocation of Constructors and Destructors.

Virtual Functions and Dynamic Polymorphism: The Need for Virtual Functions, Virtual Functions, The Mechanism of Virtual Functions, Pure Virtual Functions, Virtual Destructors.   **08 Hrs.**

Unit-IV

Stream Handling: Streams, The Class Hierarchy of Handling Streams, Text Input/Output, Opening and Closing Files, Files as objects of the fstream Class, File Pointer, Random Access to Files, Error Handling, Manipulators.

Operator Overloading: Operator Overloading, Overloading the Various Operators, Type conversion.   **08 Hrs.**

Unit-V

Templates: Introduction, Function Templates, Class Templates.

Exception Handling: Introduction, C-style Handling of Error generating codes, C++ Style Solution - the try/throw/catch constructs. Limitation of Exception Handling

07 Hrs.

Reference Books:

1) E. Balagurusamy, "Object Oriented Programming with C++", 7/e, McGraw-Hill, 2014.
2) SouravSahay, "Object-Oriented Programming with C++", 7/e, Oxford University Press, 2012.
3) Lippman, Lajoie and Moo, "C++ Primer", 5/e, Addison-Wesley, 2012.
4) HerbertSchildt, "The Complete Reference C++", 7/e, TMH, 2014.

| 21UISO631 | Software Engineering | (3-0-0) 3 |

Contact Hours: 39

Course Learning Objectives (CLOs):

Student should understand the need for a process of software development complexity of system development, types of systems and quality requirements,

analysis of any problem domain and formulation of requirements and assessment of quality, contemporary modeling, designing, development and validation techniques, fundamental aspects of software testing techniques.

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Illustrate** the need for Software Engineering and software process.	1	-	12
CO-2	**Analyze** the system to be automated for identifying the software requirements.	-	2	-
CO-3	**Design** High-level and Low-level design of an application from the identified software requirements.	10	3	-
CO-4	**Apply** the methods of test generation from requirements and structural testing.	-	4	13,14
CO-5	**Adapt** software testing techniques.	-	13,14	10

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.0	2.0	2.0	-	-	-	-	-	2.0	-	1.0	1.5	1.5

Pre-requisites: 1.Basics of Computer Programming

Contents:

Unit-I

Overview FAQ's about software engineering, Professional and ethical responsibility. Socio-Technical systems: Emergent system properties; Systems engineering; Organizations, people and computer systems; Legacy systems. Critical Systems: A simple safety critical system; System dependability; Availability and reliability. **Software Processes:** Models, Process iteration, Process activities; The Rational Unified Process; Computer Aided Software Engineering.

07 Hrs.

Unit-II

Software Requirements: Functional and Non-functional requirements; User requirements; System requirements; Interface specification; The software requirements document. **Requirements Engineering Processes**: Feasibility

studies; Requirements elicitation and analysis; Requirements validation; Requirements management.

08 Hrs.

Unit-III
Software Design: Architectural Design: Architectural design decisions; System organization; Modular decomposition styles; Control styles.
Object Oriented design: Objects and Object Classes; An Object-Oriented design process; Design evolution. UI Design Issues. Development: Rapid Software Development: Agile methods; Extreme programming; Rapid application development. Software Evolution: Program evolution dynamics; Software maintenance.

08 Hrs.

Unit-IV
Basics of Software Testing: Human Errors and Testing; Software Quality; Requirements, Behavior and Correctness. **Software testing**: System testing; Component testing; Test case design; Test automation. **Testing Techniques:** Test Generation from Predicates, Statement testing, Branch Testing, Condition Testing, Path Testing, Procedural Call Testing, Data Flow Testing.

08 Hrs.

Unit-V

Structural (White Box) Testing: Definition-Use pairs, Definition-Use associations; Data flow testing criteria; Data flow coverage with complex structures; The infeasibility problem. **Fault Based Testing**: Overview, Assumptions in fault based testing, Mutation analysis, Fault-based adequacy criteria, Variations on mutation analysis.**Black Box Testing:** Introduction, Functional testing, Integration testing, System testing, Acceptance testing, Adhoc testing, Regression testing, Smoke testing; The Test-Selection Problem; Equivalence Partitioning; Boundary Value Analysis; Category-Partition Method, Cause-Effect Graphing.

08 Hrs.

Reference Books:
1) Ian Somerville, "Software Engineering",8/e, Pearson Education, 2012.
2) Rogers S Pressman, "Software Engineering: A Practitioners Approach",7/e, MCGrawHill, 2007.
3) Shari Lawrence Pfleeger, Joanne m Atlec , "Software Engineering theory and Practice" , 3/e, Pearson Education, 2006.
4) Waman S Jawadekar, "Software Engineering Principles and Practice", Tata McGraw Hill, 2004.
5) Foundations of Software Testing - Aditya P Mathur, Pearson Education, 2008
6) Software Testing and Analysis Process Principles and Techniques – Mauro

Pezze, Michal Young, Wiley India, 2008

21UISO632	Human Computer Interaction	(3-0-0) 3

Contact Hours: **39**

Course Learning Objectives (CLOs): Human Computer Interaction is offered as an elective subject for undergraduate students at V semester level. The main objective is make a student understand and learn the foundations of Human Computer Interaction, to become familiar with the design technologies for individuals and persons with disabilities and to learn the guidelines for user interface.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)/ PSOs(13-14)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO-1	**Design** Effective dialog for HCI.	1	-	12,13,14
CO-2	**Design** effective HCI for individuals and persons with disabilities.	2,5	3	12,13,14
CO-3	**Apply** Theories & concepts associated with effective work design for real world application.	1	2,5	12,13,14
CO-4	**Explain** the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites**.**	1	2	12
CO-5	**Develop** meaningful user interface.	1,3	5	12,14

POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 13	PSO 14
Mapping Level	3.0	2.33	2.5	-	2.0	-	-	-	-	-	-	1.0	1.0	1.0

Contents:

Unit - I

Introduction to HCI : Objective & Overview , Definition of HCI , Nature of the field, HCI Discipline, History evolution of the field, Evolution of HCI- Major milestones.
The Human: I/O channels, Memory, Reasoning and problem solving, The Computer: Devices, Memory, processing and networks, Interaction: Models, frameworks, Ergonomics, styles, elements, interactivity- Paradigms.

08 Hrs.

Unit - II
Design & Software Process: Interactive Design: Basics process, scenarios, navigation, screen design, Iteration and prototyping. HCI in software process: Software life cycle, usability engineering, Prototyping in practice, design rationale. Design rules: principles, standards, guidelines, rules. Evaluation Techniques, Universal Design.

08 Hrs.

Unit - III
Models and Theories: HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements, Communication and collaboration models, Hypertext, Multimedia and WWW.

08 Hrs.

Unit – IV
Mobile Ecosystem: Platforms, Application frameworks, Types of Mobile Applications: Widgets, Applications, Games, Mobile Information Architecture. Mobile Design: Elements of Mobile Design, Tools.

08 Hrs.

Unit – V
Web Interface Design: Designing Web Interfaces, Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.

07 Hrs.

References:
1) Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3/e, Pearson Education, 2004 (UNIT I, II & III)
2) Brian Fling, ―Mobile Design and Development‖, 1/e, O'Reilly Media Inc., 2009 (UNIT – IV)
3) Bill Scott and Theresa Neil, ―Designing Web Interfaces, 1/e, O'Reilly, 2009. (UNIT-V)
4) Helen Sharp, Jennifer Preece, Yvonne Rogers – Interaction Design Beyond Human Computer Interaction, 5/e, Wiley, 2019.
5) Gerard Jounghyun Kim, Human Computer Interaction- Fundamentals and practices, 1/e, CRC press, Taylor & Francis group, Auerbach Publications, 2015.