DEVI AHILYA VISHWAVIDYALAYA, INDORE

FACULTY OF ENGINEERING

FRAMEWORK OF SCHEME

III Year B.Tech. Programme (As Per AICTE Guideline)

(Computer Science & Business Systems)

INSTITUTE OF ENGINEERING & TECHNOLOGY

(www.ietdavv.edu.in)

DEVI AHILYA VISHWAVIDYALAYA, INDORE

INSTITUTE OF ENGINEERING & TECHNOLOGY

SCHEME OF EXAMINATION FOR III B.Tech. PROGRAMME

(As per AICTE guideline and NEP 2020)

Semester-V

S.No.	Course Code	Course Name	Type	CI(L+T)-LI-TW+SL) (Hours/Semester)	Credits* (Total Hrs/30)
1.	5RBPC1	Software Design	PC	20+10-20-70	4
2.	5RBPC2	Computer Networks	PC	20+10-20-70	4
3.	5RBHS1	Fundamentals of Management	HS	20+10-00-60	3
4.	5RBHS2	Business Strategy	HS	20+10-00-60	3
5.	5RBOE1	Open Elective-I	OE	20+10-00-60	3
6.	5RBPE1	Program Elective - I	PE	20+10-20-70	4
7.	5RBPC3	Minor Project	PC	00+00-10-20	1
TOTAL CREDITS					**22**

S. No.	Course Code	List of Program Elective – I
1	5RBPE1	Machine Learning
2	5RBPE2	Conversational Systems
3	5RBPE3	Cloud, Microservices and Applications

S. No.	Course Code	List of Open Elective - I
1	5RBOE1	Business Communication and Value Science – III
2	5RBOE2	Supply Chain Management

**This is as per the new National Credit Framework, which accounts for 30 hrs. of learning as equivalent to 1 credit Legend:*

1. BS-Basic Science, ES-Engineering Science, HS-Humanities and Social Science including Management, PC-Programme Core, IK- Indian Knowledge System

2. CI: Classroom Instruction (Includes different instructional/implementation strategies i.e. Lecture (L), Tutorial (T), Case method, Demonstrations, Video demonstration, Problem based learning etc. to deliver theoretical concepts)
3. LI: Laboratory Instruction (Includes experiments/practical performances /problem based experiences in laboratory, workshop, field or other locations using different instructional/Implementation strategies)
4. TW: Term work (includes assignments, seminars, micro projects, industrial visits, any other student activities etc.)
5. SL: Self Learning, MOOCs, spoken tutorials, online educational resources etc. (If provided in curriculum structure.

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<tr><td rowspan="3">5RBPC1:
Software Design</td><td colspan="2">Classroom Instruction (CI)</td><td>Lab Instruction (LI)</td><td>Term Work (TW) and Self Learning (SL)</td><td>Total no. of Hours Per Semester</td><td>Total Credits (Total Hours/30)</td></tr>
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Course Learning Objectives:

- To provide a deep understanding of Object-Oriented Analysis and Design (OOAD) principles and equip students with the practical skills.
- To model, design, and document software systems using the Unified Modelling Language (UML).
- Develop software design documentation and communicate design decisions effectively using standard modelling and documentation techniques.

Prerequisites: A solid understanding of Object-Oriented Programming (OOP) principles and basic proficiency in an object-oriented language like C++ or Java.

COURSE CONTENTS

Unit I

Introduction to Software Design: Role of design in the Software Development Life Cycle (SDLC), characteristics of good design, and design complexities. Object-Oriented Concepts: Deep dive into Abstraction, Encapsulation, Inheritance, and Polymorphism. Object-Oriented Analysis and Design (OOAD): The difference between structured analysis and object-oriented analysis. Identifying objects, classes, and responsibilities. Design Principles: Introduction to the SOLID principles (Single Responsibility, Open/Closed, Liskov Substitution, Interface Segregation, and Dependency Inversion) and DRY (Don't repeat yourself).

CO Mapped: CO1

Unit II

Introduction to UML: History, goals, and the conceptual model of UML. Understanding UML building blocks. Class Diagrams, Defining classes, attributes, operations, and visibility. Relationships: Associations, Multiplicity, Aggregation, Composition, Generalization, and Dependencies. Object Diagrams: Purpose of object diagrams, representing instances, and mapping object diagrams to class diagrams.

CO Mapped: CO2

Unit III

Use Case Diagrams: Identifying actors, use cases, and system boundaries. Understanding relationships. Interaction Diagrams Overview: Purpose and context of modelling object interactions. Sequence Diagrams, Understanding lifelines, activation bars, synchronous/asynchronous messages, creation/destruction of objects, and combined fragments Communication Diagrams, Emphasizing the structural organization of objects that send and receive messages.

CO Mapped: CO3

Unit IV

Activity Diagrams: Modelling workflows and business processes. Using action states, transitions, branches (decisions), merges, forks, and joins (concurrency). Swimlanes: Organizing responsibilities in an activity diagram using partitions. State Machine Diagrams: Modelling the lifecycle of a single, event-driven object. Understanding states, initial/final states, transitions, events, guard conditions, and actions. Timing Diagrams: A brief overview of modelling timing constraints and changes in state over a linear time axis.

CO Mapped: CO4

Unit V

Component Diagrams: Modelling the physical and replaceable parts of a system. Understanding components, provided/required interfaces, and dependencies. Deployment Diagrams: Modelling the runtime architecture. Defining nodes (hardware), execution environments, communication paths, and deploying artifacts to nodes. Forward and Reverse Engineering: Translating UML models into executable code (forward) and generating UML diagrams from existing code (reverse). Comprehensive Case Study: End-to-end OOAD application. Applying all UML diagrams to design a complete system (e.g., an ATM System, Library Management System, or E-commerce platform.

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	**CO**
CO1	Understand and Apply OO Principles
CO2	Construct Structural Models
CO3	Model System Interactions
CO4	Formulate Complex Workflows

CO5	Architect Physical Deployments

List of Practicals:

Recommended Tools: Star UML, Argo UML, Rational Rose, or web-based tools like Lucidchart/Draw.io.

1. Use Case Modeling (Library Management System): Identify actors, use cases, and system boundaries. Read a provided problem statement for a university Library Management System. Identify primary and secondary actors, list the use cases (e.g., Issue Book, Return Book, Calculate Fine), and draw the complete Use Case Diagram including <<include>> and <<extend>> relationships.

2. Class Diagram and Relationships (ATM System) Objective: Model the static structure of a system. Design a detailed Class Diagram for an ATM System.

3. Forward Engineering: UML to C++ Mapping: Translate static structural models into object-oriented code. Take the Class Diagram generated in Practical 2 (ATM System) and write the corresponding C++ skeleton code.

4. Sequence Diagram (E-Commerce Checkout): Model time-ordered message passing between objects. Draw a Sequence Diagram for the "Checkout and Payment" scenario of an online shopping platform.

5. Communication Diagram (Student Registration): Model the structural organization of communicating objects.

6. Activity Diagram with Swim lanes (Order Processing): Visualize business workflows and concurrent processes. Create an Activity Diagram for a multi-department Order Processing System.

7. State Machine Diagram (Vending Machine): Model the lifecycle of a reactive, event-driven object. Design a State Machine Diagram for a Vending Machine. Map out the states (Idle, Processing Payment, Dispensing, Out of Stock), transitions, triggering events (Coin Inserted, Button Pressed), and guard conditions (Balance Sufficient).

8. Component Diagram (Railway Reservation System): Model the logical and replaceable components of a software system. Draw a Component Diagram for an Online Railway Reservation System.

9. Deployment Diagram (Hospital Management System): Map logical software artifacts to physical hardware nodes. Architect a Deployment Diagram for a web-based Hospital Management System.

10. Reverse Engineering: C++ to UML: Understand how existing code relates to design models. Analyze a provided set of C++ source files for a basic inventory tracking application.

Books Recommended:

[1] Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development" by Craig Larman.
[2] UML Distilled: A Brief Guide to the Standard Object Modelling Language" by Martin Fowler.
[3] Design Patterns: Elements of Reusable Object-Oriented Software" by Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides (The Gang of Four).

CO-PO-PSO Relationship:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	1	1	1							3	2	1
CO2	3	3	2	2	1							2	3	1
.CO3	3	3	2	2	2							3	2	1
CO4	3	3	2	2	2	1						2	3	1
CO5	3	3	2	2	2	3	1					3	2	1

- *CO (Rows) mention Nil / Very Small / Insignificant Contribution to the PO (Column)
- 1: Relevant and Small Significant 2: Medium or Moderate and 3: Strong.

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Course Learning Objectives:

- To build a solid foundation in computer networking concepts.
- Spanning from the physical transmission of data to high-level application protocols, with a strong emphasis on routing algorithms and layered network architectures.

Prerequisites: Basics of computer hardware and software, Digital electronics.

COURSE CONTENTS

Unit I

Network Basics: Definition, goals, and applications of computer networks. Types of networks (LAN, MAN, WAN, PAN) and network topologies (Star, Bus, Ring, Mesh, Tree). Network Models: Detailed study of the OSI Reference Model and the TCP/IP Protocol Suite. Comparison between OSI and TCP/IP. Physical Layer: Transmission media (Guided: Coaxial, Twisted Pair, Fiber Optics; Unguided: Radio, Microwave, Infrared).Switching Techniques: Circuit switching, packet switching, and message switching.

CO Mapped: CO1

Unit II

Data Link Layer Design Issues: Framing methods, error detection and correction (Parity, Checksum, CRC, Hamming Code). Flow and Error Control: Stop-and-Wait ARQ, Go-Back-N ARQ, and Selective Repeat ARQ protocols. Multiple Access Protocols (MAC): Random access (ALOHA, Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA), controlled access, and channelization. Standard Ethernet: IEEE 802.3 standard, MAC sub layer frame format, Fast Ethernet, and Gigabit Ethernet. Devices: Hubs, Bridges, and Layer 2 Switches.

CO Mapped: CO2

Unit III

Logical Addressing: IPv4 addressing, classful addressing, CIDR (Classless Inter-Domain Routing), sub netting, and super netting. Introduction to IPv6. Network Layer Protocols: IPv4 datagram format, ICMP, ARP, and RARP. Routing Algorithms: * Static vs. Dynamic routing. Shortest Path Routing (Dijkstra's Algorithm). Distance Vector Routing (Bellman-Ford Algorithm) and the Count-to-Infinity problem. Link State Routing. Congestion Control: Causes of congestion, Leaky Bucket algorithm, and Token Bucket algorithm. Layer 3 Devices: Routers.

CO Mapped: CO3

Unit IV

Transport Layer Services: Process-to-process delivery, multiplexing, and de multiplexing. Transmission Control Protocol (TCP): TCP segment format, 3-way handshake (connection establishment and termination), TCP flow control (Sliding Window), and TCP congestion control. User Datagram Protocol (UDP): UDP datagram format, connectionless service, and use cases for UDP vs. TCP. Socket Concepts: Introduction to network sockets and port numbers (well-known vs. ephemeral ports).

CO Mapped: CO4

Unit V

Domain Name System (DNS): Name space, domain name resolution, and DNS records. Application Protocols: HTTP/HTTPS (Web), FTP (File Transfer), SMTP, POP3, IMAP (Email), and DHCP. Network Security Basics: Principles of cryptography, symmetric vs. asymmetric key cryptography (RSA basics). Security Protocols & Firewalls: IPSec, SSL/TLS overview, and types of firewalls (Packet filtering, Application Gateway).

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	CO
CO1	Analyse the fundamental concepts of data communication, physical transmission media, and the layered architecture
CO2	Apply error detection and correction techniques and evaluate flow control and multiple access protocols to ensure reliable data transfer at the Data Link Layer.
CO3	Solve logical addressing problems (IPv4/IPv6 sub netting) and evaluate network routing algorithms
CO4	Examine Transport Layer services, distinguishing between the operational mechanics, flow control, and congestion management of TCP and UDP.
CO5	Explain the functioning of core Application Layer protocols (DNS, HTTP, SMTP) and assess fundamental network security principles and cryptographic

	techniques

List of Practicals:

1. Physical Network Configuration Cable Making: Creating straight-through and cross-over UTP cables using RJ-45 connectors.
2. Topology Setup: Assembling physical network topologies (Star, Bus, Mesh) using switches and hubs.
3. Device Configuration: Configuring network interface cards (NICs) and initial settings for routers and switches.
4. IP Addressing &Sub netting: Configuring IPv4/IPv6 addresses, subnet masks, and gateways on workstations.
5. Basic Commands: Using ipconfig/ifconfig, netstat, ping, traceroute, and arp for troubleshooting.
6. DHCP Server: Configuring a router or server to provide dynamic IP addresses.
7. DNS Server: Setting up a DNS server for domain name resolution.
8. VLAN Configuration: Implementing Virtual Local Area Networks on managed switches.
9. LAN Design: Designing and simulating a small Local Area Network (LAN).
10. Routing Protocols: Configuring and verifying static routing, RIP, OSPF, or EIGRP.
11. TCP Socket Programming: Implementing an Echo Client and Echo Server.
12. UDP Socket Programming: Creating a simple file transfer or chat application.
13. Packet Sniffing: Using Wireshark to analyze HTTP, TCP, and IP packet headers.
14. Firewall Configuration: Setting up basic packet filtering rules.
15. Error Detection: Implementing CRC (Cyclic Redundancy Check) for error detection.

Books Recommended:

[1] "Data Communications and Networking" by Behrouz A. Forouzan.

[2] "Computer Networks" by Andrew S. Tanenbaum and David J. Wetherall.

[3] Computer "Computer Networking: A Top-Down Approach" by James F. Kurose and Keith W. Ross.

CO-PO-PSO Relationship:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	3	2	1
CO2	3	3	2	-	-	-	-	-	-	-	-	3	3	2
CO3	3	2	2	-	2	-	-	-	-	-	-	3	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	1	3	-	-	-	-	-	-	2	2	3

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Course Learning Objectives:

- To provide a basic understanding to the students with reference to working of business organizations through the process of management.
- To give a brief understanding of the managerial functions of planning (Including decision making) and organizing.
- To understand the core management principles which applies to individuals, medium and large organizations. The students are expected to learn the basics of management functions and realize the ideal characteristics of a manager. The impetus of this subject is to make the students familiarize with the professional skills required to be an effective manager.
- To familiarize the students with organizational, group and individual behaviour.
- To disseminate the theory and practice of moral code of conduct and familiarize the students with the concepts of “right” and “good” in individual, social and professional context.

Prerequisites: Basic communication skills and a general interest in business operations.

COURSE CONTENTS

Unit I

Management Theories: Concept and Foundations of Management, Evolution of Management Thoughts [Pre-Scientific Management Era (before 1880), Classical Management Era (1880-1930), Neo-classical Management Era (1930-1950), Modern Management Era (1950-on word). Contribution of Management Thinkers: Taylor, Fayol, Elton Mayo.

CO Mapped: CO1

Unit II

Functions of Management- Planning, Organizing, Staffing, Directing, Controlling. Fayol's Principles of Management.

CO Mapped: CO2

Unit III

Organization Behaviour: Introduction, Personality, Perception, Learning and Reinforcement, Motivation, Group Dynamics, Power & Influence, Work Stress and Stress Management, Decision Making, Problems in Decision Making, Decision Making, Organizational Culture, Managing Cultural Diversity.

CO Mapped: CO3

Unit IV

Organizational Design: Classical, Neoclassical and Contingency Approaches to Organizational Design; Organizational Theory and Design, Organizational Structure (Simple Structure, Functional Structure, Divisional Structure, Matrix Structure).

CO Mapped: CO4

Unit V

Managerial Ethics: Ethics and Business, Ethics of Marketing & advertising, Ethics of Finance & Accounting, Decision Making Frameworks, Business and Social Responsibility, International Standards, Corporate Governance, Corporate Citizenship, Corporate Social Responsibility Leadership: Concept, Nature, Importance, Attributes of a Leader, Developing Leaders Across the Organization, Leadership Grid.

CO Mapped: CO5

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*Case studies on different topics of all the Units are advisable.

Course Outcomes (CO):

CO. No.	CO
CO1	Analyze the foundational concepts and evolution of management thoughts, evaluating the historical contributions of key management thinkers like Taylor and Fayol.
CO2	Apply the fundamental functions of management planning, organizing, staffing, directing, and controlling to practical operational scenarios.
CO3	Evaluate theories of organizational behaviour, group dynamics, and motivation to effectively manage workplace stress, culture, and decision making processes.
CO4	Compare and contrast classical, neoclassical, and contingency approaches to formulate appropriate organizational designs and structural models (Matrix, Divisional).
CO5	Assess frameworks for managerial ethics, corporate social responsibility, and

	leadership attributes to make sound, ethical business decisions.

Books Recommended:

[1] “Organization and Management” by R. D. Agrawal.
[2]"Essentials of Management: An International, Innovation, and Leadership Perspective" by Harold Koontz and Heinz Weihrich.
[3] "Organizational Theory, Design, and Change" by Gareth R. Jones.

CO-PO-PSO Relationship:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	2	2	3	-	-	-	-	-	-	3	3	1
CO2	3	3	2	2	3	-	-	-	-	-	-	3	3	1
CO3	3	3	2	2	3	-	-	-	-	-	-	3	3	1
CO4	3	3	2	2	3	-	-	-	-	-	-	3	3	1
CO5	3	3	2	2	3	-	-	-	-	-	-	3	3	1

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Devi Ahilya Vishwavidyalaya, Indore, India **Institute of Engineering and Technology**				**III Year B.Tech. (Computer Science & Business Systems) V Sem**		
Course Code & Name	**Instructions Hours per Semester and Credits**					
5RBHS2: Business Strategy	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per Semester**	**Total Credits (Total Hours/30)**
	L	**T**	**P**	**TW+SL**	**90**	**3**
	20	**10**	**00**	**60**		

Course Learning Objectives:

- To learn the fundamental concepts of strategic management to analyze business situations and apply these concepts to solve business problems.
- To understand the fundamental principles of and interrelationships among business functions such as: R&D, production, marketing, finance, HR and information technology.
- To understand the inter-relationships of business to individuals, other organizations, government and society.
- To analyze complex, unstructured qualitative and quantitative problems, using appropriate tools.

Prerequisites: A foundational understanding of core business disciplines including finance, marketing, microeconomics, and organizational behaviour is required to effectively synthesize and apply business strategy.

COURSE CONTENTS

Unit I

Introduction to Strategic Management: Importance of Strategic Management, Vision and Objectives, Schools of thought in Strategic Management, Strategy Content, Process, and Practice, Fit Concept and Configuration Perspective in Strategic Management.

CO Mapped: CO1

Unit II

Internal Environment of Firm- Recognizing a Firm's Intellectual Assets: Core Competence as the Root of Competitive Advantage, Sources of Sustained Competitive Advantage, Business Processes and Capabilities-based Approach to Strategy.

CO Mapped: CO2

Unit III

External Environments of Firm- Competitive Strategy: Five Forces of Industry Attractiveness that Shape Strategy, The concept of Strategic Groups, and Industry Life Cycle, Generic Strategies, Generic Strategies and the Value Chain.

CO Mapped: CO3

Unit IV

Corporate Strategy and Growth Strategies: The Motive for Diversification, Related and Unrelated Diversification, Business Portfolio Analysis, Expansion, Integration and Diversification, Strategic Alliances, Joint Ventures, and Mergers & Acquisitions.

CO Mapped: CO4

Unit V

Strategy Implementation: Structure and Systems: The 7S Framework, Strategic Control and Corporate Governance. Strategy Evaluations and control: Motivation to evaluate; Criteria for Evaluation; Measuring and Feedback.

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	CO
CO1	Analyze Strategic Foundations: Analyze the foundational concepts of strategic management, including organizational vision, objectives, and various schools of thought, to evaluate a firm's strategic fit.
CO2	Evaluate Internal Capabilities: Evaluate a firm's internal environment to identify intellectual assets, core competencies, and business processes that generate sustained competitive advantage.
CO3	Assess External Environments: Assess the external industry environment using frameworks like the Five Forces and the Industry Life Cycle to formulate appropriate generic strategies and optimize the value chain.
CO4	Formulate Corporate Strategies: Formulate corporate-level growth strategies by analyzing business portfolios and evaluating options for diversification, integration, mergers, acquisitions, and strategic alliances.
CO5	Design Implementation Frameworks: Design effective strategy implementation and control systems utilizing the 7S Framework and applying principles of strong corporate governance.

Books Recommended:

[1] M.E. Porter, Competitive Strategy, 1980.M.E. Porter.
[2] Competitive Advantage, 1985 Richard Rumelt (2011).

CO-PO-PSO Relationship:

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CO1	3	2	1	1	1							3	2	1
CO2	3	3	2	2	2							3	2	1
CO3	3	3	2	2	1							3	3	1
CO4	3	2	2	3	2							3	2	1
CO5	2	2	2	2	2							3	2	1

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Course Learning Objectives:

1. To Develop Intrapersonal Insight: Equip students with self-evaluation tools (like SWOT and TOWS) to build emotional intelligence, self-awareness, and intrinsic motivation for long-term career resilience.
2. Navigate Global Workplaces: Foster a deep understanding of pluralism, diversity, and cross-cultural dynamics to prepare students for collaborative roles in multinational IT and business environments.
3. Cultivate Ethical Leadership: Instil a sense of civic responsibility and ethical decision-making, helping students bridge the gap between individual technological contributions and broader nation-building.
4. Master Professional Communication: Enhance advanced technical and business writing skills, ensuring students can effectively translate and present complex engineering concepts to diverse, non-technical stakeholders.

Prerequisites: Business Communication & Value Science-I and Business Communication & Value Science-II.

COURSE CONTENTS

Unit I

Self-Analysis Techniques: Introduction to structured self-evaluation frameworks. SWOT and TOWS Matrices: Practical application of SWOT (Strengths, Weaknesses, OpportUnities, Threats) and TOWS analysis for individual career planning and strategic decision-making. The Psychology of Motivation: Differentiating between intrinsic and extrinsic motivation in the workplace. Personal Management: Advanced goal setting, time management techniques, and building emotional resilience in high-pressure tech environments.

CO Mapped: CO1

Unit II

Understanding Pluralism: The concept and importance of pluralism in the modern corporate world. Cultural Spaces: Defining cultural spaces and analyzing how they dictate professional behaviour, workplace norms, and business operations. Diversity and Inclusion (D&I): The business case for D&I. Recognizing the benefits, navigating the challenges, and implementing best practices for inclusive teams. Managing Bias: Identifying and mitigating unconscious bias to foster a more equitable work environment.

CO Mapped: CO2

Unit III

Fundamentals of Cross-Cultural Communication: Identifying common barriers in international business interactions. Cultural Frameworks: Applying models like Hofstede's Cultural Dimensions to understand High-context vs. Low-context cultures. Overcoming Barriers: Strategies for navigating language differences, ethnocentrism, and cultural misunderstandings within distributed IT and business teams. Non-Verbal Dynamics: Understanding the nuances of body language, spatial awareness, and professional etiquette across different global geographies.

CO Mapped: CO3

Unit IV

Technology and Nation Building: Evaluating the socio-economic impact of corporate decisions and the role of engineering and business systems in national development. Ethics and Civic Responsibility: Corporate Social Responsibility (CSR) and the ethical obligations of future technologists. Leadership Fundamentals: Transitioning from an individual contributor to a team leader. Conflict Resolution: Applying emotional intelligence (EQ) and negotiation skills to resolve workplace disputes and manage team dynamics effectively.

CO Mapped: CO4

Unit V

Mechanics of Technical Writing: Principles of clarity, precision, and audience analysis in technical documentation. Engineering & Research Documentation: Structuring and drafting rigorous technical documents, including software architecture specifications, object-oriented design documents, algorithm explanations, and predictive modeling research papers. Business Reporting: Crafting clear executive summaries, business proposals, and analytical reports. Advanced Presentation Skills: Designing impactful visual aids and mastering the delivery of complex technical data to non-technical business stakeholders.

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	CO
CO1	Apply Self-Analysis Frameworks: Apply structural self-evaluation tools like SWOT and TOWS matrices to build personal resilience, manage time effectively, and foster intrinsic motivation for career advancement.
CO2	Analyze Cultural Dynamics: Analyze the principles of pluralism, diversity, and inclusion to mitigate unconscious bias and foster equitable cultural spaces within modern corporate environments.
CO3	Evaluate Cross-Cultural Communication: Evaluate global communication models to effectively navigate cultural barriers, ethnocentrism, and diverse non-verbal dynamics in international business interactions.
CO4	Assess Ethical Leadership: Assess the socio-economic impact of engineering on nation-building, applying ethical frameworks and emotional intelligence to lead teams and resolve workplace conflicts
CO5	Formulate Technical Documentation: Formulate professional business reports and rigorous technical documentation, effectively translating complex computing concepts—such as algorithm designs or predictive modeling research—for both technical peers and non-technical stakeholders.

Books Recommended:

[1] "Cross-Cultural Management: Essential Concepts" by David C. Thomas and Mark F. Peterson.
[2] "Technical Communication: Principles and Practice" by Meenakshi Raman and Sangeeta Sharma.
[3] "Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman.

CO-PO-PSO Relationship:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	3	3						1	1	3
CO2	3	3	3	2	2	3						2	2	3
CO3	3	2	3	2	3	3						1	1	3
CO4	3	2	3	2	3	3						2	2	3
CO5	2	3	3	3	3	3						1	1	3

- *CO (Rows) mention Nil / Very Small / Insignificant Contribution to the PO (Column)
- 1: Relevant and Small Significant 2: Medium or Moderate and 3: Strong.

<table>
<tr><td colspan="4">Devi AhilyaVishwavidhyalaya, Indore, India
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<tr><td>Course Code & Name</td><td colspan="6">Instructions Hours per Semester and Credits</td></tr>
<tr><td rowspan="2">5RBOE2:
Supply Chain Management</td><td colspan="2">Classroom Instruction (CI)</td><td>Lab Instruction (LI)</td><td>Term Work (TW) and Self Learning (SL)</td><td>Total no. of Hours Per Semester</td><td>Total Credits (Total Hours/30)</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>TW+SL</td><td rowspan="2">90</td><td rowspan="2">3</td></tr>
<tr><td>20</td><td>10</td><td>00</td><td>60</td></tr>
</table>

Course Learning Objectives:

- To understand core SCM concepts.
- To explain the fundamental components of an end-to-end supply chain, including procurement, inventory management, warehousing, transportation, and customer fulfilment.

Prerequisites:

1. Before taking this course, students are generally expected to have a foundational understanding of basic business operations and analytical concepts
2. Basic Principles of Management / Business Operations: Familiarity with how organizations structure their functions, such as purchasing, production, and distribution.

COURSE CONTENTS

Unit I Operations Management & New Product Development

Transformation process model: Inputs, Process and outputs; Classification of operations, Responsibilities of Operations Manager; New Product Development, Selection and Design of Product, Services.

CO Mapped: CO1

Unit II: Process Selection, Facility Location & Layout Planning

Process types in manufacturing: Project, jobbing, batch, line, mass, continuous; Process types in services: professional services, services shops, mass services; Plant location; Layout planning.

CO Mapped: CO2

Unit III: Production Planning & Control

Production Planning & Control: Production planning techniques for various process choices, Techniques of production control, Aggregate planning techniques.

CO Mapped: CO3

Unit IV: Quality Management & Six Sigma

Quality management: Introduction; Meaning; Quality characteristics of goods and services; Tools and techniques for quality improvement: check sheet, histogram, scatter diagram, cause and effect diagram, Pareto chart, process diagram, statistical process control chart; Quality assurance; Total quality management (TQM) model; Service quality, concept of Six Sigma and its application.

CO Mapped: CO4

Unit V: Productivity Improvement Techniques & Maintenance Management: Productivity Improvement Techniques: Work study; Method study; Work measurement time study: stop watch time study; Work sampling. Maintenance: maintenance policies for facilities and equipment; Time of failure; Preventive versus breakdown maintenance; Procedure for maintenance, total productive maintenance (TPM)

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	**CO**
CO1	Apply Demand Forecasting & Planning Models: Apply quantitative and qualitative forecasting techniques to accurately predict customer demand, manage lead times.
CO2	Analyze Inventory & Logistics Strategies: Analyze inventory management models (such as EOQ, Safety Stock, and JIT) and logistics networks to optimize storage, transportation routes, and operational costs.
CO3	Evaluate Strategic Sourcing & Procurement: Evaluate supplier selection criteria, vendor negotiation strategies, and global sourcing frameworks to build resilient, cost-effective, and ethical procurement channels.
CO4	Assess Supply Chain Risk & Sustainability: Assess supply chain vulnerabilities, green logistics initiatives, and risk mitigation frameworks to ensure business continuity and environmental compliance in global operations.
CO5	Formulate Integrated SCM Solutions: Formulate data-driven supply chain strategies using modern technologies—such as ERP systems, RFID, and predictive analytics—to improve end-to-end visibility and alignment with corporate goals.

Books Recommended:

[1] Adam Jr., Everett E., and Ronald J. Ebert. Production and Operations Management. 5th ed., Prentice-Hall, 1992, 2000.

[2] Bedi, Kanishka Production & Operations Management. Oxford University Press.

[3] Chary, S.N. Production and Operations Management. 9th ed., Tata McGraw-Hill, 1997.

[4] Haleem, Abid Production and Operations Management. Galgotia Publications, 2004.

[5] Hill, Terry. Operations Management. Palgrave, 2000. Shanker, Ravi Industrial Engineering. Galgotia Publications.

CO-PO-PSO Relationship:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	3	2	3	3						1	1	3
CO2	3	3	3	2	2	3						2	2	3
CO3	3	2	3	2	3	3						1	1	3
CO4	3	2	3	2	3	3						2	2	3
CO5	2	3	3	3	3	3						1	1	3

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<tr><td>Course Code & Name</td><td colspan="6">Instructions Hours per Semester and Credits</td></tr>
<tr><td rowspan="2">5RBPE1: Machine Learning</td><td colspan="2">Classroom Instruction (CI)</td><td>Lab Instruction (LI)</td><td>Term Work (TW) and Self Learning (SL)</td><td>Total no. of Hours Per Semester</td><td>Total Credits (Total Hours/30)</td></tr>
<tr><td>L</td><td>T</td><td>P</td><td>TW+SL</td><td rowspan="2">120</td><td rowspan="2">4</td></tr>
<tr><td>20</td><td>10</td><td>20</td><td>70</td></tr>
</table>

Course Learning Objectives:

- To understand the fundamental concepts, mathematical foundations, and workflow of Machine Learning.
- To analyze real-world datasets using Exploratory Data Analysis (EDA) and prepare high-quality datasets through feature engineering and pre-processing techniques.
- To design, implement, evaluate, and optimize supervised and unsupervised machine learning models.
- To apply ensemble learning techniques and interpret model predictions using Explainable Artificial Intelligence (XAI).
- To develop practical Machine Learning solutions using modern AI technologies including Deep Learning, Transformers, Large Language Models (LLMs), Vector Databases, and Retrieval-Augmented Generation (RAG).

Prerequisites: Python Programming, Data Structures and Algorithms, Linear Algebra, Probability and Statistics, Differential Calculus, Database Fundamentals.

COURSE CONTENTS

Unit I:

Introduction to Machine Learning (ML);AI, ML and Data Science, ML workflow and lifecycle, Vectors, Matrices, Matrix Multiplication, Eigenvalues and Eigenvectors, Probability and Statistics, Cost Functions and Gradient Descent (Introduction), Exploratory Data Analysis (EDA), Data visualization, Missing values, duplicates and outliers, Correlation analysis, Feature engineering, Feature selection, Feature extraction (Introduction), Feature scaling, Encoding categorical variables, Data pre processing pipeline, Train-Test Split, Cross Validation, Bias-Variance Trade-off, Over fitting and Under fitting.

CO Mapped: CO1

Unit II:

Supervised Machine Learning: Linear, Multiple, and Polynomial Regression, Logistic Regression, Ridge and Lasso Regression, Decision Trees, Support Vector Machines, Kernel Functions, and Performance Metrics including Accuracy, Precision, Recall, F1-score, and ROC-AUC.

CO Mapped: CO2

Unit III:

Unsupervised Learning and Model Optimization: K-Means, Hierarchical Clustering, DBSCAN, Cluster Evaluation, Principal Component Analysis (PCA), Introduction to Singular Value Decomposition, Hyperparameter Optimization, Grid Search, Random Search, Machine Learning Pipelines, and Model Selection

CO Mapped: CO3

Unit IV:

Ensemble Learning and Explainable AI: Ensemble Learning, Bagging, Random Forest, AdaBoost, Gradient Boosting, Introduction to XGBoost, Feature Importance, Explainable AI (SHAP & LIME), Ethical AI, Fairness and Bias, and Model Deployment Fundamentals**.**

CO Mapped: CO4

Unit V:

Modern AI and Emerging Paradigms: Artificial Neural Networks, Deep Learning Fundamentals, Back propagation, Attention Mechanism, Transformers, Large Language Models (LLMs), Prompt Engineering, Dense Embeddings, Vector Databases, Similarity Search, Retrieval-Augmented Generation (RAG), Introduction to Time Series Forecasting, Future Trends in Artificial Intelligence

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	**CO**
CO1	Explain the fundamental concepts, mathematical foundations, workflow, and applications of Machine Learning for solving real-world problems
CO2	Analyze real-world datasets by performing exploratory data analysis (EDA), data pre processing, feature engineering, and feature selection to prepare data for machine learning.
CO3	Develop and evaluate supervised and unsupervised machine learning models using appropriate algorithms, performance metrics, and model validation techniques.
CO4	Optimize and interpret machine learning models using hyper parameter tuning, ensemble learning methods, and Explainable Artificial Intelligence (XAI) techniques.
CO5	Design and implement intelligent AI applications using modern technologies such as

	Deep Learning, Transformers, Large Language Models (LLMs), Vector Databases, and Retrieval-Augmented Generation (RAG).

List of Practicals:

1. Python, NumPy and Pandas refresher.
2. Exploratory Data Analysis (EDA).
3. Data cleaning and feature engineering.
4. Linear Regression.
5. Logistic Regression.
6. Decision Trees and SVM.
7. K-Means Clustering.
8. Principal Component Analysis.
9. Hyperparameter tuning using GridSearchCV.
10. Random Forest and Boosting.
11. SHAP/LIME model interpretation.
12. Neural Networks using PyTorch.
13. Text Classification using Transformers.
14. Vector Databases using FAISS/ChromaDB.
15. Build a simple RAG application.

Books Recommended:

[1] Hands-On Machine Learning with Scikit-Learn, Keras, and TensoFlow:AurélienGéron

[2] Pattern Recognition and Machine Learning Christopher: M. Bishop

[3] The Elements of Statistical Learning : Hastie, Tibshirani-Friedman

[4] Deep Learning : Goodfellow, Bengio & Courville

CO-PO-PSO Relationship:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	-	-	2	-	-	2	2	2	3	2	-	1	1	3
CO2	-	-	2	-	-	2	1	2	3	2	-	2	2	3
CO3	-	-	2	-	-	1	1	2	2	1	-	1	1	3
CO4	-	-	1	-	-	1	-	-	2	1	-	2	2	3
CO5	-	-	1	-	-	1	-	-	1	1	-	1	1	3

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<tr><td>Course Code & Name</td><td colspan="6">Instructions Hours per Semester and Credits</td></tr>
<tr><td rowspan="3">5RBPE2: Program Elective-II Conversational Systems</td><td colspan="2">Classroom Instruction (CI)</td><td>Lab Instruction (LI)</td><td>Term Work (TW) and Self Learning (SL)</td><td>Total no. of Hours Per Semester</td><td>Total Credits (Total Hours/30)</td></tr>
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</table>

Course Learning Objectives:

- To understand the fundamentals of conversational systems in design.
- To develop rule-based and AI-powered chat bots.
- To apply Natural Language Processing (NLP) techniques in dialogue systems.

Prerequisites: Python Programming, Data Structures and Algorithms.

COURSE CONTENTS

Unit I: Introduction to Conversational Systems

Evolution of Human-Computer Interaction, Conversational AI Overview, Chatbots vs Virtual Assistants, Types of Conversational Systems, Rule-based Chatbots, Retrieval-based Chatbots, Generative Chatbots, Components of Dialogue Systems, User Intent, Dialogue Flow, Knowledge Base, Applications of Conversational Systems in Healthcare, Banking, Education, E-commerce, Customer Support.

CO Mapped: CO1

Unit II: Natural Language Processing for Conversational AI

Natural Language Processing Fundamentals, Text Pre processing, Tokenization, Stop Word Removal, Stemming, Lemmatization, Part-of-Speech Tagging, Named Entity Recognition, Intent Detection, Entity Extraction, Text Vectorization, Bag of Words, TF-IDF, Word Embeddings, Word2Vec, GloVe, Fast Text, BERT Embeddings.

CO Mapped: CO2

Unit III: Dialogue Management

Dialogue Flow Design, Context Management, Dialogue State Tracking, Dialogue Policies, Slot Filling, Multi-turn Conversations, Rule-based Dialogue Systems, Finite State Machines, Knowledge-based Dialogue Systems, Reinforcement Learning for Dialogue Management, Response Selection, Conversation Evaluation.

CO Mapped: CO3

Unit IV: Deep Learning for Conversational Systems

Neural Networks for NLP, Recurrent Neural Networks (RNN), Long Short-Term Memory (LSTM), Gated Recurrent Units (GRU), Sequence-to-Sequence Models, Encoder-Decoder Architecture, Attention Mechanism, Transformer Architecture, Large Language Models (LLMs), GPT Models, Prompt Engineering, Retrieval-Augmented Generation (RAG), Response Generation Techniques, Fine-tuning Language Models.

CO Mapped: CO4

Unit V: Conversational AI Platforms and Deployment

Dialog flow, Rasa, Microsoft Bot Framework, Amazon Lex, IBM Watson Assistant, Voice Assistants, Speech-to-Text, Text-to-Speech, Chatbot Integration with APIs, Web and Mobile Chatbot Deployment, Cloud Deployment, Chatbot Evaluation Metrics, User Experience Design, Ethics in Conversational AI, Privacy and Security, Responsible AI, Future Trends in Conversational Systems.

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	**CO**
CO1	Explain the fundamentals, architecture, and applications of conversational systems and chat bots technologies.
CO2	Apply Natural Language Processing techniques for text pre-processing, intent recognition, entity extraction, and language understanding.
CO3	Design and implement dialogue management strategies for developing intelligent and context-aware conversational agents.
CO4	Develop conversational systems using machine learning, deep learning, transformer models, and Large Language Models (LLMs).
CO5	Deploy, evaluate, and maintain conversational AI applications using modern

CO. No.	CO
	frameworks while considering ethical, privacy, and security aspects.

List of Practicals:

1. Installation and configuration of Python, Jupyter Notebook, NLTK, spaCy, and Hugging Face libraries.
2. Perform text pre-processing using tokenization, stop word removal, stemming, and lemmatization.
3. Implement Part-of-Speech (POS) tagging and Named Entity Recognition (NER) using spaCy.
4. Develop an intent classification model using machine learning techniques.
5. Build a rule-based chatbot using Python.
6. Design and implement a retrieval-based chatbot using predefined knowledge bases.
7. Develop a context-aware multi-turn conversational chatbot.
8. Implement dialogue state tracking and slot filling for task-oriented dialogue systems.
9. Create a chatbot using the Rasa framework.
10. Develop and deploy a chatbot using Google Dialog flow.

Books Recommended:

[1] Michael McTear, Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots, Morgan & Claypool Publishers, 2020.

[2] Srinivasan Janarthanam, Hands-On Chatbots and Conversational UI Development, Packt Publishing, 2017.

[3] Denis Rothman, Transformers for Natural Language Processing, 2nd Edition, Packt Publishing, 2021.

[4] Hobson Lane, Cole Howard, and Hannes Hapke, Natural Language Processing in Action, Manning Publications, 2019.

CO-PO-PSO Relationship:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	3	2	1
CO2	3	3	2	-	-	-	-	-	-	-	-	3	3	2
CO3	3	2	2	-	2	-	-	-	-	-	-	3	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	1	3	-	-	-	-	-	-	2	2	3

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- 1: Relevant and Small Significant 2: Medium or Moderate and 3: Strong

Devi Ahilya Vishwavidyalaya, Indore, India **Institute of Engineering and Technology**				**III Year B.Tech. (Computer Science & Business Systems) V Sem**		
Course Code & Name	**Instructions Hours per Semester and Credits**					
5RBPE3: Program Elective-III Cloud, Microservices and Applications	**Classroom Instruction (CI)**		**Lab Instruction (LI)**	**Term Work (TW) and Self Learning (SL)**	**Total no. of Hours Per Semester**	**Total Credits (Total Hours/30)**
	L	**T**	**P**	**TW+SL**	**120**	**4**
	20	**10**	**20**	**70**		

Course Learning Objectives:

- To understand cloud computing concepts, service models, and deployment models.
- To learn micro services architecture and cloud-native application development.

Prerequisites: Basic knowledge of cloud computing and Machine Learning.

COURSE CONTENTS

Unit I: Fundamentals of Cloud Computing

Introduction to Cloud Computing, Evolution of Cloud Computing, Characteristics of Cloud Computing, Virtualization, Hypervisors, Cloud Service Models (IaaS, PaaS, SaaS), Cloud Deployment Models (Public, Private, Hybrid, CommUnity), Cloud Architecture, Benefits and Challenges of Cloud Computing, Cloud Applications.

CO Mapped: CO1

Unit II: Cloud Infrastructure and Containerization

Cloud Infrastructure, Virtual Machines, Containers, Docker Architecture, Docker Images, Docker Containers, Docker Compose, Kubernetes Fundamentals, Container Orchestration, Cloud Storage, Distributed File Systems, Load Balancing, Auto Scaling, Cloud Networking.

CO Mapped: CO2

Unit III: Micro Services Architecture and Communication

Introduction to Micro services, Monolithic vs Micro services Architecture, Service Discovery, API Gateway, RESTful Web Services, gRPC, Inter-service Communication, Event-driven Architecture, Message Brokers, RabbitMQ, Apache Kafka, Circuit Breaker Pattern, Distributed Transactions, Configuration Management.

CO Mapped: CO3

Unit IV: Cloud-Native Application Development and DevOps

Cloud-native Application Development, Spring Boot Microservices, API Development, Security in Microservices, OAuth 2.0, JWT Authentication, Monitoring and Logging, Prometheus, Grafana, Distributed Tracing, CI/CD Pipelines, Jenkins, GitHub Actions, Infrastructure as Code, Terraform.

CO Mapped: CO4

Unit V: Cloud Platforms& Security

Cloud Platforms (AWS, Microsoft Azure, Google Cloud Platform), Serverless Computing, Function as a Service (FaaS), Cloud Security, Identity and Access Management (IAM), Cloud Cost Optimization, Performance Monitoring, Disaster Recovery, Business Continuity, Edge Computing, Future Trends in Cloud and Microservices.

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	CO
CO1	Explain the concepts, architecture, deployment models, and services of cloud computing.
CO2	Apply virtualization, containerization, and orchestration technologies to develop cloud applications.
CO3	Design and implement scalable microservices using modern architectural patterns and communication protocols.
CO4	Develop cloud-native applications with security, monitoring, and DevOps practices.
CO5	Deploy, manage, and optimize enterprise cloud applications using public cloud

CO. No.	CO
	platforms while addressing security and performance requirements.

List of Practicals:

1. Installation and configuration of Virtual Box, Docker, and Kubernetes.
2. Create and manage Virtual Machines in a cloud environment.
3. Build and run Docker containers using Dockerfiles.
4. Create multi-container applications using Docker Compose.
5. Deploy applications on Kubernetes using Pods, Deployments, and Services.
6. Develop RESTful APIs using Spring Boot.
7. Implement a microservices-based application using Spring Boot.
8. Configure API Gateway and Service Discovery.
9. Implement asynchronous communication using RabbitMQ or Apache Kafka.
10. Secure microservices using JWT and OAuth 2.0.

Books Recommended:

[1] Rajkumar Buyya, Christian Vecchiola, and S. ThamaraiSelvi, Mastering Cloud Computing: Foundations and Applications Programming, McGraw-Hill Education (India) Pvt. Ltd., First Edition, 2013.

[2] Thomas Erl, Ricardo Puttini, and Zaigham Mahmood, Cloud Computing: Concepts, Technology & Architecture, Pearson Education, First Edition, 2013.

[3] Sam Newman, Building Microservices: Designing Fine-Grained Systems, 2nd Edition, O'Reilly Media, 2021.

[4] Eberhard Wolff, Microservices: Flexible Software Architecture, Addison-Wesley Professional, First Edition, 2016.

CO-PO-PSO Relationship:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	3	2	1
CO2	3	3	2	-	-	-	-	-	-	-	-	3	3	2
CO3	3	2	2	-	2	-	-	-	-	-	-	3	3	3
CO4	3	3	3	-	-	-	-	-	-	-	-	2	3	3
CO5	3	3	3	1	3	-	-	-	-	-	-	2	2	3

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<tr><td>Course Code & Name</td><td colspan="6">Instructions Hours per Semester and Credits</td></tr>
<tr><td rowspan="2">5RBPC3:
Minor Project</td><td colspan="2">Classroom Instruction (CI)</td><td>Lab Instruction (LI)</td><td>Term Work (TW) and Self Learning (SL)</td><td>Total no. of Hours Per Semester</td><td>Total Credits (Total Hours/30)</td></tr>
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<tr><td>00</td><td>00</td><td>10</td><td>20</td></tr>
</table>

Course Learning Objectives:

- To apply theory to practice: Use knowledge and concepts learned in classes to real-world work settings.
- To Deep understanding: Develop a more thorough understanding of academic principles by engaging with them in a practical environment.

Prerequisites: Knowledge of programming languages, Software engineering.

Guideline and instruction for Minor Project

Project will be developed individually. After the approval of project topic students are allowed to work on the project. For the successful completion of Minor Project students has to submit the document (Synopsis, SRS and SDS) and also present the PPT presentation on the selected topic:

COURSE CONTENTS

Unit I

Ideation and Problem Definition

Identify a Problem: Look for everyday inconveniences, automate a manual task, or build a simplified clone of a popular app (e.g., a basic weather dashboard, a to-do API, or an expense tracker).

Define the Scope (MVP): Outline your Minimum Viable Product. What are the absolute core features your project needs to function? Drop any "nice-to-have" features that will take too much time.

Draft a Problem Statement: Write a one-paragraph summary of what you are building, who it is for, and what specific problem it solves.

CO Mapped: CO1

Unit II

Planning and Requirement Analysis

Select the Tech Stack: Choose programming languages, frameworks, and databases you are either comfortable with or actively want to learn. For example, a web app might use HTML/CSS/JavaScript with React on the frontend and Node.js with Mongo DB on the backend.

List Functional Requirements: Write down exactly what the system should do (e.g., "User can log in," "User can upload a file," "System calculates the total").

Create a Timeline: Break the project down into weekly or daily tasks. Allocate specific time buffers for debugging, as coding almost always takes longer than anticipated.

CO Mapped: CO2

Unit III

System Design and Architecture

Create Wireframes/Mock ups: If your project has a visual component (a website or mobile app), sketch out the user interface (UI). You can use simple tools like Figma, Balsamiq, or even pen and paper.

Design the Database Schema: If your project stores data, map out your tables/collections. Define the entities (Users, Posts and Orders) and the relationships between them.

Map the Logic Flow: Draw a flowchart or use unified modeling language (UML) diagrams to visualize how data will move through your application from the user input to the database and back.

CO Mapped: CO3

Unit IV

Implementation and Development

Set Up Version Control: Initialize a Git repository immediately. Commit your code frequently with clear, descriptive messages (e.g., "Added user authentication module"). Push your code to a platform like GitHub or Git Lab.

Build Incrementally: Start with the absolute core functionality. Get the basic structure working before you worry about making the UI look perfect or adding complex edge-case features.

Follow Best Practices**:** Write clean, readable code. Use meaningful variable names, separate your code into modular functions/files, and add comments to explain complex logic.

CO Mapped: CO4

Unit V

Testing, Deployment, and Documentation

Testing: Run through your application as a user would to find bugs. Test edge cases (e.g., what happens if a user inputs text into a number field?). Fix any breaking issues.

Deployment: Host your project so others can see it. You can use free tiers on platforms like GitHub Pages, Vercel, or Netlify for frontends, and Render, Heroku, or PythonAnywhere for back ends.

Documentation: Write a comprehensive README.md file in your repository. It should include the project title, a brief description, screenshots, installation instructions (how to run it locally), and the technologies used. If your university requires a formal report, format this information into a standard project document.

CO Mapped: CO5

Course Outcomes (CO):

CO. No.	**CO**
CO1	Formulate a clear problem statement and define a minimum viable product (MVP) to address a specific computational challenge.
CO2	Design system architectures, logic flows, and database schemas by applying principles of data structures and algorithms.
CO3	Implement functional software prototypes utilizing appropriate technologies across domains like networking, operating systems, or machine learning.
CO4	Evaluate and test the application to identify bugs, resolve edge cases, and ensure stable deployment.
CO5	Create comprehensive technical documentation and present the project execution clearly to technical and non-technical audiences.

Guidelines:

1. The Minor Project must be developed individually by every student.
2. Students are permitted to begin work on the project only after obtaining approval of the project topic from the concerned faculty/department.
3. For the successful completion of the Minor Project, Students are required to prepare and submit the following documents:

a. Synopsis
b. Software Requirements Specification (SRS)
c. Software Design Specification (SDS)

4. Students must prepare and deliver a PowerPoint (PPT) presentation on the selected project topic.

CO-PO-PSO Relationship:

CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2	1	1	1	-	-	-	-	-	-	3	2	1
CO2	3	3	2	2	1	-	-	-	-	-	-	2	3	1
CO3	3	3	2	2	2	-	-	-	-	-	-	3	2	1
CO4	3	3	2	2	2	1	-	-	-	-	-	2	3	1
CO5	3	3	2	2	2	3	1	-	-	-	-	3	2	1

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