SEVENTH SEMESTER

Sr No	Course Category	Course Code	Course Title	Hours per Week			Credits	Maximum Marks		
				L	T	P		Continual Assessment	End Sem Examination	Total
1	PCC	22CB701T	Usability design of software Applications.	3	-	-	3	30	70	100
2	PCC	22CB701P	Usability design of software Applications Lab	-	-	2	1	25	25	50
3	PCC	22CB702T	Introduction to IOT	3	-	-	3	30	70	100
4	PCC	22CB702P	Introduction to IOT Lab	-	-	2	1	25	25	50
5	PEC	22CB703T	Financial Management	2	-	-	2	15	35	50
6	PEC	22CB704T	Human Resource Management	2	-	-	2	15	35	50
7	PEC	22CB705T	Professional Elective V*	3	-	-	3	30	70	100
8	PEC	22CB706T	Professional Elective VI*	3	-	-	3	30	70	100
9	PEC	22CB707T	IT Project Management	3	-	-	3	30	70	100
10	ELC	22CB708P	Project	-	-	4	2	50	50	100
		Total		**19**		**8**	**23**	**280**	**520**	**800**

22CB705T	Professional Elective V
22CB705T(i)	PE V-Cognitive science & Analytics
22CB705T(ii)	PE V- IT Workshop Skylab/Matlab
22CB705T(iii)	PE V- Cryptology
22CB705T(iv)	PE V- Services Science & Service Operational Management

22CB706T	Professional Elective VI
22CB706T(i)	PE VI- Quantum Computation and Quantum information
22CB706T(ii)	PE VI- Advanced social,text,media analytics
22CB706T(iii)	PE VI- Mobile Computing

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COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB701T	Usability design of software Applications	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
• To create a learning system through which management students can enhance their innovation and creative thinking skills • To acquaint themselves with the special challenges of starting new ventures • To use IPR as an effective tool to protect their innovations and intangible assets from exploitation.	• To sensitize the fundamentals of User Centered Design and User Experience their relevance & contribution to businesses. • Familiarize them to the facets of User Experience (UX) Design, particularly as applied to the digital artefacts. • Appreciation of research, solution conceptualization & validation, heuristic evaluation as activities in design & development lifecycle. • Acquire the ability to constructively engage with the Design professionals they would work with in the future and work on Usability design and project design lifecycle. • Analyze and identify the methods to offer a better UI experience for the applications and gain expertise in redesigning an existing Application or website

Unit I: **[8 Hrs]**

Introduction to User Centered Design: Usability Fundamentals and Quality - Usability and utility, Ease of use, necessity of usability considerations, cost and time considerations, Quality concepts, internal and external quality criteria, Industry quality standards.

Unit II: **[9 Hrs]**

User Interface and the User Experience: Software Development Life Cycle, User Interface development process, User Experience design principles, Design thinking and problem solving approach.
User Experience Analysis and Design - Understanding users, requirements, perceptions, abilities and constraints, Human-Computer Interaction (HCI), Constant iterative optimization and prototyping, Five dimensions of interaction design

Unit III: **[9 Hrs]**

Heuristic Evaluation: 10 Heuristic Principles, Examples Heuristic Evaluation: Group Assignment initiation (Website and App) Evaluation for key tasks of the app or website for heuristic principles, severity, recommendations.
Information Visualization - Understanding visualization, Common uses for information visualization, Design scenarios, Use cases.
Usability Heuristics and Smart Design - Heuristic evaluation and visibility (feedback), Severity rating and methods for evaluating the usability, Ergonomic design with navigation structure and enlarger methods, Digital Human Model (DHM) software and Biophilic design.

Unit IV: **[9 Hrs]**

Usability Design of Mobile Applications: Defining Mobile Learning (m-learning), Pedagogy of m-learning, Cognitive Load Theory (CLT), Design considerations for mobile devices and optimization with responsive design.
Project design lifecycle: Redesign project through the design lifecycle – Discovery - Define – Design - Implement (Design Prototype) - Usability Testing

Unit V: **[10 Hrs]**

UX Research: Understanding users, their goals, context of use, and environment of use. Research Techniques: Contextual Enquiry, User Interviews, Competitive Analysis for UX.
Personas and Scenarios: Scenarios and Persona Technique – Overview of Design Thinking Technique - Discovery and brainstorming
Development and Prototyping: Concept Development - Task flow detailing for the Project - Prototyping Techniques - Paper, Electronic, and Prototyping Tools.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Interaction Design: Beyond Human-Computer Interaction	Jennifer Preece, Helen Sharp, Yvonne Rogers	Fourth	Wiley publications

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Observing the User Experience - A Practitioner's Guide to User Research	Elizabeth Goodman, Mike Kuniavsky, Andrea Moed	Second	Morgan Kaufmann

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SIXTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB701P	Usability design of software Applications Lab			2	1	25	25	50

Course Objectives	Course Outcomes
• Apply User-Centered Design (UCD) Principles in Real-World Projects • Develop Proficiency in UX Research and Evaluation Methods • Design and Prototype Interactive User Interfaces • Integrate Accessibility and Inclusivity in Design • Reflect on Ethical and Legal Considerations in UX Design	• Apply User-Centered Design (UCD) Principles to Develop Interactive Prototypes • Conduct Usability Evaluations Using Standard Techniques • Integrate Accessibility and Ethical Considerations into Design Solutions

Expt. No.	Title of the experiment
1	Introduction to usability design principles.
2	Identifying a website or App for Redesign with Justification
3	Analyzing the Selected Application Through the Design Life Cycle
4	Identifying Personas and Scenarios for the Application
5	Concept Development and Task Flow Detailing
6	Prototype Development with Iterations and Justification
7	Evaluating the prototype through usability Testing and Demonstration
8	Final overview of Technical and Ethical considerations with presentations

Text Books

S.N	Title	Authors	Edition	Publisher
1	Handbook of Usability Testing: How to Plan, Design and Conduct Effective Tests	Jeffrey Rubin, Dana Chisnell	Second	John Wiley & Sons
2	Usability and User Experience (UX) Design	Benjamin Franz, Michaela Kauer-Franz	E-book	SAP-Press
3	About Face	Alan Cooper and Robert Reimann	Fourth	John Wiley & Sons

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Measuring the User Experience: Collecting, Analyzing, and Presenting Usability Metrics	Bill Albert, Tom Tullis	Second	Morgan Kaufmann
2	Visual Usability: Principles and Practices for Designing Digital Applications	Tania Schlatter, Deborah Levinson.	Second	Morgan Kaufmann

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COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB702T	Introduction to IoT	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
• To introduce students to the fundamental concepts, architecture, and applications of the Internet of Things across various industries. • To develop practical skills in interfacing sensors, implementing IoT communication protocols, and processing IoT data. • To enable students to design and analyze IoT systems, focusing on real-time data handling, edge computing, and network protocols.	• CO1: Describe the basic concepts, characteristics, and applications of IoT. • CO2: Explain IoT architecture and key components like edge computing and data pipelines. • CO3: Demonstrate the integration of sensors with industrial data acquisition systems. • CO4: Analyze IoT communication protocols and network architectures. • CO5: Apply data processing techniques for time-series IoT data.

Unit I: Introduction to IoT and Use cases	**[9 Hrs]**
Understanding basic concepts of IoT, Characteristics of IoT, Consumer IoT vs Industrial Internet, Fundamental building blocks, Use Cases of IoT in various industry domains.	
Unit II: Architecture of IoT	**[9 Hrs]**
Architecture: IoT reference architectures, Industrial Internet Reference Architecture, Edge Computing, IoT Gateways, Data Ingestion and Data Processing Pipelines, Data Stream Processing.	
Unit III: Sensors and Industrial Systems	**[9 Hrs]**
Introduction to sensors and transducers, integrating sensors to sensor processing boards, introduction to industrial data acquisition systems, industrial control systems and their functions.	
Unit IV: Networking and Communication for IoT	**[9 Hrs]**
OSI 7 layer architecture and its mapping to IoT architecture, Introduction to proximity networking technologies (ZigBee, Bluetooth, and Serial Communication), Industrial network protocols (Modbus, CANbus), Communicating with cloud applications (web services, REST, TCP/IP and UDP/IP sockets, MQTT, WebSockets, protocols. Message encoding (JSON, Protocol Buffers).	
Unit V: IoT Data Processing and Storage	**[9 Hrs]**
Time Series Data and their characteristics, time series databases, basic time series analytics, data summarization and sketching, dealing with noisy and missing data, anomaly and outlier detection.	

Text Books

S.N	Title	Authors	Edition	Publisher
1	The Internet of Things	Samuel Greengard		MIT Press Essential Knowledge Series
2	Internet of Things: A Hands On Approach	Arsheep Bahga, Vijay Madisetti	1st Edition 2014	VPT
3	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	2017	Cisco Press

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Introduction to IoT	Sudip Misra, Anandarup Mukherjee, Arijit Roy	First Edition 2021	Cambridge University Press
2	Visualizing Data-Exploring and Explaining Data with the Processing Environment	Ben Fry	First Edition 2008	Publisher: O'Reilly Media
3	Internet of Things: Principles and Paradigms	Rajkumar Buyya, Amir Vahid Dastjerdi	2016	Elsevier

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB702P	Introduction to IoT Lab	-	-	2	1	25	25	50

Course Objectives	Course Outcomes
• To familiarize students with real-world applications of IoT and equip them with hands-on experience in setting up IoT development environments. • To enable students to interface various sensors, actuators, and communication modules with microcontrollers like Arduino or Raspberry Pi. • To provide practical exposure to IoT data filtering, cloud integration, and remote data communication using protocols like MQTT and platforms like 000webhost.	CO1: Demonstrate the ability to identify and explain IoT use cases across various domains. CO2: Install, configure, and utilize development tools for IoT prototyping on platforms like Arduino and Raspberry Pi. CO3: Interface sensors, actuators, and communication modules (e.g., Bluetooth, relay, LCD) with microcontrollers and implement basic control logic. CO4: Implement edge computing concepts by processing and filtering data locally before transmission. CO5: Connect IoT devices to cloud databases and platforms using protocols like MQTT and HTTP, and retrieve/store data using web technologies.

Practical No.	Title of the experiment
1	Research and Present IoT Use Cases. **Objective-** Understand and present real-world IoT applications in various industries.
2	Setting up an IoT Development Environment. **Objective-** Install and configure tools like Arduino IDE or Raspberry Pi OS for IoT development.
3	Sensor Interfacing with Microcontroller. **Objective-** Interface a temperature sensor with Arduino and read data.
4	a. To interface LED/ Buzzer with Arduino and write a program to turn ON LED for 1 sec after every 2 seconds. b. To interface Push button / Digital sensor (IR/LDR) with Arduino and write a program to turn on LED when push button is presses at sensor detection.
5	Implementing Edge Computing Concept. **Objective-**Filter sensor data on Arduino before sending. Task- Only send temperature data if it crosses threshold.
6	To interface DHT11 sensor with Arduino and write a program to print temperature and humidity on Liquid Crystal Displays (LCD).
7	To interface motor using relay with Arduino and write a program to turn ON motor when push button is pressed.
8	a. To interface Bluetooth with Arduino and write a program to send sensor data to smartphone using Bluetooth. b. To interface Bluetooth with Arduino and write a program to turn LED ON /OFF when '1' / '0' is received from smartphone using Bluetooth.
9	a. Design a sketch on Arduino to publish temperature data to MQTT broker. b. Design a sketch on Arduino to subscribe to MQTT broker for temperature data and print it.
10	a. Create 000webhost account and create MySQL Database. b. Develop PHP Code to retrieve data from 000webhost account using MySQL Database.
11	Develop application using with Arduino / ESP 32 / Raspberry pi.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Internet of Things: A Hands On Approach	Arsheep Bahga, Vijay Madisetti	1st Edition 2014	VPT
2	Getting Started with the Internet of Things	Cuno Pfister	1st Edition	O'Reilly Media, 2011

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Internet of Things: Architecture and Design Principles	Raj Kamal	1st Edition	McGraw Hill Education, 2017
2	Designing the Internet of Things	Adrian McEwen and Hakim Cassimally	1st Edition	Wiley India Pvt. Ltd., 2013

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB703T	Financial Management	2			2	15	35	50

Course Objectives	Course Outcomes
● Understand the fundamentals of financial management, including firm goals and financial environments. ● Apply time value of money and valuation techniques to assess financial securities. ● Analyze risk-return trade-offs, leverage, and cost of capital for financial decision-making. ● Evaluate investment opportunities using capital budgeting methods. ● Manage working capital, cash, and receivables for efficient financial operations.	1. Understand the fundamental concepts of financial management. 2. Appreciate basic concepts such as time value of money, cost of capital, risk and return, working capital management, capital budgeting etc. 3. Leverage the concept of Capital management, cash management for deciding financial angle of IT projects.

Unit I: **[10 Hrs]**

Introduction: Introduction to Financial Management - Goals of the firm - Financial Environments.
Time Value of Money: Simple & Compound Interest Rates, Amortization, Computing more than once, Annuity Factor.
Valuation of Securities: Bond Valuation Preferred Stock Valuation, Common Stock Valuation, Concept of Yield and YTM.

Unit II: **[10 Hrs]**

Risk & Return: Defining Risk and Return, Using Probability Distributions to Measure Risk, Attitudes Toward Risk, Risk and Return in a Portfolio Context, Diversification, The Capital Asset Pricing Model (CAPM)
Operating & Financial Leverage: Operating Leverage, Financial Leverage, Total Leverage, Indifference Analysis in leverage study
Cost of Capital : Concept , Computation of Specific Cost of Capital for Equity - Preference – Debt, Weighted Average Cost of Capital – Factors affecting Cost of Capital
Capital Budgeting : The Capital Budgeting Concept & Process - An Overview, Generating Investment Project Proposals, Estimating Project, After Tax Incremental Operating Cash Flows, Capital Budgeting Techniques, Project Evaluation and Selection - Alternative Methods

Unit III: **[10Hrs]**

Working Capital Management: Overview, Working Capital Issues, Financing Current Assets (Short Term and Long Term-Mix), Combining Liability Structures and Current Asset Decisions, Estimation of Working Capital.
Cash Management: Motives for Holding cash, Speeding Up Cash Receipts, Slowing Down Cash Payouts, Electronic Commerce, Outsourcing, Cash Balances to maintain, and Factoring.
Accounts Receivable Management: Credit & Collection Policies, Analyzing the Credit Applicant, Credit References, Selecting optimum Credit period.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Financial Management - Theory & Practice	P. Chandra	Standard Edition	Tata McGraw Hill

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Financial Management	Srivastava, Misra	Second	Oxford University Press
2	Fundamentals of Financial Management	Van Horne and Wachowicz	Tenth	Prentice Hall/ Pearson Education.

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB704T	Human Resource Management	2	-	-	2	15	35	50

Course Objectives	Course Outcomes
1. To provide knowledge about management issues related to staffing, training, 2. To provide knowledge about management issues related to performance 3. To provide knowledge about management issues related to compensation 4. To provide knowledge about management issues related to human factors consideration and compliance with human resource requirements.	CO1: Students would have gained knowledge on the various aspects of HRM CO2: Students will gain the knowledge needed to succeed as human resources professionals. CO3: Students will develop the skills needed for a successful HR manager. CO4: Students would be prepared to implement learned concepts in the workplace while staying aware of emerging HRM concepts.

Unit I : INTRODUCTION TO HUMAN RESOURCE MANAGEMENT **[10 Hrs]**

The importance of human resources, Objective of Human Resource Management - Human resource policies - Role of human resource manager. Strategic Human Resource Management (SHRM), HR as a business partner, HR in Startups vs. Corporates

Unit II : HR PLANNING, TRAINING AND EXECUTIVE DEVELOPMENT **[10Hrs]**

Importance of Human Resource Planning Internal and External sources of Human Resources - Recruitment – Selection Socialization. Types of training and Executive development methods purpose benefits. Return on Investment (ROI) in Training, Campus recruitment & lateral hiring trends, Digital recruitment platforms (LinkedIn, AI tools)

Unit III : EMPLOYEE COMPENSATION AND PRORMANCE EVALUATION **[10 Hrs]**

Compensation plan, Reward, Motivation, Career Development – Mentor, Protégé relationships, Compensation Strategy and Policy, Compensation Laws and Compliance, Job Evaluation Methods, Benefits and Work-Life Balance

Performance Evaluation and Control: Performance evaluation Feedback - The control process, Redressal methods, Modern Performance Appraisal Methods, Continuous Performance Management, Biases and Challenges in Performance Appraisal, Performance Improvement Plans (PIPs), Role of HR and grievance committees

Text Books

S.N	Title	Authors	Edition	Publisher
01	Human Resource Management	Decenzo and Robbins	8th Edition	Wiley, 2007
02	Human Resource Management A n Experimental Approach	John Bernardin. H.	5th Edition	Tata McGraw Hill, 2013, New Delhi

Reference Books

S.N	Title	Authors	Edition	Publisher
01	Managing Human Resources	Luis R., Gomez-Mejia David B. Balkin & Robert L. Cardy	7th Edition	PHI, 2012
02	Human Resource Management	Dessler		Pearson Education Limited, 2007

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB705T(i)	PE V - Cognitive science & Analytics	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
• Introduce the foundations, evolution, and value chain of analytics and its related domains. • Explore the fundamentals of cognitive science, including brain processing, language, and memory. • Develop understanding of data types, measurement scales, and interdisciplinary views of data. • Familiarize students with multivariate and cognitive analytics techniques for decision-making. • Introduce AI and machine learning concepts and methodologies used in cognitive analytics projects.	• Describe the evolution of analytics and distinguish between key domains like data mining, machine learning, and AI. • Explain core cognitive science concepts including brain functions, memory, and language processing. • Classify different types of data and apply appropriate measurement and scaling techniques. • Apply multivariate and cognitive analytics techniques to analyze complex data sets. • Design AI and machine learning solutions using cognitive tools and standard data science methodologies.

Unit I: FOUNDATIONAL AREAS OF ANALYTICS **[8 Hrs]**

Introduction to Analytics: Definition, Description & Evolution of Analytics, History of Analytics, and Applicability of Analytics with development of Technology and Computer, How Analytics entered mainstream, Various overlapping concepts and fields of Analytics such as Data Mining, Machine Learning, Artificial Intelligence and Simulation, **Emerging Areas in Analytics:** Mathematical programming, Evolutionary computation, Simulation, Machine learning/data mining, Logic-based models, and, Combinations of categories, **Value Chain of Analytics:** Descriptive Analytics Covering Exploratory Data Analysis & Basic of Statistics, Diagnostics Analytics: BI/Analysis, Trend, Pattern, Simultaneous Relationship, Predictive Analytics: Cause-Effect Relationship and Futuristic prediction in terms of probabilities, Continuous & Categorical Predictions.

Unit II: FOUNDATIONAL AREAS OF COGNITIVE SCIENCE **[8 Hrs]**

Introduction to the study of cognitive sciences, Brief history of cognitive science development and Methodological concerns in philosophy
Understand Brain and Sensory Motor Information: Fundamentals of Neuro Science, Processing of sensory information in the brain, and Brain Imaging Elements, **Language & Linguistic Knowledge:** Background and details of Syntax & Semantics, Understanding of Generative Linguistic, **Memory & Processing:** Theory of Information Processing, Fundamentals of Short term Memory.

Unit III: DATA THEORY & TAXONOMY OF DATA **[8 Hrs]**

Data as a whole: Understanding of Data as a whole for distinguishing and relating various types of data and Categorization of Data: Structured, Unstructured Data, Quantitative & Qualitative Data.
Views of Data: Understanding Data as an interdisciplinary framework: covering statistics, neural networks, and fuzzy logic
Measurement & Scaling Concepts: Measurement of variables and commonly used statistical tools: Number of procedures for measurement of the variables, Categorization procedures, Scale construction procedures and Techniques of data processing for qualitative as well as quantitative data; Various types of Scales: Nominal, Ordinal, Interval & Ratio Scales.

Unit IV: MULTIVARIATE DATA ANALYTICS & COGNITIVE ANALYTICS **[8 Hrs]**

High level overview of Categorization of Techniques: Inter-dependence Relationship & Dependence Relationship Techniques
Inter-dependence Techniques: Factor Analysis, Principal Component Analysis (PCA), Cluster Analysis, **Dependence Techniques:** Regression, Logistic Regression, Basic statistical concepts such as Descriptive & Diagnostics statistics, hypothesis testing, analysis of variance and correlation, Predictive analytics techniques such as decision tree learning, clustering and forecasting techniques.
Prescriptive analytics Concepts: linear programming, integer programming, goal programming & stochastic models
Cognitive analytics Concepts: Text Analytics, Learning Analytics, Data Mining, Cognitive Systems, Cognitive Computing,

Unit V: ARTIFICIAL INTELLIGENCE & MACHINE LEARNING, APPROACH & METHODOLOGY **[8Hrs]**

Fundamentals & spectrum of Artificial Intelligence: Various areas of AI:
Knowledge: Text Analytics, Topic Modelling, Natural Language Processing (NLP), Natural Language Generation (NLG), Natural Language Understanding (NLU), Named-entity recognition (NER), **Perception:** Image Analytics, Video Analytics & Audio Analytics
Memory: Cognitive Engagement: BOTs, Virtual & Digital Assistants, Augmented Reality, Virtual Reality, Mixed Reality, **Learning**: Intelligent Automation. CRISP-DM Methodology, SEMMA Methodology, Predictive & Classification Models, Clustering, ANN, CNN, RNN.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Cognitive Science: An Introduction to the Science of the Mind	José Luis Bermúdez	First	Cambridge University Press

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Cognitive Analytics: Concepts, Methodologies, Tools, and Applications	S. M. Ross	First	Prentice Hall.

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB705T(ii)	PE V - IT Workshop Skylab/Matlab	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1.Understand the basics of MATLAB, its history, features,andapplication areas . 2.Learn to work with MATLAB variables, workspace management,andcommand-line operations. 3.Perform matrix and array manipulations and use mathematicalfunctionseffectivelyinMATLAB. 4.Develop skills in data visualization through basic plotting techniques. 5. Apply programming constructs, including control flow and user-definedfunctions,inMATLAB. 6. Understand and apply debugging techniques for M-files in MATLAB programming	**CO1:** Describe the history, features, and programming practices of MATLAB. **CO2:** Create and manage variables, control operation precedence, and handle MATLAB workspace and session data. **CO3:** Perform matrix and array manipulations, use mathematical functions, and solve linear equations in MATLAB. **CO4:** Generate basic plots with titles, labels, annotations, and customize plot styles and colors. **CO5:** Develop MATLAB programs using scripts, functions, and handle input-output operations.

Unit I Overview and Project Scheduling **[9 Hrs]**

Introduction to MATLAB

History, basic features, strengths and weaknesses, good programming practices and plan your code

Unit II- Working with variables, workspace and miscellaneous commands **[9Hrs]**

Creating MATLAB variables, overwriting variable, error messages, making corrections, controlling the hierarchy of operations or precedence, controlling the appearance of floating point number, managing the workspace, keeping track of your work session, entering multiple statements per line, miscellaneous commands,

Unit III- Matrix, array and basic mathematical functions **[9 Hrs]**

Matrix, array and basic mathematical functions

Matrix generation, entering a vector, entering a matrix, matrix indexing, colon operator, linear spacing, creating a sub-matrix, dimension, matrix operations and functions matrix generators, special matrices, array and array operations, solving linear equations, other mathematical functions.

Unit IV - Basic plotting and Introduction to programming **[9 Hrs]**

. **Basic plotting**

Overview, creating simple plots, adding titles, axis labels, and annotations, multiple data sets in one plot, specifying line styles and colours

Introduction to programming

Introduction, M-File Scripts, script side-effects, M-File functions, anatomy of a M-File function, input and output arguments, input to a script file, output commands

Unit V- Control flow and operators and Debugging M-files **[9 Hrs]**

Control flow and operators

``if ... end" structure, relational and logical operators, ``for ... end" loop, ``while ... end" loop, other flow structures, operator precedence, saving output to a file

Debugging M-files

Debugging process, preparing for debugging, setting breakpoints, running with breakpoints, examining values, correcting and ending debugging, correcting an M-file .

Text Books

S.N	Title	Authors	Edition	Publisher
1	*Digital Image Processing using MATLAB*	Rafael C. Gonzalez	Edition-III	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	*MATLAB: A Practical Introduction to Programming and Problem Solving*	Stormy Attaway	Edition-II	MacGraw hill

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB705T(iii)	PE V- Cryptology	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
• To introduce the foundational concepts of cryptography, including number theory, pseudo-randomness, and elementary cryptographic systems. • To develop understanding of symmetric key cryptosystems, including stream and block ciphers, hash functions, and authentication techniques. • To explain public key cryptographic systems, mathematical foundations, and the functioning of RSA, ECC, and digital signatures. • To explore real-world security applications such as e-commerce, key management, and emerging threats including quantum cryptanalysis. • To provide an introduction to post-quantum cryptography, quantum threats, and contemporary cryptographic schemes designed to resist quantum attacks.	**CO1:** Apply basic principles of number theory and pseudo-random generation in cryptographic contexts. **CO2:** Analyze and implement symmetric key encryption techniques including modern stream and block ciphers. **CO3:** Demonstrate understanding of public key infrastructure, key exchange mechanisms, and the mathematical underpinnings of RSA and ECC. **CO4:** Evaluate and apply cryptographic techniques in practical security applications and assess vulnerabilities, including those posed by quantum computing. **CO5:** Understand the principles, challenges, and schemes of post-quantum cryptography and assess their suitability for future secure systems.

Unit I Introduction to Cryptography **[9 Hrs]**

Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems.
Basic security services: confidentiality, integrity, availability, non-repudiation, privacy.

Unit II- Symmetric key cryptosystems **[9 Hrs]**

Symmetric key cryptosystems: Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC; Block Ciphers: DES, AES, Modes of Operation; Hash Functions; Authentication.

Unit III- Public Key Cryptography **[9 Hrs]**

Public Key Cryptography: Symmetric vs. Asymmetric encryption, Basic working of public and private keys
Mathematical Foundations: Modular arithmetic, Euler's theorem, Fermat's little theorem, Prime number generation, Chinese Remainder Theorem (CRT),RSA, ECC,Digital signatures.

Unit IV - Security Applications **[8 Hrs]**

Security Applications: Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications, Issues related to Quantum Cryptanalysis.

Unit V- Introductory topics in Post-Quantum Cryptography **[10 Hrs]**

Post-quantum cryptography overview, Quantum threats to classical cryptosystems, Shor's algorithm and its implications, Grover's algorithm and impact on symmetric cryptography, Hard mathematical problems in post-quantum cryptography, Lattice-based cryptography, NIST post-quantum cryptography standardization project, Key encapsulation mechanisms (KEMs), Digital signature schemes in post-quantum cryptography, Security models and assumptions, Implementation challenges and performance considerations

Text Books

S.N	Title	Authors	Edition	Publisher
1	Cryptography, Theory and Practice	Mike Cohn	Edition-III	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	A course in number theory and cryptography	N.Koblitz:,GTM	Edition-II	Macgrawhill

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB705T(iv)	PE V- Services Science & Service Operational Management	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. To introduce the concept, role, and importance of services in the economy and society, with a special focus on the service sector. 2. To familiarize students with the shift from Goods-Dominant Logic (GDL) to Service-Dominant Logic (SDL) and the implications for value co-creation and customer involvement.	**CO1:** Understand service sector in the economy and apply the principles of Service-Dominant Logic (SDL) and SSV model. **CO2**: Understand the concept of service guarantee, service recovery and Forecasting Demand and managing capacity and demand. **CO3**: Understand and develop strategies for managing service supply relationships and apply optimization techniques to vehicle routing problems in logistics.

Unit I: **[8 Hrs]**

Introduction: Introduction to the course, Introduction to service operations, Role of service in economy and society, Introduction to Indian service sector, **Nature of Services and Service Encounters**: Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters
Service-Dominant Logic: From Goods-Dominant logic to Service-Dominant logic, Value Co-creation.
Service Strategy and Competitiveness: Development of Strategic Service Vision (SSV), **Service Design:** Customer Journey and Service Design, Design Thinking methods to aid Service Design, models of facility locations (Huff's retail model), Role of service-scape in layout design, Service quality

Unit II: **[8 Hrs]**

Service Guarantee & Service Recovery: How to provide Service guarantee? How to recover from Service failure?
Forecasting Demand for Services: A review of different types of forecasting methods for demand forecasting.
Managing Capacity and Demand: Strategies for matching capacity and demand, Psychology of waiting, Application of various tools used in managing waiting line in services.

Unit III: **[8 Hrs]**

Managing Facilitating Goods: Review of inventory models, Role of inventory in services
Managing service supply relationship: Understanding the supply chain/hub of service, Strategies for managing suppliers of service
Vehicle Routing Problem: Managing after sales service, Understanding services that involve transportation of people and vehicle, Techniques for optimizing vehicle routes
Service Innovation: Services Productivity, Need for Services Innovation

Text Books

S.N	Title	Authors	Edition	Publisher
1	Service Management: Operations, Strategy, Information Technology	Fitzsimmons & Fitzsimmons	7th edition	McGraw Hill publications
2				
3				

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Services marketing: Integrating customer focus across the firm	Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D.	2012	McGraw Hill publications
2	Services Marketing	Lovelock, C	7th edition	Pearson Education India
3	Service Design for Business: A Practical Guide to Optimizing the Customer Experience	Reason, Ben, and Lovlie, Lavrans	2016	Pan Macmillan India
4	Open services innovation: Rethinking your business to grow and compete in a new era	Chesbrough, H	2010	John Wiley & Sons

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB706T(i)	PE VI- Quantum Computation and Quantum information	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. To introduce the fundamental principles of quantum computation and quantum information theory. 2. To understand quantum bits, quantum gates, and circuits. 3. To explore quantum algorithms and their advantages over classical ones. 4. To provide insight into quantum entanglement, cryptography, and error correction. 5. To study the theoretical foundations and practical challenges in implementing quantum computing systems.	1. Understand the mathematical foundations of quantum computing. 2. Explain the working of quantum logic gates and circuits. 3. Analyze and implement basic quantum algorithms. 4. Apply concepts of quantum entanglement and teleportation. 5. Evaluate quantum error correction and the basics of quantum cryptography.

Unit I **[9 Hrs]**

Introduction to Quantum Computation: Classical vs Quantum computation,Complex numbers and their role in,quantum mechanics,Dirac notation (Bra-Ket) and basic operations on kets and bras,Postulates of quantum mechanics,Qubits and multi-qubit systems,Quantum state representation and measurement.

Unit II **[9 Hrs]**

Quantum Gates and Circuits: Single and multi-qubit gates: Pauli gates, Hadamard, Phase, CNOT, Toffoli, Quant circuit model,Universal quantum gates,Gate synthesis and decomposition.

Unit III **[9 Hrs]**

Quantum Algorithms: Quantum parallelism,Deutsch-Jozsa algorithm,Simon's algorithm,Grover's Search Algorithm,Shor's Factoring Algorithm,Quantum key distribution (QKD)

Unit IV **[9 Hrs]**

Quantum Information Theory: Entanglement and Bell states,Quantum teleportation,No-cloning theorem,Quantum dense coding,Von Neumann entropy

Unit V **[9 Hrs]**

Quantum Error Correction and Cryptography: Basic error models:Bit-flip, phase-flip, and Shor code,Quantum key distribution: BB84 Protocol,Security proofs in quantum cryptography,Recent advances and challenges.

Text Books

S.N	Title	Authors	Edition	Publisher
1	Quantum Computation and Quantum Information	Michael A. Nielsen & Isaac L. Chuang	10th	Cambridge University Press
2	Quantum Computing: A Gentle Introduction	Eleanor G. Rieffel & Wolfgang Polak	1st	MIT Press

Reference Books

S.N	Title	Authors	Edition	Publisher
1	An Introduction to Quantum Computing	Phillip Kaye, Raymond Laflamme	1st	Oxford University Press
2	Classical and Quantum Computation	Alexei Yu. Kitaev et al.	1st	American Mathematical Society

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COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB706T(ii)	PE-VI- Advanced Social, Text and Media Analytics	3			3	30	70	100

Course Objectives	Course Outcomes
• To introduce the fundamental concepts and techniques of text mining, including preprocessing, categorization, clustering, and sentiment analysis. • To equip students with the skills for processing and analyzing text and web data using tools such as LDA, LSI, clickstream analysis, and search engine techniques. • To enable learners to collect, model, and analyze social media and network data using data mining and graph-based approaches for actionable insights.	CO1- Understand core text mining techniques such as preprocessing, clustering, categorization, and sentiment analysis. CO2-Apply text processing and classification methods like tokenization, LDA, and LSI for text analytics. CO3-Analyze web data using tools like clickstream analysis, SEO, and web traffic modeling. CO4-Process and model social media data using data collection and classification techniques. CO5- Evaluate social networks using graph theory and social network analysis methods.

Unit I **[9 Hrs]**

Text Mining: Introduction, Core text mining operations, Preprocessing techniques, Categorization, Clustering, Information extraction, Probabilistic models for information extraction, Text mining applications.
Methods & Approaches: Content Analysis; Natural Language Processing; Clustering & Topic Detection; Simple Predictive Modeling; Sentiment Analysis; Sentiment Prediction.

Unit II: **[9 Hrs]**

Text Processing: Text encoding, tokenization, lemmatization and stop words, Proximity and phrase queries, Positional indices, Query expansion, Query processing fundamentals, Automatic thesaurus generation, Spelling correction and synonyms, N-, gram, Edit distance.
Text Analytics: Text classification techniques, Topic model fundamentals, Document-term matrix, Latent Dirichlet Allocation (LDA), Latent Semantic Indexing (LSI)

Unit III: **[9 Hrs]**

Web Analytics: Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization, Web crawling and Indexing, Ranking algorithms, Web traffic models.

Unit IV: Social Media Data Processing **[9 Hrs]**

Social Media Data Processing: Social media data basics, Classification of social data, Modeling of social data, How to collect data - with case studies, Social media as big data, Database for modeling

Unit V: **[9 Hrs]**

Social Media Analytics: Social network and web data and methods. Graphs and Matrices. Basic measures for individuals and networks. Information visualization. **Making connections:** Link analysis. Random graphs and network evolution. **Social contexts:** Affiliation and identity; Social network analysis

Text Books

S.N	Title	Authors	Edition	Publisher
1	The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data	Ronen Feldman and James Sanger	2006	Cambridge University Press
2	Analyzing Social Media Networks with NodeXL: Insights from a Connected World	Hansen, Derek, Ben Sheiderman, Marc Smith	2011	Elsevier / Morgan Kaufmann
3	Web Analytics 2.0: The Art of Online Accountability	Avinash Kaushik	2009	Wiely
4	Introduction to Social Network Methods	Robert A. Hanneman & Mark Riddle	2005	University of California, Riverside

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Social network analysis: Methods and applications	Wasserman, S. & Faust, K.	1994	New York: Cambridge University Press.
2	Theories of communication networks	Monge, P. R. & Contractor, N. S.	2003	New York: Oxford University Press

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COMPUTER SCIENCE AND BUSINESS SYSTEMS

SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB706T(iii)	PE VI- Mobile Computing	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
1. To introduce fundamental concepts, architectures, and challenges in mobile computing. 2. To study mobile communication protocols and wireless networks. 3. To understand mobile IP, mobility management, and wireless application protocols. 4. To explore mobile operating systems, devices, and emerging applications. 5. To analyze security and performance issues in mobile environment.	After successful completion of the course, students will be able to: 1. Understand the architecture and components of mobile computing systems. 2. Explain GSM, GPRS, and mobile IP protocols for mobility. 3. Apply wireless and mobile application protocols in real-world scenarios. 4. Develop insights into mobile operating systems and app development frameworks. 5. Evaluate performance and security issues in mobile communication systems.

Unit I	**[9 Hrs]**
Introduction, issues in mobile computing, overview of wireless telephony: cellular concept,GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs,Channel allocation in cellular systems, CDMA, GPRS, MAC – SDMA – FDMA –TDMA – CDMA – Cellular Wireless Networks.	
Unit II	**[9 Hrs]**
Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Bluetooth,Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting,Mobile IP, WAP: Architecture, protocol stack, application environment, applications.	
Unit III	**[9 Hrs]**
Database Issues : Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.	
Unit IV	**[9 Hrs]**
Mobile Agents computing,Security and fault tolerance,Transaction processing in mobile computing environment,Context-aware computing and mobile context modeling,Resource management in mobile environments,Synchronization and concurrency control for mobile databases,Middleware support for mobile applications, Data caching and consistency management	
Unit V	**[9 Hrs]**
Ad Hoc networks, localization, MAC issues, Routing protocols,Global state routing (GSR), Destination sequenced distance vector routing (DSDV),Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV),Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications	

Text Books

S.N	Title	Authors	Edition	Publisher
01	Mobile Communications	Jochen Schiller	2nd	Pearson Education
02	Mobile Computing	Rajkamal	2nd	Oxford University Press

Reference Books

S.N	Title	Authors	Edition	Publisher
01	Wireless Communications and Networks	William Stallings	2nd	Pearson Education
02	Mobile Computing: Technology, Applications and Services	Asoke K. Talukder et al.	1st	McGraw-Hill Education

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SEVENTH SEMESTER

Course Code	Course Name	Th	Tu	Pr	Credits	Evaluation		
						CA	ESE	Total
22CB707T	IT Project Management	3	-	-	3	30	70	100

Course Objectives	Course Outcomes
• To introduce students to the fundamentals of project planning, feasibility studies, and project scheduling techniques including PERT and CPM. • To impart knowledge on cost estimation, cost control, and project auditing for efficient project execution and management .• To familiarize students with agile project management principles and methodologies and their relevance in dynamic IT environments. • To provide in-depth understanding of Scrum practices, roles, processes, and best practices in agile project execution. • To develop practical knowledge of DevOps tools and practices for continuous integration, deployment, and monitoring in IT projects.	**CO1**: Apply project feasibility analysis techniques and develop project schedules using PERT and CPM. **CO2**: Analyze and control project costs and resources using advanced project management tools and techniques. **CO3**: Demonstrate understanding of Agile project management and differentiate between Agile, Scrum, Lean, DevOps, and ITIL. **CO4**: Implement Scrum methodology in IT projects by assigning roles, managing sprints, and applying Scrum best practices. **CO5**: Use DevOps tools and practices such as Docker, CI/CD, automated testing, and monitoring to improve software project delivery.

Unit I Overview and Project Scheduling **[9 Hrs]**

Project Overview and Feasibility Studies- Identification, Market and Demand Analysis, Project Cost Estimate, Financial Appraisal

Project Scheduling: Project Scheduling, Introduction to PERT and CPM, Critical Path Calculation, Precedence Relationship, Difference between PERT and CPM, Float Calculation and its importance, Cost reduction by Crashing of activity

Unit II- Cost Control and Scheduling and Project Management **[9 Hrs]**

Cost Control and Scheduling: Project Cost Control (PERT/Cost), Resource Scheduling & Resource Leveling

Project Management Features: Risk Analysis, Project Control, Project Audit and Project Termination

Unit III- Agile Project Management **[9 Hrs]**

Agile Project Management: Introduction, Agile Principles, Agile methodologies, Relationship between Agile Scrum, Lean, DevOps and IT Service Management (ITIL).

Unit IV - Scrum **[9 Hrs]**

. **Scrum:** Various terminologies used in Scrum (Sprint, product backlog, sprint backlog, sprint review, retro perspective), various roles (Roles in Scrum), Best practices of Scrum.

Unit V- DevOps **[9 Hrs]**

DevOps: Overview and its Components, Containerization Using Docker, Managing Source Code and Automating Builds, Automated Testing and Test Driven Development, Continuous Integration, Configuration Management, Continuous Deployment, Automated Monitoring

Text Books

S.N	Title	Authors	Edition	Publisher
1	Succeeding with Agile: Software Development Using Scrum	Mike Cohn	Edition-III	Pearson

Reference Books

S.N	Title	Authors	Edition	Publisher
1	Agile Product Management with Scrum	Ken Schwaber	Edition-II	MacGraw hill

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