GOVERNMENT OF INDIA
MINISTRY OF
PARLIAMENTARY AFFAIRS

Azadi Ka Amrit Mahotsav

mygov मेरी सरकार

PREAMBLE TO THE CONSTITUTION

PREAMBLE

WE, THE PEOPLE OF INDIA,

having solemnly resolved to constitute India into a SOVEREIGN SOCIALIST SECULAR DEMOCRATIC **REPUBLIC** and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity;

and to promote among them all

FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation;

IN OUR CONSTITUENT ASSEMBLY this 26th day of November, 1949, do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

I have read the Preamble

[redacted]

Signature

23-01-2022

SRI SIDDHARTHA ACADEMY OF HIGHER EDUCATION

("Deemed to be University u/s 3 of the UGC Act, 1956")
Accredited 'A+' Grade by NAAC
Agalakote, B.H.Road, Tumkur – 572 107.KARNATAKA, INDIA.

No. SSAHE/ACA-S&C/33/UG(BE)/2024 Date: 15/07/2024

N O T I F I C A T I O N

Sub: - Ordinance pertaining to Curriculum of Undergraduate Programme Bachelor of Engineering (3rd Year Information Science and Engineering)

Ref: Proceedings of the Academic Council meeting held on 10/07/2024 vide agenda No. SSAHE/AC/XXVIII-12/2024

In exercise of the powers vested under section 6 of 6.05 of MoA / Rules of SSAHE, the Revised Ordinance pertaining to Curriculum of Undergraduate Programme Bachelor of Engineering (3rd Year Information Science and Engineering) is notified herewith as per Annexure.

By Order,

REGISTRAR

REGISTRAR
Sri Siddhartha Academy of Higher Education
TUMKUR - 572 107, Karnataka.

To,
Dean / Principal, Sri Siddhartha Institute of Technology,

Copy to
1) Office of the Chancellor, SSAHE, for kind information,
2) PA to Vice-Chancellor / PA to Registrar / Controller of Examinations / Finance Officer, SSAHE
3) All Officers of the Academy Examination Branch / Academic Section
4) Guard File / Office copy.

S.S.A.H.E TUMKUR

Department of Information Science and Engineering

(Accredited by NBA from 2022-25)

Vision of the Department

"To impart knowledge to young aspirants to develop Information Technology based solutions for the Industrial and Societal needs".

Mission of the Department

- Prepare students to acquire knowledge in the field of Information Technology through effective teaching learning methodologies.
- Establish conducive environment for better learning through the state of the art curriculum to exhibit talents and ingenuity.
- Nurture the students to be industry ready by enhancing their employability skills and entrepreneurial skills.
- Develop Information Technology based solution as per the need of Society.

Program Educational Objectives (PEOs)

- Analyse, design and develop Information Technology based solutions using suitable platforms.
- Accomplish any tasks with ethical values and commitment to meet the societal problems.
- Inculcate team work capabilities and managerial skills to become entrepreneur or employee of an organization.
- Instil lifelong learning capabilities and to pursue higher education and research.

Program Outcomes (POs)

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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.
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.
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.
5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
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 relevant to the professional engineering practice.
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.
8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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, make effective presentations, and give and receive clear instructions.
11. Project management and finance: Demonstrate 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.
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

1. Able to apply appropriate techniques for storage of huge amount of data and ensuring its integrity.
2. Choose appropriate method for data acquisition from real world and propose suitable solutions to solve problems.

SRI SIDDHARTHA INSTITUTE OF TECHNOLOGY- TUMAKURU
(A constituent College of Siddhartha Academy of Higher Education, Tumakuru)
Academic Year 2024-25

Scheme of Teaching and Examination-2022 (160 Credits Scheme)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

V Semester B.E.

Sl No.	Course Code		Course Title	Teaching Dept.	L	T	P	Credits	CIE	SEE	Total Marks	Exam Hrs.
01	PC	22IS501	Machine Learning Techniques	IS	3	-	-	3	50	50	100	3
02	PC	22IS502	Embedded Systems and Internet of Things	IS	3	-	2	4	50	50	100	3
03	PC	22IS503	Computer Networks	IS	3	-	2	4	50	50	100	3
04	PE	22IS5PE4X	Professional Elective-I	IS	3	-	-	3	50	50	100	3
05	OE	22IS5OE5X	Open Elective-I	IS	3	-	-	3	50	50	100	3
06	HS	22IE56X	Institutional Elective (561: Research Methodology, 562: Management and Entrepreneurship, 563: Project Management)	IS	2	-	-	2	50	50	100	3
07	PC	22IS507	Dept. Skill Lab - 3 (Machine Learning Laboratory)	IS	1	-	2	2	50	50	50	3
08	HS	22SK508	Skill Development-II	T&P	-	-	2	1	50	-	50	-
L-Lecture, T-Tutorial, P-Practical,/Drawing, CIE-continuous Internal Evaluation, SEE-Semester End Examination				**Total**	**18**	**-**	**8**	**22**	**400**	**350**	**750**	**-**
Credit Distribution: Basic Science (BS)=8+8+3+3=22, Engineering Science (ES)=10+11=21, Humanities and Social Sciences (HS)=1+2+2+2+1=8, Program Core (PC)=2+16+16+13=47, Program Elective (PE)=3, Open Elective (OE)=3, Institutional Elective =2, Total Credits=20+20+21+21+22=104.												

Professional Elective-I	Open Elective-I
22IS5PE41: Advanced JAVA and J2EE 22IS5PE42: Data Analytics using R Programming 22IS5PE43: Cloud Computing	22IS5OE51: Software Engineering 22IS5OE52: Fundamentals of Algorithms 22IS5OE53: Introduction to UNIX

Department: Information Science and Engineering			**Semester:**	**V**
Subject: Machine Learning Techniques				
Subject Code:	**22IS501**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	Familiarize with the basic Machine Learning concepts.
2	Understand a variety of Machine Learning algorithms, theoretical results and applications.
3	Differentiate the working of supervised and unsupervised learning algorithms.
4	Learn Machine Learning techniques and apply the suitable technique for the given data set.

Unit	Description	Hrs.
I	**Introduction to Machine Learning:** Need for Machine Learning, Machine Learning Explained, Machine Learning in Relation to other Fields, Types of Machine Learning, Machine Learning Applications(Text Book:2,Chapter:1), A Simple Machine-Learning Task: Training Sets and Classifiers, Minor Digression: Hill-Climbing Search, Hill Climbing in Machine Learning, Some Difficulties with Available Data. **Bayesian Classifiers:** The Single-Attribute Case, Vectors of Discrete Attributes, Probabilities of Rare Events: Exploiting the Expert's Intuition**.** (Text Book: 1, Chapter: 1, 2).	**08**
II	**Bayesian Classifiers contd…** How to Handle Continuous Attributes, Gaussian "Bell" Function: A Standard pdf, Approximating PDFs with Sets of Gaussians. **Nearest-Neighbor Classifiers:** The k-Nearest-Neighbor Rule, Measuring Similarity, Irrelevant Attributes and Scaling Problems, Performance Considerations, Weighted Nearest Neighbors, Removing Dangerous Examples, Removing Redundant Examples. (Text Book: 1, Chapter: 2, 3).	**08**
III	**Similarities: Linear and Polynomial Classifiers:** The Essence, The Additive Rule: Perceptron Learning, The Multiplicative Rule: WINNOW, Domains with More Than Two Classes, Polynomial Classifiers, **Artificial Neural Networks:** Multilayer Perceptrons as Classifiers, Neural Network's Error. (Text Book: 1, Chapter: 4, 5).	**08**
IV	**Artificial Neural Networks contd…** Backpropagation of Error, Special Aspects of Multilayer Perceptrons, Architectural Issues (Text Book: 1, Chapter: 5). **Ensemble Learning:** Introduction, Parallel Ensemble Models, Incremental Ensemble Models, Sequential Ensemble Models (Text Book: 2, Chapter: 12).	**08**
V	**Performance Evaluation:** Basic Performance Criteria, Precision and Recall, Other Ways to Measure Performance, Learning Curves and Computational Costs. Methodologies of Experimental Evaluation. **Unsupervised Learning:** Cluster Analysis, A Simple Algorithm: k-Means, More Advanced Versions of k-Means, Hierarchical Aggregation. (Text Book: 1, Chapter: 11, 14).	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Comprehend the knowledge of Machine Learning algorithm for different applications.
CO2	Illustrate the working of supervised and unsupervised Machine Learning Techniques.
CO3	Apply suitable Machine Learning algorithm to solve the real world problems.
CO4	Analyze and compare the performance of various Machine Learning Techniques.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3											
CO2	3	3	3	2										
CO3	3	3	3	3	2							1		
CO4	3	3	3	3	2							1		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	An Introduction to Machine Learning	Miroslav Kubat	Second Edition, 2021 Springer, ISBN-13978-3030819347
2	Machine Learning	S. Sridhar, M Vijayalakshmi	*First Edition,* Oxford, 2021 *ISBN*-13. 978-0190127275

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Machine Learning	Tom M. Mitchell	India Edition 2013, McGraw Hill Education, ISBN: 13:9780070428072, 10:0070428077.
2	Machine Learning – An Algorithmic Perspective	Stephen Marsland	Chapman and Hall/CRC; 2 edition 2014 ISBN-10:1466583282 ISBN-13:978-1466583283

Department: Information Science and Engineering	**Semester:**	**V**

Subject: Embedded Systems and Internet of Things				
Subject Code:	**22IS502**		**L – T – P - C:**	**3–0–2–4**

Sl. No	Course Objectives
1	Understand embedded systems and the architecture of IoT.
2	Illustrate diverse methods of deploying smart objects and connect them to network.
3	Demonstrate the implementation of IoT based embedded systems.
4	Identify sensor technologies and understand the role of IoT in various domains of Industry.

Unit	Description	Hrs.
I	Introduction to Embedded and IoT Systems: Embedded System, Processor Embedded into a system, Embedded hardware units and devices in a system, Examples of Embedded System. Embedded System on Chip(SoC).	**08**
II	What is IoT?:, Genesis of IoT, IoT Impact, IoT Challenges. IoT Network Architecture and Design: Drivers Behind New Network Architectures, The oneM2M IoT Standardized architecture. The IoT World Forum (IoTWF) Standardized Architecture. IoT Data Management and Compute Stack (Cloud, Fog and Edge Computing).	**08**
III	Smart Objects- The “Things” in IoT: Sensors, Actuators, and Smart Objects. Connecting Smart Objects: IoT Access Technologies- IEEE 802.15.4, LoRaWAN, NB-IoT and Other LTE Variations.	**08**
IV	IP as the IoT Network Layer: The Business Case for IP, The need for Optimization, Optimizing IP for IoT-From 6LowPAN to 6Lo. Application Protocols for IoT: The Transport Layer, IoT Application Layer Protocols, CoAP, MQTT.	**08**
V	IoT based Embedded Systems: Introduction to Arduino, Exploring the ArduinoUNO Learning board, Fundamentals of Arduino Programming. Introduction to ESP32. Domain specific applications of IoT: Home automation, Industry applications, Environmental applications. IoT Cloud Platform and IoT client applications on mobile phones.	**08**

LAB CONTENT

Sl. No	Experiment Description
1	Introduction to IoT toolkit – Familiarization with Arduino/Raspberry Pi/ ESP32 / NodeMCU and perform necessary SW installations.
2	Experiment to interface temperature sensor DHT11 and write a program to print the temperature and humidity reading.
3	Controlling the LED with a push button – turn on /turn off LED photo resistors LDR) – switch on the LED when light level goes below a particular threshold.
4	Build a Motion detector using a PIR sensor and display appropriate messages.

5	Controlling two actuators using Arduino.
6	Creation of things speak account 8 Actuator controlling through cloud.
7	DHT11sensor data to cloud.
8	IoT based air pollution control system.
9	MQTT communication protocol with the ESP32 to publish messages and subscribe to topics.
10	CoAP server on ESP32 and Node client.

Course Outcomes:

Course outcome	Descriptions
CO1	Explain the various concepts of Embedded Systems and the technologies behind IoT.
CO2	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
CO3	Asses the existing solutions in the implementation of IoT.
CO4	Implementing IoT based Embedded Systems applications.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3											2		
CO2	2	2										2		
CO3	1	3	1	1				2				3		
CO4	1	3	3	2	3	2	2		3			3		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Embedded Systems	Raj Kamal	8th Edition, Mcgraw Hill, ISBN: 9789339203405 2014,
2	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things‖	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	1stEdition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)
3	Internet of Things	Srinivasa K G	CENGAGE Leaning India, 2017

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Internet of Things – A hands-on approach	Arshdeep Bhaga, Vijay Madisetti	Universities Press, 2015
2	The Internet of Things: Key Applications and Protocols	Olivier Hersent, David Boswarthick, Omar Elloumi	Packt Publications, (ISBN:978-1-78528-6582)
3	Internet of Things with Arduino Cookbook	Marco Schwatrz	Wiley publications, (ISBN:978-81-265-57653)

Department: Information Science and Engineering	**Semester:**	**V**

Subject: Computer Networks				
Subject Code:	**22IS503**		**L – T – P - C:**	**3–0–2–4**

Sl. No	Course Objectives
1	Understand the physical layer and data link layer functionality.
2	Learn concepts of routing and congestion handling.
3	Acquire knowledge on protocols in Transport layer for connection management.
4	Appreciate application layer protocols for user functionality.

Unit	Description	Hrs.
I	**Physical Layer:** Guided transmission media: Persistent Storage, Twisted Pairs, Coaxial Cable, Fiber Optics, Wireless transmission: Frequency hopping spread spectrum, Direct sequence spread spectrum, Digital modulation, Multiplexing: Frequency division multiplexing, Time division multiplexing, Code division multiplexing, Wavelength division multiplexing, Switching: Circuit switching and Packet switching.	**08**
II	**Data link Layer:** Data link layer design issues, Service provided to network layer, Framing, Error control, Flow control, Error detection and correction, Error correcting codes, Error detecting codes, Elementary data link protocols: Simplex link layer protocols: Adding flow control-stop and weight, Adding error correction-Sequence numbers and ARQ, Improving efficiency: Bidirectional transmission: Piggybacking, Sliding windows.	**08**
III	**Network Layer:** Network layer design issues: Store and forward packet switching, Implementation of connectionless service, Implementation of connection oriented service, comparison of Virtual circuit and Datagram networks. Routing algorithms: Shortest path routing, Flooding, Distance vector routing, Approaches to traffic management, Packet scheduling, Connecting endpoints across heterogeneous networks, Packet fragmentation, IP version 4 protocol, IP addresses, IP version 6.	**08**
IV	**Transport Layer:** Transport service primitives, Connection establishment, Connection release, Introduction to UDP, Remote procedure call, The TCP segment header, TCP connection establishment, TCP connection release, TCP Sliding window, TCP timer management, TCP Congestion control.	**08**
V	**Application Layer:** DNS: History and overview, The DNS lookup process, The DNS namespace and Hierarchy, Name resolution, Electronic mail: Architecture and Services, User agent, Message formats: MIME, Message transfer: SMTP, IMAP, The World Wide Web: Architectural overview, Static web objects, Dynamic web pages and web applications, HTTP and HTTPS: Overview, Methods, Message headers, Caching.	**08**

LAB CONTENT

Sl. No	Experiment Description
1	Write a program to implement the data link layer framing methods such as Bit Stuffing.
2	Write a program to implement the data link layer framing methods such as Character Stuffing and also to De-stuff it.
3	Write a program for frame sorting technique used in buffers.
4	Write a program for error detecting code using CRC-CCITT (16-bits).
5	Write a program to implement Dijkstra's algorithm to compute the Shortest path through a graph.
6	Write a program to obtain Routing table at each node using Distance Vector Routing by taking an example subnet graph with weights indicating delay between nodes.
7	Write a program to obtain broadcast tree by taking example subnet of hosts.
8	Write a program to automatic subnet address generation using network address.
9	Using TCP/IP sockets, write a client-server program to make client sending the file name and the server to send back the contents of the requested file if present.
10	Write a program on datagram socket for client/server to display the messages on client side, typed at the server side.
11	Write a program for congestion control using a leaky bucket algorithm.
12	Write a program to demonstrate hamming code for error correction.

Course Outcomes:

Course outcome	Descriptions
CO1	Able to acknowledge the working principles physical and data link layers.
CO2	Able to identify suitable techniques for handling network layer efficiently.
CO3	Able to use proper protocols and connection management techniques.
CO4	Able to claim application layer protocols for user communication

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	2	1								2		
CO2	1	3	2	2	1					1		2		
CO3	2	2	3	2	1					1		1		
CO4	3				2	1				3		1		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Computer Networks	Andrew S. Tanenbaum, Nick Feamster, David J. Weatherall	Sixth Edition, Pearson, 2022, ISBN 978-93—560-6360-0

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Data Communications and Networking with TCPIP Protocol Suite	Behrouz A. Forouzan	6th Edition, Tata McGraw- Hill, 2022, ISBN-13: 978-9355320940
2	Computer Networking- A Top- Down approach	James F Kurose and Keith W Ross	8th Edition, Pearson Education, 2022 ISBN-13: 978-0-13-285620-1

Department: Information Science and Engineering			**Semester:**	**V**
Subject: Advance JAVA and J2EE				
Subject Code:	**22IS5PE41**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	Know the different streamlined approaches to handling common programming tasks.
2	Understand console based, GUI based and web-based applications
3	To familiarize the Data Base and connectivity through the Java database connectivity (JDBC) and to introduce the basics of J2EE
4	Learn to create, debug and run multi-tier and enterprise-level applications

Unit	Description	Hrs.
I	**Multithreaded Programming:** The Java Thread Model: Thread Priorities, Synchronization, Messaging, The Thread Class and the Runnable Interface; The Main Thread, Creating a Thread: Implementing Runnable, Extending Thread, Choosing an Approach; Creating Multiple Threads, Using isAlive( ) and join( ), Thread Priorities, Synchronization: Using Synchronized Methods, The synchronized Statement; Interthread Communication: Deadlock; Suspending, Resuming, and Stopping Threads, Obtaining a Thread's State, Using a Factory Method to Create and Start a Thread, Using Multithreading	**08**
II	**Event Handling:** Two Event Handling Mechanisms, The Delegation Event Model: Events, Event Sources, Event Listeners; Event Classes: The ActionEvent Class, The AdjustmentEvent Class, The ComponentEvent Class, The ContainerEvent Class, The FocusEvent Class, The InputEvent Class, The ItemEvent Class; The KeyEvent Class: The MouseEvent Class, The MouseWheelEvent Class, The TextEvent Class, The WindowEvent Class; Sources of Events, Event Listener Interfaces: The ActionListener Interface, The AdjustmentListener Interface, The ComponentListener Interface, The ContainerListener Interface, The FocusListener Interface, The ItemListener Interface, The KeyListener Interface, The MouseListener Interface, The MouseMotionListener Interface, The MouseWheelListener Interface, The TextListener Interface, The WindowFocusListener Interface, The WindowListener Interface; Using the Delegation Event Model: Some Key AWT GUI Concepts, Handling Mouse Events, Handling Keyboard Events; Adapter Classes, Inner Classes: Anonymous Inner Classes	**08**
III	**Introducing Swing:** The Origins of Swing, Swing Is Built on the AWT, Two Key Swing Features: Swing Components Are Lightweight, Swing Supports a Pluggable Look and Feel; The MVC Connection, Components and Containers: Components, Containers, The Top-Level Container Panes, The Swing Packages, A Simple Swing Application, Event Handling, Painting in Swing: Painting Fundamentals, Compute the Paintable Area, A Paint Example. **Exploring Swing:** JLabel and ImageIcon, JTextField, The Swing Buttons: JButton, JToggleButton, Check Boxes, Radio Buttons; JTabbedPane,	**08**

	JScrollPane, JList, JComboBox, Trees, JTable.	
IV	**JDBC:** The Concept of JDBC; JDBC Driver Types; JDBC Packages; A Brief Overview of the JDBC process; Database Connection; Associating the JDBC / ODBC Bridge with the Database; Statement Objects; ResultSet; Transaction Processing; Metadata, Data types; Exceptions.	**08**
V	**Introducing Servlets:** Introducing Servlets, Background, The Life Cycle of a Servlet, Servlet Development Options, Using Tomcat, A Simple Servlet: Create and Compile the Servlet Source Code, Start Tomcat, Start a Web Browser and Request the Servlet; The Servlet API, The javax.servlet Package: The Servlet Interface, The ServletConfig Interface, The ServletContext Interface, The ServletRequest Interface, The ServletResponse Interface, The GenericServlet Class, The ServletInputStream Class, The ServletOutputStream Class, The Servlet Exception Classes; Reading Servlet Parameters, The javax.servlet.http Package: The HttpServletRequest Interface, The HttpServletResponse Interface, The HttpSession Interface, The Cookie Class, The HttpServlet Class; Handling HTTP Requests and Responses: Handling HTTP GET Requests, Handling HTTP POST Requests; Using Cookies, Session Tracking. **Java Beans:** What Is a Java Bean?, Advantages of Beans, Introspection: Design Patterns for Properties, Design Patterns for Events, Methods and Design Patterns, Using the BeanInfo Interface; Bound and Constrained Properties, Persistence, Customizer.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Apply Javas' built-in libraries to solve real world problems.
CO2	Design a reusable component for Graphical User Interface applications.
CO3	Implement three-tier architecture applications.
CO4	Invoke and develop server side objects.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3				2							
CO2			3		3									
CO3			2	2	2									
CO4			2	2	2									

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Java – The Complete Reference	Herbert Schildt	11th Edition, Tata McGraw Hill, 2019, ISBN: 978-1-26-044024-9 MHID: 1-26-044024-9
2	J2EE - The Complete Reference	Jim Keogh	23rd Reprint and 2008, Tata McGraw Hill, ISBN-13:978-0-07—52912-0.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to JAVA Programming	Y. Daniel Liang	10th Edition, Pearson Education, 2015, ISBN-13:9780133761313

Department: Information Science and Engineering			**Semester:**	**V**
Subject: Data Analytics using R Programming				
Subject Code:	**22IS5PE42**		**L – T – P – C:**	**3 – 0 – 0 – 3**

Sl. No	Course Objectives
1	Understand the theory and basics of data analytics and its life cycle.
2	Interpret fundamental statistical techniques in the context of the open source R analytic software environment.
3	Learn advanced analytical methods including clustering, classification and regression analysis.
4	Gain knowledge on specific technologies and tools that support advanced analytics with Big Data.

Unit	Description	Hrs
I	**Introduction to Big Data Analytics:** Big Data Overview, Data Structures, Analyst Perspective on Data Repositories, State of the Practice in Analytics, BI Versus Data Science, Current Analytical Architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics Data Analytics Lifecycle: Data Analytics Lifecycle Overview, Phase 1: Discovery, Phase 2: Data Preparation, Phase 3: Model Planning.	**08**
II	**Data Analytics Lifecycle:** Phase 4: Model Building, Phase 5: Communicate Results, Phase 6: Operationalize, Case Study: Global Innovation Network and Analysis (GINA) Phase 1: Discovery, Phase 2: Data Preparation, Phase 3: Model Planning, Phase 4: Mode/Building, Phase 5: Communicate Results, Phase 6: Operationalize. **Review of Basic Data Analytic Methods Using R :** Introduction to R, Exploratory Data Analysis, Statistical Methods for Evaluation.	**08**
III	**Advanced Analytical Theory and Methods:** Clustering, Overview of Clustering, K means, Additional Algorithms, **Advanced Analytical Theory and Methods: Association Rules :** Overview, A priori Algorithm, Evaluation of Candidate Rules, Applications of Association Rules, An Example: Transactions in a Grocery Store, Validation and Testing, Diagnostics .	**08**
IV	**Advanced Analytical Theory and Methods: Regression**: Linear Regression, Logistic Regression, Reasons to Choose and Cautions, Additional Regression Models. **Advanced Analytical Theory and Methods:** Classification: Decision Trees.	**08**
V	**Advanced Analytics-Technology and Tools: MapReduce and Hadoop Analytics for Unstructured Data:** UseCases MapReduce, Apache Hadoop **The Hadoop Ecosystem**: Pig , Hive, HBase, Mahout, **NoSOL**:.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Explain data architectures and data analytics lifecycle to manage and execute analytical projects.
CO2	Apply rigorous investigation of the datasets and use data analytics tool to perform exploratory data analysis.
CO3	Describe analytical methods considered for the model planning and execution phases of the data analytics lifecycle.
CO4	Explore on specific technologies and tools that support advanced analytics with Big Data.

Course Articulation Matrix:

CO \ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2				2	2		2			
CO2	3	3	2	2	3			2	2		2	2		
CO3	3	3	2	2	3			2	2		2	2		
CO4	3	3	2	2	3			2	2	1	2	2		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data	EMC Education Services	John Wiley and Sons Inc. 2015 Copyright

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Big Data and Analytics	Seema Acharya and Subhashini Chellappan	Wiley India Pvt. Ltd. 2018

Department: Information Science and Engineering			**Semester:**	**V**
Subject: Cloud Computing				
Subject Code:	**22IS5PE43**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	Provide comprehensive view to different aspects of cloud computing like; service models, Deployment models and challenges.
2	Introduce to cloud virtualization, with different type of virtualization and capacity planning metrics to clouds.
3	Know the concrete concepts of cloud security and their standards.
4	Contrast how Service oriented Architecture principles is helpful in Cloud Computing.

Unit	Description	Hrs.
I	**Examining the value proposition:** Defining Cloud Computing, Cloud Types, The NIST model, The Cloud Cube Model, Deployment models, Service models, Examining the Characteristics of Cloud Computing, Paradigm shift, Benefits of cloud computing, Disadvantages of cloud computing; Assessing the value proposition: Early adopters and new applications, the laws of cloudonomics, cloud computing obstacles, behavioral factors relating to cloud adoption, measuring cloud computing costs, specifying SLAs.	**08**
II	**Continuation of Examining, the value Proposition:** Understanding Cloud Architecture: Exploring the Cloud Computing Stack, Composability, Infrastructure, Platforms, Virtual Appliances, Communication Protocols; Understanding Services and Applications by Type: Defining IaaS, Defining PaaS, Defining SaaS, Defining IDaaS.	**08**
III	**Understanding Platform:** Using Virtualization Technologies, Load balancing and Virtualization, Understanding Hypervisors; Capacity Planning: Defining Baseline and Metrics, Baseline measurements, System metrics, Load testing, Resource ceilings, Server and instance types, Network Capacity, Scaling. **Cloud Infrastructure:** Cloud Computing at Amazon, Microsoft Windows Azure and Online Services.	**08**
IV	**Exploring Cloud Infrastructure:** Securing the Cloud, The security boundary, Security service boundary, Security mapping, Securing Data, Brokered cloud storage access, Storage location and tenancy, Encryption, Auditing and compliance, Establishing Identity and Presence, Identity protocol standards, Windows Azure identity standards.	**08**
V	**Understanding Services and Applications:** Understanding Service Oriented Architecture: Introducing Service Oriented Architecture, Event-driven SOA or SOA 2.0, The Enterprise Service Bus, Service catalogs, Defining SOA Communications, Business Process Execution Language, Business process modeling.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Define Cloud computing and characteristics and various types of cloud services.
CO2	Describe benefits and drawbacks of Cloud computing.
CO3	Explain various types of virtualization, capacity planning metrics and services.
CO4	Discuss Cloud Security and various challenges, SOA and various issues.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1		1		1						1			
CO2	1				1						1			
CO3	3		3		2			3			2	2		
CO4	3		2		3			3			2	2		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Cloud Computing Bible	Barrie Sosinsky	Wiley Publishing Inc. 2011 (free ebook available). ISBN: 978-0-470-90356-8
2	Cloud Computing Theory and Practice	Dan C. Marinescu	Elsevier Inc. 2013 ISBN: 978-0-12404-627-6

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Cloud Computing and SOA Convergence in Your Enterprise	David S. Linthicum	Addison-Wesley Professional. 1st edition-January 1, 2009. ISBN: 978-0-13-600922-1
2	Cloud Computing, A Practical Approach	Toby Velte, Anthony Velte,Robert Elsen peter	McGraw Hill Professional, 2010 ISBN: 978-0-07-162694-1

Department: Information Science and Engineering			**Semester:**	**V**
Subject: Software Engineering				
Subject Code:	**22IS5OE51**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	Understand systematic and disciplined approach for software development.
2	Analyse and Develop different customer requirements and SRS.
3	Compare different software testing strategies and Appreciate Project management activities.

Unit	Description	Hrs.
I	**Software And Software Engineering:** The Nature of Software, the Unique Nature of Web Apps, Software Engineering, the Software Process, Software Engineering Practice. The Software Process: Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models.	**08**
II	**Introduction to agility:** What Is Agility?, Agility and the Cost of Change, What Is an Agile Process, Other Agile Process Models, A tool set for the Agile Process	**08**
III	**Requirements Engineering And Modeling:** Requirements Engineering, Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts.	**08**
IV	**Requirements Engineering And Modeling contd..** Class-Based Modeling. Requirements Modeling Strategies, Flow-Oriented Modeling, Creating a Behavioral Model, Requirements Modeling for WebApps – How Much Analysis is Enough, Requirements Modeling Input, Requirements Modeling Output.	**08**
V	**Architectural Design:** Software Architecture, Architectural Genres, Architectural Styles, Architectural Design. **Project Management Concepts**: The management spectrum, People	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Understand Software Development Life Cycle (SDLC) and Client Requirements using various Requirements Modelling Techniques.
CO2	Design and develop Software Models, Architecture and Code.
CO3	Compare the uses of Agile and Web Apps development with traditional software development.
CO4	Describe project planning, Cost estimation and adopt Management skills and abilities.

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	1			2					2	1		
CO2	1	2	3	2		1	2	1	2	2	2	1		
CO3	1	3	3	3	2	2	1	1	3	3	3	1		
CO4	1	2	3	1		1	2	2	3	3	3	3		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Software Engineering - A Practitioners approach.	Roger .G. Pressman	8th Edition, 2019 Tata McGrawhill. ISBN–13: 978-0073375977

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	An Integrated Approach to Software Engineering.	Pankaj Jolate	Narosa Publications, 3rd Edition, 2018 ISBN: 978-1-4684-9312-2
2	Software Engineering.	Ian Sommerville	10th Edition, 2018, Pearson Education Ltd. ISBN–13:978-0137035151

Department: Information Science and Engineering			**Semester:**	**V**
Subject: Fundamentals of Algorithms				
Subject Code:	**22IS5OE52**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	Learn how to design recursive and non-recursive algorithms.
2	Know different Algorithm Design Techniques for effective problem solving.
3	Learn how to analyze the algorithm with respect to space and time complexity.
4	Understand basic efficiency classes and asymptotic notations to express the complexity.

Unit	Description	Hrs.
I	**Introduction, Fundamentals of the Analysis of Algorithm Efficiency, Brute Force:** Algorithm Definition, Fundamentals of algorithmic problem solving, Analysis Framework, Formal Definitions of Asymptotic Notations, Basic efficiency classes, Mathematical analysis of Non-Recursive Algorithms for element uniqueness problem, Maximum element in an array and recursive Algorithms for factorial and element uniqueness problem. **Brute Force:** Selection Sort, String Matching,	**08**
II	**Divide and Conquer:** Merge Sort, Finding the Maximum and Minimum. **Decrease and Conquer:** Insertion Sort, Topological Sorting.	**08**
III	**Transform and Conquer:** Heaps and Heap Sort, AVL Trees. **Space and Time Tradeoffs**, Hashing: Hash table, Hash functions, Collision handling by open addressing and chaining.	**08**
IV	**Greedy Technique:** Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm. **Dynamic Programming:** Floyd's Algorithms and 0/1 Knapsack Problem.	**08**
V	**Back tracking:** n-Queen's Problem, Subset-Sum Problem. **Branch and Bound:** Assignment Problem, Knapsack Problem, and Traveling Salesman Problem.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the basic concepts of design and analysis of algorithms.
CO2	Demonstrate various algorithm design techniques to solve a given problem.
CO3	Design/Develop an algorithm using algorithm design technique and analyze its complexity to rank order of growth.
CO4	Apply the appropriate algorithm design technique to solve the given problem instance.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2											
CO2	1	3	3	2										
CO3		2	2	2										1
CO4	2	3	3	2										

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to the Design & Analysis of Algorithms	AnanyLevitin	3rd Edition, Pearson Education, 2012, ISBN-13: 978-0-13-231681-1
2	Computer Algorithms/C++	Ellis Horowitz, Satraj Sahni and Rajasekaran	2nd Edition, 2014, Universities Press, ISBN-13:978-8173716119

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Introduction to Algorithms	Cormen T.H, Leiserson C.E. &Rivest R.L	3rd Edition, PHI, 2009, ISBN-13: 978-0262033848
2	Fundamental of algorithms	Gilles Brassard & Paul Bratley	2nd Edition, PHI 1999, ISBN-13:978-120311312

Department: Information Science and Engineering			**Semester:**	**V**
Subject: Introduction to UNIX				
Subject Code:	**22IS5OE53**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	Understand the UNIX Operating System architecture and its functionalities.
2	Gain important aspects of file system and file attributes.
3	Familiar with utilities provided by UNIX.
4	Learn how to use UNIX editor environment.

Unit	Description	Hrs
I	**UNIX Architecture & Command Usage:** The UNIX Operating System, The UNIX Architecture, Features of UNIX, Locating Commands, Internal and External Commands, Command Structure, Flexibility of command usage, Man Browsing and manual pages on-line, Understanding man documentation, Further help with man –k, appropos and what is?	**08**
II	**General-Purpose Utilities:** Cal: The Calendar, date: Displaying the System Date, echo: Displaying a message, printf: An alternative to echo, bc: The Calculator, script: Recording your session, email basics, mailx: The Universal Mailer, passwd: changing your password, who: Who are the users? Uname: Knowing your machine characteristics, tty: Knowing your terminal.	**08**
III	**The File System:** File System: The File, What's in aFile name? The Parent – Child Relationship, The HOME variable, pwd, cd, mkdir, rmdir, Absolute Pathnames and Relative Pathnames, ls, The UNIX File System. **Handling Ordinary Files:** Cat, cp, rm, mv, more, The lp subsystem, file, wc, cmp.	**08**
IV	**Basic File Attributes:** ls –l: Listing File Attributes, The –d Option, Listing Directory Attributes, File Ownership, File Permissions, chmod: Changing File Permissions, Directory Permissions, Changing File Ownership	**08**
V	**The vi Editor:** Vi basics, Input mode, Saving text and quitting, Navigation, Editing text, Undoing last editing instructions, Repeating the last command, Searching for a pattern, Substitution.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Describe the architecture and features of UNIX Operating System.
CO2	Use File system and basic file system commands.
CO3	Interpret various UNIX utilities to manage file processing operations.
CO4	Explain how to use various commands available in editor environment.

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1												
CO2	2	1												
CO3		3	1	1								2		
CO4	2		1		1							2		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Unix Concepts and Applications	Sumitabha Das	4th Edition, Tata McGraw Hill, 2018. ISBN-13 978-0070635463

Reference Books: Nil

Department: Humanities and Sciences		**Semester:**	**V**
Subject: Research Methodology (Institutional Elective)			
Subject Code:	**22IE561**	**L – T – P - C:**	**2 – 0 – 0 – 2**

Sl. No	Course Objectives
1	To give an overview of the research methodology and explain the technique of defining a research problem.
2	To explain carrying out a literature search, its review and to explain various research designs and their characteristics.
3	To explain the details of sampling designs, and also different methods of data collections.
4	To develop theoretical, conceptual frameworks, writing a review, to explain the art of interpretation and the art of writing research reports.

COURSE TOPICS: The course has 28 lecture hours in 5 Units. 2- Lecture hours per week of 1-hour duration.

Unit	Description	Hrs
I	**Research Methodology:** Introduction, Meaning of Research, Objectives of Research, Motivation in Research, Types of Research, Research Approaches, Significance of Research, Research Methods versus Methodology, Research and Scientific Method, Importance of Knowing How Research is Done, Research Process, Criteria of Good Research, and Problems Encountered by Researchers in India. **Defining the Research Problem:** Research Problem, Selecting the Problem, Necessity of Defining the Problem, Technique Involved in Defining a Problem, An Illustration. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding.	**6 hrs**
II	**Reviewing the literature:** Place of the literature review in research, Bringing clarity and focus to your research problem, Improving research methodology, Broadening knowledge base in research area, Enabling contextual findings, How to review the literature, searching the existing literature, reviewing the selected literature, Developing a theoretical framework, Developing a conceptual framework, Writing about the literature reviewed. **Bloom's Taxonomy Level:** L1 – Remembering, L2 – Understanding.	**5 hrs**
III	**Research Design:** Meaning of Research Design, Need for Research Design, Features of a Good Design, Important Concepts Relating to Research Design, Different Research Designs, Basic Principles of Experimental Designs, Important Experimental Designs. **Design of Sample Surveys:** Introduction, Sample Design, Sampling and Non-sampling Errors, Sample Survey versus Census Survey, Types of Sampling Designs. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding.	**7hrs**

IV	**Data Collection**: Experimental and Surveys, Collection of Primary and Secondary Data, Selection of Appropriate Method for Data Collection, Case Study Method.**Hypothesis**- Basic concepts, types of hypothesis, Formulation of hypothesis, testing of hypothesis, Analysis of data, **Interpretation of data-** Meaning of Interpretation, Technique of Interpretation, Precaution in Interpretation, Editing, classification and tabulation. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding.	**6hrs**
V	**Report Writing:** Significance of Report Writing, Different Steps in Writing Report, Layout. Types of Reports, Oral Presentation, Mechanics of Writing a Research Report, Precautions for Writing Research Reports. Research ethics, Citations, Similarity check.	**4hrs**

Course Outcomes:

Course outcome	Descriptions
	At the end of the course the student will be able to:
CO1	Discuss research methodology and the technique of defining a research problem.
CO2	Explain the functions of the literature review in research, carrying out a literature search.
CO3	Developing theoretical and conceptual frameworks and writing a review.
CO4	Explain various research designs, their characteristics. explain the art of interpretation and the art of writing research reports.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	2	1	2	2	1	1	3	3	2	3		
CO2	1	1	2	2	1	1	1	1	1	1	1	2		
CO3	3	3	3	3	1	2	2	1	3	3	2	3		
CO4	1	3	2	1	1	2	2	3	3	2	3	3		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Research Methodology: Methods and Techniques	C.R. Kothari, Gaurav Garg	New Age International 4th Edition, 2018
2	Research Methodology a step-by-step guide for beginners. (For the topic Reviewing the literature under module 2	Ranjit Kumar	SAGE Publications Ltd. 3rd Edition, 2011

Reference Books:

Sl	Reference Book Title	Author	Volume and Year of Edition
1	Research Methods: the concise knowledge base	Trochim	Atomic Dog Publishing2005
2	Conducting Research Literature Reviews: From the Internet to Paper	Fink A	Sage Publications 2009

Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each unit. Each question will have questions covering all the topics under a unit. The students will have to answer FIVE full questions, selecting ONE full question from each unit.

Department: Humanities and Sciences		**Semester:**	**V**
Subject: Management and Entrepreneurship(Institutional Elective)			
Subject Code:	**22IE562**	**L – T – P -**	**2 – 0 – 0 – 2**

Sl. No	Course Objectives
1	Explain fundamentals of management, functions of a manager. Also explain planning, organizing, and staffing, decision making processes and explain the organizational structure.
2	Describe the understanding of motivation and different control systems in management, leadership process, understanding of Entrepreneurship and its development process.
3	Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur and summarize the preparation of project report, need significance of report. Also to explain about industrial ownership.
4	To explain various forms of the intellectual property, its relevance and business impact in the changing global business environment and to discuss leading International Instruments concerning Intellectual Property Rights.

COURSE TOPICS: The course has 28 lecture hours in 5 Units, 2- Lecture hours per week of 1-hour duration.

Unit	Description	Hrs
I	**Introduction** - Meaning, nature and characteristics of management, scope and Functional areas of management, goals of management, levels of management, **Planning-** Nature, importance, types of plans, steps in planning, **Organizing**- nature and purpose, types of Organization, Staffing- meaning, process of recruitment and selection. **Directing and controlling**- meaning and nature of directing, leadership styles, motivation Theories, Communication- Meaning and importance, Coordination meaning and importance, Controlling- meaning, steps in controlling, methods of establishing control. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding.	**6 hrs**
II	**Entrepreneur** – meaning of entrepreneur, characteristics of entrepreneurs, classification and types of entrepreneurs, various stages in entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India and barriers to entrepreneurship. Identification of business opportunities, market feasibility study, technical feasibility study, financial feasibility study and social feasibility study. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding.	**5 hrs**
III	**Preparation of project and ERP (Enterprise resource planning)** - meaning of project, project identification, project selection, project report, need and significance of project report, contents, formulation, guidelines by planning commission for project report, Enterprise Resource Planning: Meaning and Importance- ERP and Functional areas of Management – Marketing / Sales- Supply Chain Management – Finance and Accounting – Human Resources – Types of reports and methods of report generation. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding.	**5hrs**
IV	**Micro and Small Enterprises**: Definition of micro and small enterprises, characteristics and advantages of micro and small enterprises, steps in	**6hrs**

	establishing micro and small enterprises, Government of India indusial policy 2007 on micro and small enterprises, case studies in respective domains. Institutional support: MSME-DI, NSIC, SIDBI, KIADB, KSSIDC, TECSOK, KSFC, DIC and District level single window agency. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding.	
	Intellectual Property: Introduction to IP**:** Importance of IPR, International conventions / agreements / treaties, Origin of IP law and history, laws related to IP in India: Indian Patent Act 1970, WIPO. **Patents:** Criteria for patentability, patentable and non-Patentable Matters, introduction to Prior Art Search, types of patent application: ordinary, convention, PCT, divisional and Patent of addition, filing procedure, drafting complete specification and claims. **Copyright:** Criteria, filing procedure, Copyright Infringement, rights of authorship and ownership, Fair Use, first sale doctrine, moral rights and economic rights. **Trademarks:** definition, eligibility Criteria, types of patents, filing procedure, Classification of Trademarks and well-known mark **Geographical Indications:** Definitions, importance, filing procedure, GI ecosystem in India and case laws **Industrial design:** eligibility criteria, Non-Protectable Industrial Designs India, Procedure for Registration, importance of design registration. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding.	**6hrs**

Course Outcomes:

Course outcome	Descriptions
CO1	Explain management functions of a manager. Also explain planning and decision making processes. Organizational structure, staffing and leadership processes.
CO2	Describe the understanding of motivation and different control systems in management and understanding of Entrepreneurships and its development process.
CO3	Illustrate Small Scale Industries, various types of supporting agencies and financing available for an entrepreneur. Summarize the preparation of project report, need significance of report.
CO4	Shall get an adequate knowledge on patent and copyright for their innovative research works and provide further the way for developing their idea for innovations

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	2	1	3	2	3	3	3	2	2		
CO2	1	1	2	2	1	2	1	3	3	3	3	1		
CO3	1	2	3	2	1	3	2	3	3	3	3	1		
CO4	1	1	2	1	1	2	2	2	2	2	1	2		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Principles of Management	P. C. Tripathi, P. N. Reddy	Tata McGraw Hill, 4th / 6th Edition, 2010.
2	Intellectual property rights - Unleashing the knowledge economy	Pmbuddha Ganguli	Tata Mccraw HiU Publishing Company Ltd

Reference Books:

Sl No	Reference Book Title	Author	Volume and Year of Edition
1	Management and Entrepreneurship	Kanishka Bedi	Oxford University Press-2017
2	Entrepreneurship Development	S S Khanka	S Chand & Co.
3	Dynamics of Entrepreneurial Development & Management -	Vasant Desai	Himalaya Publishing House

Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each unit. Each question will have questions covering all the topics under a unit. The students will have to answer FIVE full questions, selecting ONE full question from each unit.

Department: Humanities and Sciences		Semester:	FIFTH Semester
Subject: Project Management (Institutional Elective)			
Subject Code:	22IE563	L – T – P - C:	2 – 0 – 0 – 2

Sl. No	Course Objectives
1	To understand the scope, timing and quality of the project, and to analyze the project goals, constraints, deliverables, performance criteria, control needs and resource requirement in consultation with stake holders
2	To implement the process of project management, life cycle and the embodied concepts, tools and techniques in order to achieve project success
3	To understand the team efforts and stakeholders in professional manner, respecting differences, to ensure a collaborative project environment
4	To apply project management practices to new programs, initiatives, products, services and events relative to the needs of stakeholders

COURSE TOPICS: The course has 28 lecture hours in 5 Units, 2- Lecture hours per week of 1-hour duration.

Unit	Description	Hrs
I	**Introduction:** Project, Program, and portfolio, Operations management, Product life cycle, Project life cycle, Project management life cycle, Role of project manager and office, Ten Project Knowledge areas with their associated processes **Project Integration Management**: Develop project charter, Develop project management plan, Direct & manage project work, Monitor control project,	**6hrs**
II	**Project scope management:** Plan scope management, Collect requirements, Define scope, Create WBS (Work Breakdown Structure), Validate Scope, Control scope. **Project Schedule management**: **Plan Schedule management** Define activities, Sequence activities, Estimate activity durations, Develop schedule, and Control schedule. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding. L3-Analyzing	**5hrs**
III	**Project cost management:** Plan cost management, Estimate cost, Determine budget, and Control costs. Project quality management: Plan quality management, Manage quality and Control quality **Project resource management:** Plan resource management, Estimate activity resources, Acquire resources, Develop team, Manage team and Control resources. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding. L3-Analyzing	**6 hrs**

IV	**Project communication management:** Plan communication management , Manage communications and Monitor communications **Project risk management:** Plan risk management, Identify risks, Perform qualitative risk analysis, Perform quantitative risk analysis, Plan risk responses, Implement risk responses and Monitor risks. **Project Procurement management:** Planprocurement management, Conduct procurement, Control procurements. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding. L3-Analyzing	**6hrs**
V	**Project stake holder management:** Identify stake holders, Plan stake holder management, Manage stake holder engagement, and Monitor stake holder engagement. A case study relevant to the domain knowledge of the department is taken up to explain the principles of the project management as brought out above. **Bloom's Taxonomy Level:** L_1 – Remembering, L_2 – Understanding. L3-Analyzing	**5hrs**

Course Outcomes:

Course outcome	Descriptions
CO1	Outline the procedure for analyzing a project and define the rational of work break structure
CO2	Illustrate the use of network techniques for successful project implementation
CO3	Design the procedure for overall financial analysis of the project alongside the resources requirement and ideal quality
CO4	Identify the sources and process for communication, risk management and procurement and build a comprehensive plan for the stakeholder management.

Course Articulation Matrix

PO /PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2	1	2	2	1	2	2	3	3	3	2		
CO2	1	2	2	3	1	3	2	3	3	3	3	1		
CO3	1	3	2	1	1	2	1	3	3	3	3	1		
CO4	1	1	2	3	1	2	2	3	3	3	3	2		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Project Management Book of Knowledge	Book of Knowledge	6th Edition, PMI, USA
2	Project Management	Dennis Lock	Taylor & Francis 10th Edition-2013

Reference Books:

Sl No	Reference Books Title	Author	Volume and Year of Edition
1	Project Planning: Analysis, Selection,Implementation and Review,	Prasanna Chandra	MC- Graw Hill Education, 8th Edition, 2017.
2	Project Management-a system approach to planning, scheduling & controlling	Harold Kerzner	CBS publications and Distributions,2002

Question paper pattern: The question paper will have TEN questions. There will be TWO questions from each unit. Each question will have questions covering all the topics under a unit. The students will have to answer FIVE full questions, selecting ONE full question from each unit.

Department: Information Science and Engineering	Semester:	V

Subject: Dept. Skill Lab – 3 (Machine Learning Laboratory)				
Subject Code:	**22IS507**		**L – T – P - C:**	**1–0–2–2**

Sl. No	Course Objectives
1	Make use of Data sets in implementing the machine learning algorithms.
2	Implement the machine learning concepts and algorithms in any suitable language of choice.
3	Understand and present the key algorithms and theory that form the core of machine learning.
4	Analyze the performance of Machine Learning techniques which varies with the number of training examples presented.

LAB CONTENT

Sl. No	Experiment Description
1	1. Write a Python program to load iris data set and apply Naïve-Bayes algorithm for classification of Iris flowers. 2. Write a Python program to extract social_network_ads.csv file. Apply k-Nearest Neighbor technique to identify the users who purchased the item or not. 3. Write a Python program to load whether data set and apply a perceptron learning algorithm to determine whether the rain occurs tomorrow or not.
2	4. Implement the Backpropagation algorithm in Python to classify iris data set. 5. Consider a Mall_Customers data set which is the data of customers who visit the mall and spend there. In the given dataset, we have Customer_Id, Gender, Age, Annual Income ($), and Spending Score (which is the calculated value of how much a customer has spent in the mall, the more the value, the more he has spent). From this dataset, calculate some patterns using k-Means clustering method. 6. Consider a dataset that has two variables: salary (dependent variable) and experience (Independent variable). Build a simple Linear-Regression model in Python to do the following: • Find out if there is any correlation between these two variables. • Find the best fit line for the dataset. Show how the dependent variable is changing by changing the independent variable.
3	7. Implement Support Vector Machine algorithm in Python for any suitable data set available. 8. Consider the User Database which contains information about UserID, Gender, Age, Estimated Salary, and Purchased. Apply Logistic Regression in Python to

	predict whether a user will purchase the company's newly launched product or not. Implement Polynomial Regression model in Python for any suitable data set available.
4	Mini- Project: A mini Project should be implemented and shall be carried out in a batch of two students. The students will finalize a topic in consultation with the faculty. The mini project should be carried in the college only. The mini project tasks would include: a) Understand the complete domain knowledge of application and derive the complete data requirement specification of the mini project. b) Design of the project. c) Use of appropriate algorithm. d) Documentation and submission of report. Referential mini project titles: 1. Stock price prediction 2. MNIST digit classification 3. Iris flower classification 4. Emotion recognition 5. Object detection 6. Image classification 7. Chatbot 8. Fraud detection 9. Recommendation systems 10. Fake news detection 11. BigBasket sales prediction 12. Loan approval prediction 13. House price prediction 14. Language detection 15. Heart disease prediction 16. Marriage match prediction 17. Crop disease prediction 18. Leaf disease prediction 19. Cancer prediction 20. Bit coin price prediction

Course Outcomes:

Course outcome	Descriptions
CO1	Understand the implementation procedures for the machine learning algorithms.
CO2	Design Python programs for various Learning algorithms.
CO3	Apply appropriate data sets to the Machine Learning algorithms.
CO4	Identify and apply Machine Learning algorithms to solve real world problems.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3		2									
CO2	2	2	3	1	2									
CO3	2	2	2	2	2							1		3
CO4	2	2	2	2	2							1		3

Department: Humanities and Sciences			**Semester:**	**V**
Subject: SKILL DEVELOPMENT-II (APTITUDE SKILLS)				
Subject Code:	**22SK508**		**L – T – P - C:**	**0-0-2-1**

Course Objectives:

Sl. No	This course will enable the students to
1	Develop Critical Thinking and Reasoning Skills
2	Master Seating and Arrangement Techniques
3	Enhance Analytical and Mathematical Reasoning
4	Apply Advanced Problem-Solving Strategies

Unit	Description	Hrs
I	**Logical Aptitude** - Syllogism, Venn-diagram method, Three statement syllogism, Deductive and inductive reasoning. Introduction to puzzle and games organizing information, parts of an argument, common flaws, arguments and assumptions. **Linear Seating Arrangement** Single or Double rows facing each other or away from each other in the same direction **Circular Seating Arrangement** · Uni- & Bi-directional problems on · Circular, Square, Rectangular, Hexagonal tables **Coding Decoding:** Letter Coding, Number Coding, symbol coding **Crypt arithmetic**: Basic concepts , addition , subtraction, multiplication of coded alphabets, Types of cryptarithm, Clocks and Calendar **Reasoning** – a. Verbal - Blood Relation, Sense of Direction, Arithmetic & Alphabet. Non- Verbal reasoning - Visual Sequence, Visual analogy and classification. Analytical Reasoning - Single & Multiple comparisons, Linear Sequencing.	6
II	**Permutation and Combination**: Understanding the difference between the permutation and combination, Rules of Counting-rule of addition, rule of multiplication, factorial function, Concept of step arrangement, Permutation of things when some of them are identical, Concept of 2n, Arrangement in a circle. **Probability**: Single event probability, multi event probability, independent events and dependent events, mutually exclusive events, non-mutually exclusive events, combination method for finding the outcomes.	6
III	**Number System** · Divisibility & Remainder, · Multiples & Factors,· Integers,· LCM & HCF,· Complete a number Series,· Find the Missing Term and Wrong Term **Simplification** · BODMAS Rule, · Approximation, · Decimals, · Fractions, · Surds & Indices **Percentage** Calculation-oriented basic percentage, Profit and Loss, Successive Selling type, Discount & MP, Dishonest Dealings, Partnerships	6

	Interest : Simple Interest, Compound Interest, Mixed Interest, Instalments. **Data Interpretation**: Approach to interpretation - simple arithmetic, rules for comparing fractions, Calculating (approximation) fractions, short cut ways to find the percentages, Classification of data– Tables, Bar graph, line graph, Cumulative bar graph, Pie graph, Combination of graphs. Combination of table and graphs	
IV	**Averages and Allegations mixtures**: Average: relevance of average, meaning of average, properties of average, deviation method, concept of weighted average. Allegation method: a situation where allegation technique, general representation of allegations, the straight line approach, application of weighted average and allegation method in problems involving mixtures. Application of allegation on situations other than mixtures problems. **Data Sufficiency**: Questions based on > Quantitative aptitude, > Reasoning aptitude > Puzzles	4
V	**Ratio and Proportion** · Simple Ratios, · Compound Ratios, · Comprehend and Dividend · Direct & Indirect Proportions, · Problems on ages, · Mixtures & Allegation **Speed, Time and Distance** · Relative Speed, · Average Speed, · Problems on Train, · Boat & Stream. **Time and Work** · Work Efficiency, · Work & Wages, Pipes & Cisterns	6

Course Outcomes:

Course outcome	At the end of the course students will be able to
CO1	Enhanced Logical and Analytical Thinking
CO2	Proficiency in Advanced Arrangement and Sequencing Problems
CO3	Strong Numerical and Mathematical Aptitude
CO4	Effective Data Interpretation and Quantitative Analysis

Course Articulation Matrix:

CO \ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1					2		3	3	3				
CO2	1					2		3	3	3				
CO3	1					2		3	3	3				
CO4	1					2		3	3	3				

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	How to Prepare for Logical Reasoning for CAT" by Arun Sharma	Arun Sharma	• ISBN-10: 9352602280 • ISBN-13: 978-9352602287
2	A Modern Approach to Verbal & Non-Verbal Reasoning" by R.S. Aggarwal	R.S. Aggarwal	• ISBN-10: 8121924987 • ISBN-13: 978-8121924986

Reference Books:

Sl	Text Book title	Author	Volume and Year of
1	Quantitative Aptitude for Competitive Examinations" by R.S. Aggarwal	R.S. Aggarwal	ISBN-10: 9352534026 ISBN-13: 978-9352534021
2	Logical Reasoning and Data Interpretation for the CAT" by Nishit K. Sinha	Nishit K. Sinha	ISBN-10: 933922269X ISBN-13: 978-9339222694

Scheme of Teaching and Examination-2020 (170 Credits Scheme)

Outcome Based Education (OBE) and Choice Based Credit System (CBCS)

VI Semester B.E.

Sl No.	Course Code		Course Title	Teaching Dept.	L	T	P	Credits	CIE	SEE	Total Marks	Exam Hrs
01	PC	22IS601	Software Engineering Practices and Agile Methodologies	IS	3	-	-	3	50	50	100	3
02	PC	22IS602	Web Technologies	IS	3	-	2	4	50	50	100	3
03	PC	22IS603	Cryptography and Network Security	IS	3	-	2	4	50	50	100	3
04	PE	22IS6PE4X	Professional Elective-II	IS	3	-	-	3	50	50	100	3
06	OE	22IS6OE5X	Open Elective-II	IS	3	-	-	3	50	50	100	2
05	HS	22IS66X	Online Course: NPTEL / MOOC / SWAYAM: 22NP661-NPTEL, 22MC662-MOOC, 22SW663-SWAYAM	IS	2	-	-	2	50	-	50	-
07	PW	22ISMP607	Mini Project	IS	-	-	4	2	50	50	100	3
08	HS	22SK608	Preplacement Training	T&P	-	-	2	1	50	-	50	-
L-Lecture, T-Tutorial, P-Practical,/Drawing, CIE-continuous Internal Evaluation, SEE-Semester End Examination				**Total**	**17**	**-**	**10**	**22**	**400**	**350**	**750**	**-**
Credit Distribution: Basic Science (BS)=8+8+3+3=22, Engineering Science (ES)=10+11=21, Humanities and Social Sciences (HS)=1+2+2+2+3=9, Program Core (PC)=2+16+16+15+11=58, Program Elective (PE)=3+3=6, Open Elective (OE)=3+3=6,Project Work (PW)=2, Online course=2, Total Credits=20+20+21+21+22+22=126. Total 80 AICTE Activity points need to earn by each regular student and Total 55 Activity points need to earn by each Lateral entry student at the end of 3rd Year BE.												

Professional Elective-II	Open Elective-II
22IS6PE41: Information Storage and Management	22IS6OE51: Artificial Intelligence
22IS6PE42: Artificial Neural Networks	22IS6OE52: Software Testing
22IS6PE43: Software Quality Assurance and Testing	22IS6OE53: Human Computer Interaction

Department: Information Science and Engineering			**Semester:**	**VI**
Subject: Software Engineering Practices and Agile Methodologies				
Subject Code:	**22IS601**		**L – T – P - C:**	**3–0–0-3**

Sl. No	Course Objectives
1	Understand systematic and disciplined approach for software development.
2	Analyze and develop different customer requirements and SRS.
3	Understand the Agile manifesto, principles and the context of agile methods.
4	Know the concrete techniques of design and development that agile teams use to apply.

Unit	Description	Hrs.
I	**Software And Software Engineering**: The Nature of Software, the Unique Nature of Web Apps, Software Engineering, the Software Process, Software Engineering Practice. **The Software Process:** Process Models, A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models: The Waterfall Model, Incremental Process Models, Evolutionary Process Models, Concurrent Models.	**08**
II	**Requirements Engineering And Modeling:** Requirements Engineering, Requirements Analysis, Scenario-Based Modeling, UML Models That Supplement the Use Case, Data Modeling Concepts, Class-Based Modeling. Flow-Oriented Modeling, Creating a Behavioral Model, Requirements Modeling for WebApps – How Much Analysis is Enough, Requirements.	**08**
III	**Design Concepts:** Design within the Context of Software Engineering, the Design Process, Design Concepts, The Design Model. **Architectural Design:** Software Architecture, Architectural Genres, Architectural Styles, Architectural Design.	**08**
IV	**Introduction to agility:** What Is Agility?, Agility and the Cost of Change, What Is an Agile Process, Other Agile Process Models, A tool set for the Agile Process**. Fundamentals of Agile:** The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Continuous Integration, Refactoring, Pair Programming, Simple Design	**08**
V	**Agile Scrum Framework:** Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User Stories, Characteristics and content of user stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Key challenges to implementing Agile Development and Project management Frameworks.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Understand Software Development Life Cycle (SDLC) and Client Requirements using various Requirements Modeling Techniques.
CO2	Design and develop Software Models and Architecture.
CO3	Understand the business values of adopting Agile approaches to Software Development.
CO4	Capable of applying the agile development practices, design principles and refactoring to achieve agility.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1			3	3	3		3		3	3				
CO2			3	3			2		3			3		
CO3	3	3	3	3					3					
CO4					3							3		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Software Engineering - A Practitioners approach.	Roger .G. Pressman	Tata McGraw Hill, July 2017, 8th Edition, 2019 , ISBN–13: 978-0073375977
2	Agile Software Development with Scrum	Ken Schawber, Mike Beedle	Pearson : 2002, ISBN–9780130676344, 0130676349

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	An Integrated Approach to Software Engineering.	PankajJolate	Tata McGraw Hill, July 2017, 8th Edition, ISBN 978-1259064753

Department: Information Science and Engineering	**Semester:**	**VI**

Subject: Web Technologies				
Subject Code:	**22IS602**		**L – T – P - C:**	**3–0–2–4**

Sl. No	Course Objectives
1	Illustrate the Syntax and Semantic Structure of XHTML tags with CSS.
2	Define and use user-defined tags in XML and JSON documents.
3	Design Client-Side and Server Side programs using JavaScript and PHP and to infer PHP's capabilities to access database.
4	Describe framework for creating responsive, mobile first website.

Unit	Description	Hrs.
I	**A Brief Introduction to the Internet:** What is the Internet? Internet protocol addresses; Domain names; Web Serves: Web server operation, General Server characteristics, Apache, IIS; Uniform Resource Locators: URL Formats, URL paths; Multipurpose Internet Mail Extensions: Type Specifications, Experiential Document Types; The Hypertext Transfer Protocol: The Request Phase, The Response Phase. **Introduction to HTML/XHTML:** Basic Syntax, Standard HTML Document Structure, Basic Text Markup, Images: The Image Element, Hypertext Links, Lists, Tables, Forms, Syntactic Differences between HTML and XHTML.	**08**
II	**The Basics of JavaScript:** Overview of JavaScript: Uses of JavaScript, Browsers and HTML-JavaScript Documents, Object Orientation and JavaScript, General Syntactic Characteristics, Primitives, Operations, and Expressions: Primitive Types, Numeric and String Literals, Other Primitive Types, Declaring Variables, The Math Object, The Number Object, The Date Object, Screen Output and Keyboard Input, Control Statements: Examples, Object Creation and Modification, Arrays, Functions, Examples, Constructors, Pattern Matching Using Regular Expressions, Another Examples.	**08**
III	**JavaScript and HTML Document, Introducing CSS, XML, JSON and AJAX:** The Document Object Model (DOM), Element Access in JavaScript, Handling Events from Text Box and Password Elements. CSS: Level of Style Sheets, Style Specification formats, Selector forms, Property-Value Forms, XML: Uses of XML, The Syntax of XML, XML Document Structure, JSON: JSON format, What is JSON? Array literals, Object literals, Mixing literals, JSON syntax, JSON encoding and decoding, JSON versus XML. What Is Ajax?: Ajax Is Born, The Evolution of the Web 2, The Real Ajax, Ajax Principles Technologies behind Ajax, Who Is Using Ajax?	**08**
IV	**Introduction to Bootstrap 5.3:** Getting started: Introduction, Layout: Breakpoints, Containers, Grid, Columns, Z-index; Content: Tables; Forms: Overview, range, Input group, Validation. Components: Buttons, Collapse, Modal, Navbar, Navs & tabs.	**08**

V	**Introduction to PHP:** Origins and Uses of PHP, Overview of PHP, General Syntactic Characteristics, Primitives, Operations, and Expressions: Variables, Scalar Type Conversions, Output, Control Statements: Examples, Arrays, Functions, Constructors, Pattern Matching, Form Handling, Cookies, Session Tracking, Database Access with PHP and MySQL.	**08**

LAB CONTENT

Sl. No.	Experiment Description
1.	Create and test an HTML document for: **a)** Yourself, including your name, address, and electronic mail address. If you are a student, you must include your major and your grade level. If you work, you must include your employer, your employer's address, and your job title. **b)** Add pictures of yourself and at least one other image (of your friend, spouse, or pet) to the document created. **c)** Add a second document to the document created that describes part of your background, using background as the link content. This document should have a few paragraphs of your personal or professional history.
2.	Develop static pages (using only HTML) of an online Book store. The page should resemble: www.amazon.com and the website should contain the following pages. Home page, Registration and User Login, User Profile page, Books Catalog, Shopping Cart, Payment By Credit Card, Order Confirmation.
3.	Write an HTML page that contains a selection box with a list of 5 countries. When the user selects a country; its capital should be printed next in the list. Add CSS to customize the properties of the font of the capital (color, bold and font size).
4.	Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient.
5.	Design a web page to include text boxes for entering 2 numbers and buttons (factorial, prime, Fibonacci, Natural Numbers). Display alert box and change the background of the text box when the user focuses onto the text box. Also, Display the name of the button when user moves over the buttons. When the button is clicked, perform the required computation and print the result in the web page. Create 3 programs for front end, styling and back end.
6.	Write a JavaScript code that displays text **"TEXT-GROWING"** with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches 50pt it displays **"TEXT-SHRINKING"** in BLUE color. Then the font size decreases to 5pt.
7.	Create a web page to create a form using CSS that includes tables and user interface components such as text boxes, text areas, buttons, check boxes and combo box. Create a feedback form to enable students to give their feedback regarding the teacher.
8.	Design an XHTML that uses CSS to test External Style Sheets for the chapters of the text book.

<table>
<tr><td>9.</td><td>Create and test an HTML document that describes nested ordered lists of cars. The outer list must have three entries: compact, midsize, and sports. Inside each of these three lists there must be two sublists of body styles. The compact- and midsize-car sublists are two door and four door; the sports-car sublists are coupe and convertible. Each body-style sublist must have at least three entries, each of which is the make and model of a particular car that fits the category. The outer list must use uppercase Roman numerals, the middle lists must use uppercase letters, and the inner lists must use Arabic numerals. The background color for the compact-car list must be pink; for the midsize-car list, it must be blue; for the sports-car list, it must be red. All the styles must be in a document style sheet.</td></tr>
<tr><td>10.</td><td>Design an XHTML that uses CSS to illustrate usage of table, borders, margin and padding.</td></tr>
<tr><td>11.</td><td>Design an XML document to store information about a student in an engineering college SSIT. The information must include USN, Name, and Name of the College, Branch, Year of Joining, and email id. Make up sample data for 3 students and produce a display of the raw XML document. Also create a CSS style sheet for the XML document and use it to create a display that document.</td></tr>
<tr><td>12.</td><td>Write a program to design webpage using frameworks.</td></tr>
<tr><td>13.</td><td>Write an XML file which will display the book information which includes the following.
<table>
<tr><td>a) Title of the book</td><td>b) Author Name</td><td>c) ISBN number</td><td>d) Edition</td><td>e) Price</td></tr>
</table>
Display the XML file as follows: The content should be displayed in table. The header of the table should be in color GREY and the author name column should be displayed in one color and should be capitalized and in bold. Use your own colors for remaining columns. Use CSS for the above purpose.</td></tr>
<tr><td>14.</td><td>Write an HTML document to provide a form that collects Customer’s name and phone number.
<table>
<tr><td>a)</td><td>The phone number must be in the form ddd-ddd-dddd</td></tr>
<tr><td>b)</td><td>The name should be in the form is last-name, first-name, middle-initial, where the first and last names must begin with upper case letters and have at least one lower case letter. Both must be followed immediately by a comma and possibly, one space. The middle initial must be uppercase and may or may not be followed by a period. There can be no characters before or after the whole name.</td></tr>
</table></td></tr>
<tr><td></td><td>c) Write a JavaScript that checks the submitted Telephone number and Name to be sure that it conforms to the required formats and then return a response indicating whether the number and name was correct.</td></tr>
</table>

15.	Develop and test an HTML document that has checkboxes for apple (59 cents each), orange (49 cents each), and banana (39 cents each), along with a Submit button. Each of the checkboxes should have its own onclick event handler. These handlers must add the cost of their fruit to a total cost. An event handler for the Submit button must produce an alert window with the message your total cost is$xxx, where xxx is the total cost of the chosen fruit, including 5 percent sales tax. This handler must return false (to avoid actual submission of the form data).	
16.	Develop and demonstrate, using JavaScript script, a XHTML document that collects the USN (The valid format is: A digit from 1 to 4 followed by two Uppercase characters followed by two digits followed by two uppercase characters followed by three digits; no embedded spaces allowed) of the user. Event handler must be included for the form element that collects this information to validate the input. Messages in the alert windows must be produced when errors are detected. Modify the above program to get the current semester also (restricted to be a number from 1 to 8).	
17.	Write the PHP programs to do the following.	
	a)	Find the transpose of a matrix.
	b)	Multiplication of two matrices.
	c)	Addition of two matrices.
18.	Write a PHP program to:	
	a)	Keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
	b)	Display a digital clock which displays the current time of the server.
19.	Create a XHTML form with Name, Address Line2 and E-mail text fields. On Submitting, store the values in MYSQL table. Retrieve and display the data based on Name.	
20.	Write a PHP program to sort the student records based on USN which are stored in the database.	

Course Outcomes:

Course outcome	Descriptions
CO1	Gain Knowledge in fundamental concepts of Web Technologies.
CO2	Design and develop responsive Websites using a framework which composed of HTML, CSS and JavaScript.
CO3	Implement Event Handling, Validating forms, exchange data and deploying web applications.
CO4	Develop Client side and Server side scripting to generate and display the content dynamically.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				1							1		
CO2	2	3	3	2	3							3		
CO3	2	2	3	3	3							2		
CO4	2	3	3	2	3							2		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Programming the World Wide Web	Robert W. Sebesta	8th Edition, 2020, Pearson Education. ISBN 10: 935394614X ISBN13: 978-9353946142
2	Professional AJAX	Nicholas C. Zakas, Jeremy McPeak and Joe Fawcett	2nd Edition, 2007, Wiley Publishing, Inc., ISBN: 978-0-470-10949-6
3	https://getbootstrap.com/		

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Professional JavaScript for Web Developers	Nicholas C Zakas	3rd Edition, Wrox / Wiley India, 2012. ISBN 13: 978-8126535088
2	Fundamentals of Web Development	Randy Connolly, Mount Royal University and Ricardo Hoar	3rd Edition, Pearson, 2022, ISBN: 9780135863336, 0135863333, eText ISBN: 9780137453719, 013745371X
3	PHP and MySQL web development	Luke Weelling, Laura Thomson,	5th Edition, Pearson Education, Inc., 2016. ISBN: 978-9332582736

Department: Information Science and Engineering	**Semester:**	**VI**

Subject: Cryptography and Network Security				
Subject Code:	**22IS603**		**L – T – P - C:**	**3–0–2–4**

Sl. No	Course Objectives
1	Understand security mechanism with encryption and decryption ciphers.
2	Illustrate various security algorithms.
3	To understand key management and internet security techniques.
4	Learn Application level security mechanisms.

Unit	Description	Hrs.
I	**Information and Network Security Concepts:** Cyber security, Information security, and Network security, OSI Security architecture, Security attacks, Security services, Security mechanisms, Cryptography, Network Security, **Classical Encryption Techniques:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography.	**08**
II	**Block Cipher and the Data Encryption Standard:** Traditional Block cipher structure, The Data Encryption Standard, The Strength of DES, Block cipher design principles, **Block Cipher Operation:** Electronic Code Book, Cipher Block Chaining Mode, Cipher Feedback Mode, Output Feedback Mode.	**08**
III	**Number Theory and Public Key Cryptosystem: Number Theory:** Prime Numbers, Fermat's and Euler's Theorems, Testing for Primality. **Public-Key Cryptography and RSA:** Principles of Public- Key Cryptosystems, The RSA Algorithm. **Other Public Key Cryptosystem:** Diffie-Hellman Key Exchange, Elgamal Cryptographic System. **Cryptographic Hash Functions:** Applications of Cryptographic Hash functions, Two simple hash Functions, Secure Hash Algorithm(SHA).	**08**
IV	**Message Authentication Codes:** Message Authentication Functions. **Digital Signatures:** Digital Signatures, NIST Digital Signature Algorithm. **Cryptographic Key Management and Distribution:** Distribution of public keys, X.509 Certificates, **User Authentication:** Kerberos**. Transport level security:** Web Security considerations, Transport Layer Security.	**08**
V	**Electronic Mail Security:** Internet Mail Architecture, Email threats and Comprehensive Email Security. **IP Security:** IP Security Overview, IP Security Policy. **Network Endpoint Security:** Firewalls, Intrusion Detection Systems, Malicious Software, Distributed Denial of Service Attacks.	**08**

LAB CONTENT

Sl. No	Experiment Description
1	Program to illustrate Caesar Cipher.
2	Program to illustrate Playfair Cipher.
3	Program to illustrate Hill Cipher.
4	Program to illustrate Vigenere Cipher.
5	Implement the following TRANSPOSITION TECHNIQUES concepts: Rail fence – row & Column Transformation.
6	Implement the DES algorithm.
7	Implement the SHA-1 algorithm.
8	Implement MD5 algorithm.
9	Implement the Signature Scheme - Digital Signature Standard.
10	Implement Fermat's Theorem, Eulers totient function to check primality of a given number.
11	Implement RSA algorithm.
12	Implement Diffie Hellman algorithm.
13	Implement Elgamal cryptosystem.

Course Outcomes:

Course outcome	Descriptions
CO1	Understand various encryption and decryption techniques.
CO2	Apply public key cryptography algorithms.
CO3	Identify cryptographic techniques to achieve confidentiality, authentication.
CO4	Able to understand and apply application level security techniques.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	3	2		2	2					1		
CO2	3	3	3	3		2						1		
CO3	3	3	3	2		2	2					1		
CO4	1	2	3			3		3				1		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Cryptography and Network Security	William Stallings	Eighth Edition, Prentice Hall of India, 2023. ISBN-13 978-9357059718

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Cryptography and Network Security	Atul Kahate	Tata McGrawHill, 4th Edition 2019 ISBN-13 978-9353163303
2	Network Security: Private Communication in a Public World	Charlie Kaufman, Radia Perlman, Mike Speciner	Third Edition, 2024 Pearson,Education Asia. ISBN-13 978-8196874339

Department: Information Science and Engineering			**Semester:**	**VI**
Subject: Information Storage and Management				
Subject Code:	**22IS6PE41**		**L – T – P - C:**	**3–0–0–3**

Sl. No	Course Objectives
1	Learn about the various storage infrastructure components in data center environments.
2	Familiarize in making decisions on storage-related technologies in an increasingly complex IT environment.
3	Understand the storage technologies, architectures, features, and benefits of intelligent storage systems.
4	Exposed to block-based, file-based, object-based, unified storage and software-defined storage.

Unit	Description	Hrs.
I	**Introduction to Information Storage, Data center Environment:** Information Storage,Evolution of Storage Architecture Data Center Infrastructure, Virtualization and Cloud computing (1.1 to 1.4), Application, Database Management systems, Host, Connectivity (2.1 to 2.4).	**08**
II	**Data Protection:** RAID, Intelligent Storage System:\RAID implementation methods, RAID array components, RAID Techniques, RAID, Levels, RAID impact on Disk Performance, RAID comparison, Hot spares(3.1 to 3.7), Components of an Intelligent Storage System, Storage Provisioning, Types of Intelligent Storage Systems(4.1 to 4.3).	**08**
III	**Fibre Channel Storage Area Networks:** Fibre Channel overview, The SAN and its evolution, Components of SAN, FC connectivity, Switched Fabric Ports, Fibre Channel Architecture, Fabric Services, Switched Fabric Login Types, Zoning, FC SAN Topologies, Virtualization and SAN(5.1 to 5.11).	**08**
IV	**Securing the Storage Infrastructure:** Storage Security Framework, Risk Triad, Storage Security Domains, Security Implantations in Storage Networking: NAS, ISCSI (internet Small Computer System Interface), FCIP (Fibre Channel over Internet Protocol), FCoE (Fibre Channel over Ethernet), SAN (15.1 to 15.4).	**08**
V	**Managing the Storage Infrastructure:**Monitoring the Storage Infrastructure, Storage Management Activities, Storage Infrastructure Management Challenges, Developing an Ideal Solution.(16.1 to 16.4).	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Understand Storage Area Networks characteristics and Architectures.
CO2	Explain Storage Network Technologies and Virtualization.
CO3	Analyze the Securing and Managing of Storage Infrastructure.
CO4	Configure and Simulate Storage Area Network Technologies.

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			1	1	2						1	2	
CO2		2		2	1	2							2	
CO3					1		2						2	
CO4		3			3								2	

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Information Storage and Management	G.Somasundaram, Alok Shrivastava	EMC Education Services, Wiley- India, Second Edition.2015 ISBN-13 978-8126537501

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Storage Networks Explained	Ulf Troppens, RainerErkes and Wolfgang Muller	Wiley India, 2015 ISBN-13 978-8126557424
2	Storage Networks, The Complete Reference.	Rebert Spalding	Tata McGraw Hill,2017 ISBN-13 978-0070532922

Department: Information Science and Engineering			**Semester:**	**VI**
Subject: Artificial Neural Networks				
Subject Code:	**22IS6PE42**		**L – T – P - C:**	**3-0-0-3**

Sl. No	Course Objectives
1	Perceive the basic concepts of ANN, applications and learning techniques.
2	Explain the working of perceptron and multilayer perceptron and related learning algorithms.
3	Gain essential knowledge on convolution neural networks and applications.
4	Explore structured probabilistic models for deep learning.

Unit	Description	Hrs.
I	**Artificial Neural Networks – Introduction and Learning Process-I:** What is a Neural Network? Human Brain, Models of a Neuron, Neural Networks Viewed as DG, Feedback, Network Architectures, Error-correction learning, Memory-based learning, Hebbian Learning, Competitive learning, Boltzmann Learning.	**08**
II	**Learning Process-II and Perceptron:** Learning with a teacher, learning without a teacher, Learning tasks, Memory and adaptation. Statistical Learning Theory, VC dimension, Probably approximately correct model of learning, Single-Layer Perceptrons: Adaptive filtering problem, Unconstrained optimization techniques: Steepest Descent, Newton's, Gauss-Newton; Linear Least-Squares Filter, LMS algorithm, Learning curves, Learning rate annealing techniques, Perceptron and Convergence theorem.	**08**
III	**Multilayer Perceptron and Generalization:** BP algorithm, Two passes of computation, Sequential and Batch Modes of training, Stopping Criteria, XOR problem, Heuristics for BP algorithm to perform better, Output representation and Decision rule, Generalization, Universal approximation theorem, Cross-validation.	**08**
IV	**Convolution Networks:** Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the basic convolution function, Structured Outputs, Data types, Efficient Convolution Algorithms, Random or Unsupervised features, The Neuroscientific basis for convolutional networks.	**08**
V	**Structured Probabilistic Models for Deep Learning:** The challenge of unstructured modeling, Using graphs to describe model structure: Directed, Undirected, Partition function, Energy-based models, Factor graphs; Sampling from graphical models, Advantages of structured modeling, learning about dependencies, Inference and approximate inference, The deep learning approach to structured probabilistic models	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Describe basic concepts of neural network, its applications and various learning models.
CO2	Analyze different Network Architectures, learning tasks, convolutional networks, and deep learning models.
CO3	Investigate and apply neural networks model and learning techniques to solve problems related to society and industry.
CO4	Demonstrate a prototype application developed using any NN tools and APIs.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2												
CO2	2	3	1											
CO3	2	2	3	2	1									
CO4	2	2	2	2	3									

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Neural Networks – A Comprehensive Foundation	Simon Haykin	2nd Edition, 2005. PHI, (Units I to III). ISBN-13 978-0138958633 Reprint Edition 2021

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Deep Learning (Adaptive Computation and Machine Learning Series)	Ian Good fellow, Yoshua Bengio and Aaron Courville	(3 January 2017), MIT Press, ISBN-13: 978- 0262035613.
2	Introduction to Artificial Neural Networks	Gunjan Goswami	2012 Edition, S.K. Kataria & Sons ISBN-13:978-9350142967.

Department: Information Science and Engineering			**Semester:**	**VI**
Subject: Software Quality Assurance and Testing				
Subject Code:	**22IS6PE43**		**L – T – P - C:**	**3-0-0-3**

Sl. No	Course Objectives
1	Interpret the goals of software testing and Analyze and design various tools which can be used for automating the testing process.
2	Apply the various concepts of software quality standards for establishing quality standards.
3	Demonstrate and evaluate the procedures for improving the quality Models.

Unit	Description	Hrs.
I	**Introduction:** Meeting People's Quality Expectations, Dependency and Suggested Usage, Problems. What Is Software Quality? Quality: Perspectives and Expectations, Quality Frameworks and ISO-9126, A Historical Perspective of Quality, Problems. Quality Assurance: Classification: Defect Prevention, Defect Containment.	**08**
II	**Quality Assurance in Context:** Handling Discovered Defect During QA Activities, QA Activities in Software Processes. Verification and Validation Perspectives. Reconciling the Two Views.Problems. Quality Engineering. **Quality Engineering:** Activities and Process. Quality Planning: Goal Setting and Strategy Formation. Quality Assessment and Improvement. Quality Engineering in Software Processes.	**08**
III	**A Perspective on Testing:** Basic Definitions , Test Cases, Insights from a Venn Diagram , Identifying Test Cases , Errors and Fault Taxonomies , Levels of Testing, Generalized Pseudocode, The Triangle Problem , The NextDate Function, The Commission Problem ,The SATM System, The Currency Converter	**08**
IV	**Boundary Value Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing. **Equivalence class Testing:** Equivalence test cases for the triangle problem, The NextDate Function, The Commission Problem. **Decision Table-Based Testing:** Decision tables, Test cases for the triangle problem, Next Date function, and commission problem, Guidelines and Observations.	**08**
V	**Data Flow Testing:** Definition-Use testing, Slice-based testing. **Agile Testing**. Integration Testing: Decomposition-Based Integration, Call Graph–Based Integration, Path-Based Integration. Example: Integration next date**.**	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Analyze the importance of software quality assurance & testing in software development.
CO2	Evaluate the concepts of software quality assurance techniques and find their relevance of use.
CO3	Implement the concepts of software testing and appraise the most appropriate testing approaches for a given situation.
CO4	Use the principles of testing and develop the necessary test cases in problem solution.

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1										2		
CO2	2											2		
CO3	2	1	2											
CO4	2	2	3	3										2

Text Books:

Sl. No	Text Book title	Author	Volume and Year of Edition
1	Software Testing, A Craftsman's Approach	Paul C. Jorgensen	4th Edition, Auerbach Publications, 2014. ISBN-13 978-1138628076
2	Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement.	Jeff Tian	Wiley-IEEE Computer Society Press 2005 ISBN: 978-0-471-71345-6

Reference Books:

Sl. No	Text Book title	Author	Volume and Year of Edition
1	Foundations of Software Testing.	Aditya P Mathur	Pearson Education, 2013. ISBN: 9332517657, 9789332517653
2	Software testing Principles and Practices	Srinivasan Desikan, Gopalaswamy Ramesh	2nd Edition, Pearson Education, 2007 ISBN: 978-8177582956

Department: Information Science and Engineering			**Semester:**	**VI**
Subject: Artificial Intelligence				
Subject Code:	**22IS6OE51**		**L – T – P - C:**	**3-0-0-3**

Sl. No	Course Objectives
1	Learn the background of intelligent agents and search mechanisms.
2	Understand the various knowledge representation techniques.
3	Describe the reasoning methods of proposition, predicate and higher order logics.
4	Interpret the learning techniques in artificial agents.

Unit	Description	Hrs.
I	**Knowledge Representation In Intelligent Agents:** Intelligent agents - Classification - Environment - Architecture - Models of knowledge representation - Procedural rules - Semantic representation - Semantic networks - Frames - Conceptual dependency – Ontology.	**08**
II	**Search Strategies:** Uninformed search - Informed search strategies: Greedy best first search - A* search algorithm - Constraint Satisfaction Problems: Backtracking search - Local search - Game Playing: Optimal decisions in games - Alpha-Beta Pruning.	**08**
III	**Reasoning With Proposition And Predicate Logic:** Proposition Logic - Syntax - Semantics - Horn Clauses - Resolution - First Order Logic - Syntax - Conversion from English Statements to First order logic formula - Semantics - Reasoning methods - Forward chaining - Backward chaining.	**08**
IV	**Reasoning With Higher Order Logics:** Modal Logic - Syntax - Semantics - Kripke structures - Temporal Logic - Syntax and Semantics - Reasoning mechanisms using Temporal Logic - Epistemic Logic - Syntax and Semantics - Multiagent reasoning using Epistemic Logic- Case based reasoning	**08**
V	**Learning:** Statistical methods - Bayesian techniques- Supervised learning- Unsupervised learning- Regression methods - Learning under uncertainty - Probability methods - Text processing.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Use the knowledge representation and reasoning techniques for the design of intelligent systems.
CO2	Apply the reasoning methods of various logics to computer science domains.
CO3	Create intelligent systems using learning mechanisms.
CO4	Analyze and compare the various reasoning methods.

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2											1
CO2	2	2	2	2										1
CO3	2	2	2	2	2							1		1
CO4	2	2	2	2	2							1		1

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Artificial Intelligence: A Modern Approach	Stuart Russell, Peter Norvig	Third Edition, Pearson Education, 2009.

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Artificial Intelligence	Saroj Kaushik	Cengage Learning, 2012.
2	Logic in Action, A new introduction to Logic	Johan van Benthem, Hans van Ditmarsch, Jan van Eijck and Jan Jaspars	Available in http://www.logicinaction.org/, 2014.

Department: Information Science and Engineering			**Semester:**	**VI**
Subject: Software Testing				
Subject Code:	**22IS6OE52**		**L – T – P - C:**	**3-0-0-3**

Sl. No	Course Objectives
1	Describe strategies for generating system test cases.
2	Investigate the reason for bugs and analyze the principles in software testing to prevent and remove bugs.
3	Learn to apply software testing techniques in commercial environment.

Unit	Description	Hrs.
I	**A Perspective on Testing and Examples:** Basic definitions, Test cases, Insights from a Venn diagram, Identifying test cases, Error and fault taxonomies, Levels of testing. Examples: Generalized Pseudocode, The triangle problem, The NextDate function, The commission problem, The SATM (Simple Automatic Teller Machine) problem. The currency converter.	**08**
II	**Boundary Value Testing:** Boundary value analysis, Robustness testing, Worst-case testing, Special value testing, Examples, Random testing. **Decision Table-Based Testing:** Decision tables, Test cases for the triangle problem, Next Date function, and commission problem, Guidelines and observations.(Book 1).	**08**
III	**Data Flow Testing:** Definition-Use testing. **Agile Testing. Integration Testing:** Decomposition-Based Integration, Call Graph–Based Integration, Path-Based Integration. Example: Integration next date(Book 1).	**08**
IV	**System Testing:** Threads, Basis Concepts for Requirements Specification, Model-Based Threads, Use Case–Based Threads, Long versus Short Use Cases (Book 1).**Test and Analysis Activities within a Software Process:** The quality process, Planning and monitoring, Quality goals, Dependability properties (Book 2).	**08**
V	**System, Acceptance and Regression Testing:** Overview, System Testing, Acceptance Testing, Usability, Regression Testing, Regression Test selection techniques (Book 2).	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Clear understanding and knowledge of the foundations, techniques in the area of software testing and its practice in the industry.
CO2	Compare and pick out the right type of software testing process for any given real world problem.
CO3	Able to plan a test project, design test cases, conduct testing operations, manage software problems and defects.
CO4	Implement various test processes for quality improvement.

Course Articulation Matrix:

PO/PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2													
CO2	1	3		3	2				1					
CO3	1	3		2	1				1					
CO4		1		2										

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Software Testing, A Craftsman's Approach	Paul C. Jorgensen	4th Edition, Auerbach Publications, 2014. ISBN-13 978-1138628076
2	Software Testing and Analysis – Process, Principles and Techniques	Mauro Pezze, Michal Young	Wiley India, 2008. ISBN:978-81-265-1773-2

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Foundations of Software Testing.	Aditya P Mathur	Pearson Education, 2013. ISBN: 9332517657, 9789332517653
2	Software testing Principles and Practices	Srinivasan Desikan, Gopalaswamy Ramesh	2nd Edition, Pearson Education, 2007 ISBN: 978-8177582956

Department: Information Science and Engineering			**Semester:**	**VI**
Subject: Human Computer Interaction				
Subject Code:	**22IS6OE53**		**L – T – P - C:**	**3-0-0-3**

Sl. No	Course Objectives
1	Learn the foundations of Human Computer Interaction.
2	Familiar with the design technologies for individuals and persons with disabilities.
3	Aware of mobile HCI.
4	Learn the guidelines for user interface.

Unit	Description	Hrs
I	**Foundations Of HCI:** 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**
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.	**08**
III	**Models And Theories:** HCI Models: Cognitive models: Socio-Organizational issues and stakeholder requirements-Communication and collaboration models-Hypertext, Multimedia and WWW.	**08**
IV	**Mobile HCI:** Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.	**08**
V	**Web Interface Design:** Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow.	**08**

Course Outcomes:

Course outcome	Descriptions
CO1	Describe an effective dialog for HCI.
CO2	Design effective HCI for individuals and persons with disabilities.
CO3	Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
CO4	Assess the importance of user feedback regarding the Interface.

Course Articulation Matrix:

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	2		1		3	3					1		
CO2	1	3	3	3	3	3	2	2	2	3	3	2		
CO3	1	2	2	2	3			2	2	1	2	3		
CO4				2			2	2	2	2	3	2		

Text Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Human Computer Interaction	Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale	3rd Edition, Pearson Education, 2004 (UNIT I, II & III) ISBN-13 978-0130461094
2	Mobile Design and Development	Brian Fling	First Edition, O'Reilly Media Inc., 2009 (UNIT –IV) ISBN-13 978-8184048179

Reference Books:

Sl No	Text Book title	Author	Volume and Year of Edition
1	Designing Web Interfaces	Bill Scott and Theresa Neil,	1st Edition, O'Reilly, 2022 (UNIT-V) ISBN-13 978-9355422897

Department: Information Science and Engineering			**Semester:**	**VI**
Subject: Mini Project				
Subject Code:	**22ISMP607**		**L – T – P - C:**	**0-0-4-2**

Sl. No	Course Objectives
1	Apply the knowledge and techniques learnt in theoretical classes for software development to solve real world problems.
2	Gives an insight to various tools and technology frameworks.
3	Gaining deeper understanding in specific functional areas.
4	Helps in exploring career opportunities in their areas of interest.

Unit	Description	Hrs.
	➢ Group of two students are required to carry out Mini Project work under the supervision of Project Guide. ➢ The guide shall monitor progress of the student continuously. ➢ Each group is required to present the progress of the Mini Project work during the semester as per the schedule given by the department. ➢ A presentation shall be made by the group as per the schedule announced by the department. ➢ A report shall be submitted by the candidates to the department.	

Course Outcomes:

Course outcome	Descriptions
CO1	Identify and formulate acquired knowledge within the chosen area of technology for project development for specific problems to be solved.
CO2	Analyze, discuss and design the technical aspects of the chosen project with a comprehensive and systematic approach.
CO3	Able to understand and apply knowledge of communication and language to communicate effectively orally and in writing.
CO4	Work adequately as an individual or in a team in developing technical projects in given timeline.