

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)



Autonomous Programme
Bachelor of Engineering



Department Of
COMPUTER SCIENCE AND BUSINESS SYSTEM

SCHEME and SYLLABUS
(2024 Admitted Batch)

Academic Year 2026-2027



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND
BUSINESS SYSTEMS

_VISION OF THE INSTITUTE

To be an institute of excellence in engineering education and research, producing socially responsible professionals.

MISSION OF THE INSTITUTE

1. Create conducive environment for learning and research
2. Establish industry and academia collaborations
3. Ensure professional and ethical values in all institutional endeavors

VISION OF THE DEPARTMENT

Emerge as an industry focused centre for promoting innovation, entrepreneurship, research and best practices of computer science together with managerial skills to serve the society and industry.

MISSION OF THE DEPARTMENT

1. Impart globally connected cutting-edge technologies and business skills
2. Enhance industrial experience, promote entrepreneurship and research through industry institute interaction
3. Implement best practices to enrich knowledge and skill sets
4. Produce competent professionals with societal and environmental concern



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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Explore and excel in advanced technologies across emerging domains.

PEO2: Develop professional skills that enhance employability and support higher education in contemporary fields.

PEO3: Empower research skills through lifelong learning to adapt to the field of IT.

PEO4: Demonstrate environmental awareness and sustainable practices to address societal and community needs.

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **Design/Development of solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **Conduct investigations of complex problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions. (WK8).
5. **Engineering tool usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **The engineer and the world:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).



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PROGRAM OUTCOMES (POs)

7. **Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
8. **Individual and collaborative team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.
9. **Communication:** Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **Project management and finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability for independent and life-long learning adaptability to new and emerging technologies and critical thinking in the broadest context of technological change. (WK8)

PROGRAM SPECIFIC OUTCOMES

PSO1: Develop business and IT solutions to solve real life problems.

PSO2: Implement software tools and new-generation technologies in industry-relevant fields.

Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1	10
CIE 2	10
CIE 3	10
Activities as decided by course faculty	20
SEE	50
Total	100

Scheme of Evaluation (Laboratory Courses)

Assessment	Marks
Continuous Evaluation in every lab session by the Course Coordinator	10
Record Writing	20
Laboratory CIE conducted by the Course Coordinator	20
SEE	50
Total	100

Examination	Maximum Marks	Minimum marks to qualify
CIE	50	20
SEE	50	20



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COURSE TYPES

Basic Science Course	BSC
Engineering Science Course	ESC
Emerging Technology Course	ETC
Programming Language Course	PLC
Professional Core Course	PCC
Integrated Professional Core Course	IPCC
Professional Core Course Laboratory	PCCL
Professional Elective Course	PEC
Open Elective Course	OEC
Project/Mini Project/Internship	PI
Humanities and Social Sciences, Management Course	HSMC
Ability Enhancement Course	AEC
Skill Enhancement Course	SEC
Universal Human Value Course	UHV
Non-credit Mandatory Course	MC



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Semester-wise Credit Distribution

Curricular Component / Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	8	8	3	3	-	-	-	-	22
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	9	9	-	-	-	-	-	-	18
Professional Core Course (PCC)	-	-	16	17	16	12	7	-	68
Professional Elective Course (PEC)	-	-	-	-	3	3	3	3	12
Open Elective Course (OEC)	-	-	-	-	-	3	3	3	9
Project/Mini Project/Internship (PI)	-	-	-	-	2	2	4	10	18
Humanities and Social Sciences, Management Course (HSMC)	1	2	-	1	1	-	-	-	5
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	1	1	1	-	1	-	-	6
Universal Human Value Course (UHV)	-	-	1	1	-	-	-	-	2
Total Credits	20	20	21	23	22	21	17	16	160



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FIFTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title			Teaching Hours/Week			Exam Marks			Credits
				L	T	P	TW&SL	Total	CIE	SEE	Total	
1	IPCC	24CB501	Artificial Intelligence for Business	40	0	28	52	120	50	50	100	4
2	IPCC	24CB502	Computer Networks	40	0	28	52	120	50	50	100	4
3	IPCC	24CB503	System Software and Compiler Design	40	0	28	52	120	50	50	100	4
4	PI	24CB504	Mini Project	0	0	28	32	60	50	50	100	2
5	PCCL	24CB505	UI/UX Laboratory	0	0	28	2	30	50	50	100	1
6	PEC	24CB55x	Professional Elective Course - I	40	0	0	50	90	50	50	100	3
7	HSMC	24EVS	Environmental Studies	0	28	0	2	30	50	50	100	1
8	PCC	24RIP	Research Methodology And IPR	40	0	0	50	90	50	50	100	3
9	MC	24NYP3	NSS, YOGA, PE	0	0	28	2	30	-	-	-	A
Total												22

24CB504: Mini Project Work:

Note: Project Team (4 Students/ team) should consider the following domain to develop a mini project.

1. AI for Green Technology and Agricultural Field
2. Database and Web Technology
3. Semi Conductor and Healthcare

Professional Elective Course I

Course Code	Course Name
24CB551	Micro Controller and Embedded System
24CB552	Mobile Communication
24CB553	Internet of Things
24CB554	Cloud Computing



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SIXTH SEMESTER												
Sl. No	Course Category	Course Code	Course Title				Teaching Hours/Week		Exam Marks			Credits
				L	T	P	TW&SL	Total	CIE	SEE	Total	
1	PCC	24CB601	Financial Management	40	0	0	50	90	50	50	100	3
2	PCC	24CB602	Software Engineering	40	0	0	50	90	50	50	100	3
3	PCC	24CB661	Blockchain Technology	40	0	0	50	90	50	50	100	3
4	PCC	24CB604	Parallel Computing	40	0	0	50	90	50	50	100	3
5	PI	24CB605	Main Project Phase I	0	0	28	32	60	50	50	100	2
6	PEC	24CB66x	Professional Elective Course - II	40	0	0	50	90	50	50	100	3
7	OEC	24OECB6X	Open Elective Course - I	40	0	0	50	90	50	50	100	3
8	MC	24NYP4	NSS, YOGA, PE	0	0	28	2	30	-	-	-	A
9	AEC	24ASK	Analytical Ability and Soft Skills	0	0	28	2	30	50	50	100	1
Total												21

Professional Elective Course - II	
Course Code	Course Name
24CB661	Data Mining and Warehousing
24CB662	Business Management
24CB663	Computer Graphics and Visualization
24CB664	Business Strategies

Open Elective Course – I	
Course Code	Course Name
24OECB61	Industrial Management
24OECB62	Investment Management



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SEVENTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	24CB701	Business Intelligence	4	0	0	4	50	50	100	4
2	PCC	24CB702	Information Security and Cyber Law	3	0	0	3	50	50	100	3
3	PI	24CB703	Main Project Phase- II	0	0	8	8	50	50	100	4
4	PEC	24CB77x	Professional Elective Course - III	3	0	0	3	50	50	100	3
5	OEC	24OECB7x	Open Elective Course- II	3	0	0	3	50	50	100	3
Total							21				17

Professional Elective Course - III	
Course Code	Course Name
24CB771	Digital Image Processing
24CB772	Big Data Analytics
24CB773	Advanced JAVA
24CB774	Deep Learning

Open Elective Course - II	
Course Code	Course Name
24OECB71	Business Management
24OECB72	AI for Business and Finance



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EIGHTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PEC	24SW01	Swayam (Online 12 weeks Professional Elective course through NPTEL)	3	0	0	-	50	50	100	3
2	OEC	24SW02	Swayam (Online 12 weeks Open Elective course through NPTEL)	3	0	0	-	50	50	100	3
3	PI	24INT	Internship (Research/Industry) (14-20 weeks)	0	0	12	12	100	100	200	10
Total							12				16



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Course Title	ARTIFICIAL INTELLIGENCE FOR BUSINESS		
Course Code	24CB501	L-T-P-C	(3-0-2)4
Exam	3Hrs.	Hours/Week	5
SEE	50Marks	Total Hours	40L + 12P
Course Objective: Students will be able to apply the concepts of Artificial Intelligence to construct knowledge-based systems. Course Outcomes: At the end of course, student will be able to:			
No.	Course Outcomes	PO	PSO
1	Apply AI techniques to construct intelligent agents to solve real time problems	2,3	2
2	Identify an appropriate AI method to analyse the problem and provide solution	2,4	-
3	Develop knowledge-based AI systems using First-Order Logic and search algorithms while evaluating ethical, societal, and environmental impacts.	3,7	-
4	To gain knowledge on AI-based governance, business analytics, and change management.	5,6	-
Course contents			
MODULE-1			10Hrs.
Introduction: What is AI? Intelligent Agents: Agents and environment; Good behaviour: The Concept of Rationality; the nature of environment; the structure of agents. Solving Problems by Searching: Problem-solving agents, Example problems; Searching for solution; Uninformed search strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search.			
MODULE - 2			10Hrs.
Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Optimality of A*, Memory-bounded heuristic search; Local Search Algorithms and Optimization Problems: Hill-climbing search, Simulated annealing, Local beam search, Genetic algorithms; Logical Agents: Knowledge-based agents; The Wumpus world, Logic, propositional logic, Propositional Theorem proving.			
MODULE-3			10Hrs.
First-Order Logic. Inference in first-order logic: propositional versus first-order inference, uniform and lifting, forward chaining, backward chaining, resolution. Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Ensemble Learning. Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning.			
MODULE-4			10Hrs.
Intelligent business processes with embedded analytics, adopting data-driven culture: Leadership and change management for business optimization. Natural intelligence and social aspects of AI-based decisions, Case study: Investing in the future technology of self-driving vehicles.			



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Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence – A Modern Approach	Stuart Russell, Peter Norvig	3rd Edition	Pearson	2014
2	Artificial Intelligence for Business Optimization – Research and Applications	Bhuvan Unhelkar and Tad Gonsalves	1st Edition	CRC Press, Taylor & Francis	2021

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivashankar B. Nair	3rd Edition	McGraw-Hill Education	2015
2	Introduction to Artificial Intelligence and Expert Systems	Dan W. Patterson	–	Pearson	2015
3.	Marketing Artificial Intelligence – AI, Marketing, and the Future of Business	Paul Roetzer	1st edition	BenBella Books	2022

E Books and online course materials:

1. <https://www.springernature.com/gp/librarians/products/ebooks/ebook-collection/artificial-intelligence>
2. <https://www.edx.org/course/artificial-intelligence-uc-berkeleyx-cs188-1x>
3. <https://www.udacity.com/course/intro-to-artificial-intelligence--cs271>
4. <https://www.class-central.com/subject/ai>

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	2	14	28
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	15+13 = 28
Total Learning Hours/Semester				120

Activity Based Learning (28 Hours)

ABL	Hours
ABL 1 – Intelligent Agents, Search Techniques and Logical Reasoning (15 Hours) 1. Study AI concepts, intelligent agents, agent environments, rationality, and agent architecture – 3 hrs 2. Model real-world problems as state-space search problems and identify problem formulation components – 3 hrs 3. Implement and compare uninformed search algorithms (BFS, DFS, Uniform Cost, Depth Limited, Iterative Deepening, Bidirectional Search) using suitable examples – 5 hrs 4. Analyze heuristic search algorithms (Greedy Best-First Search and A* Search) using search trees and performance comparison – 2 hrs 5. Develop simple knowledge-based systems using propositional logic and theorem proving for the Wumpus World problem – 2 hrs	15
ABL 2 – Knowledge Representation, Machine Learning and AI Business (13 Hours) 1. Represent real-world knowledge using First-Order Logic (FOL) and perform inference using forward chaining, backward chaining, and resolution – 4 hrs	13



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2. Build and evaluate Decision Tree models and explore Ensemble Learning using sample datasets – 3 hrs	
3. Simulate Reinforcement Learning concepts (Passive and Active RL) for simple agent environments – 2 hrs	
4. Develop basic AI applications for Text Classification, Information Retrieval, and explore Robotics perception through case studies or simulation tools – 4 hrs	
Total Learning Hours/Semester	28

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab Evaluation	2
Semester End Exam	3
Total	8

Laboratory Plan (integrated course):

Lab Program	Program Details
1	Write a program to implement water jug problem
2	Write a program to implement A* search algorithm
3	Write a program to implement Missionaries and cannibal's problem
4	Write a program to implement N Queens problem
5	Implement of the problem solving strategies wither using forward chaining or backward chaining.
6	Marketer to Machine: Develop a ML model for Smart email Compose. Smart email compose finishes sentences for you by predicting what word or words user will type next.
7	Marketer to Machine: Develop level-2 Marketer-to-Machine (M2M) Scale of intelligent automation to personalize business email based on user preferences and interests (Extension to Exp. No.1).
8	AI and Marketing: Develop data-driven content for a given business organization (Web site). Optimize Website content for search engines. Send emails to customers with personalized content/activity.
9	AI and Marketing: Develop a system to recommend highly targeted content to users of the Web site (Extension to Exp. No 3).
10	AI and Analytics: Create analytics dashboard. Integrate Google Analytics with the dashboard. Use AI tool (Open) to draw from the existing data to make predictions.



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Course Articulation matrix:

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

Course Title		COMPUTER NETWORKS	
Course Code	24CB502	L-T-P-C	(3-0-2) 4
Exam Hrs.	3Hrs.	Hours/Week	5
SEE	50 Marks	Total Hours	40L+12P
Course Objective: Acquire knowledge of working mechanisms of different types of Networks, Address Mechanisms and Protocols.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
No.	Course Outcomes	POs	PSOs
1.	Fundamentals of data communication, network models, physical layer concepts, digital transmission techniques, and switching methods used in computer networks.	1,2	1
2.	Analyze data-link layer addressing, ARP, error detection and correction techniques, and implement CRC for reliable data transmission.	1,2,3	-
3.	Analyze IPv4 addressing, network layer protocols, routing algorithms, and routing protocols to design efficient communication networks.	1,2,4	-
4.	Evaluate IPv6, transport layer protocols (UDP, TCP, SCTP), congestion control, and flow control mechanisms for reliable end-to-end communication.	1,3,5	-
Course Content			
MODULE-1			10Hrs
Introduction: Data Communications; Networks; Network Types; Network Models: Protocol Layering; TCP / IP Protocol Suite; Physical Layer: Introduction to Physical Layer, Data and Signals; Periodic Analog Signals; Digital Signals; Transmission impairment; Data rate limits; Digital Transmission: Digital-to-Digital conversion: Line Coding.			
MODULE-2			10Hrs
Switching: Introduction; Circuit-Switched Networks: Three Phases and Delay; Packet Switching: Datagram Networks: Virtual Circuit Networks; Introduction to Data-Link Layer: Link-layer Addressing: Three Types of Addresses, Address Resolution Protocol (ARP); Error Detection and Correction: Introduction; Block coding: Error Detection; Cyclic codes: CRC.			
MODULE-3			10Hrs
Network Layer: Network Layer Services, IPv4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, NAT; Network Layer Protocols: Internetwork Protocol: Datagram format, Fragmentation. Unicast Routing: Introduction: General Idea, Least Cost Routing; Routing Algorithms: Distance Vector, Link-State Routing, Path-Vector Routing; Unicast Routing Protocols: Internet Structure, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol Version 4 (BGP4).			
MODULE-4			10Hrs



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Next Generation IP: IPV6 Addressing, The IPV6 Protocol; Transport Layer protocols: Introduction: Services, Port Numbers, User Datagram Protocol (UDP): User Datagram, UDP Services, UDP Applications; **Transmission Control Protocol (TCP):** TCP Services, TCP Features, Segment, A TCP Connection, Windows in TCP; Transmission Control Protocol: Flow Control, Error Control, TCP Congestion Control; TCP Timer and Options; Stream Control Transmission Protocol (SCTP): Services, Features, Packet Format.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Data Communications and Networking	Behrouz A. Forouzan	5 th edition	Tata McGraw-Hill	2023

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Communication Networks– Fundamental Concepts and Key Architectures	Alberto Leon-Garcia, Indra Widjaja	2 nd edition	Tata McGraw-Hill	2015
2	Data and Computer Communication	William Stallings	8 th edition	Pearson Education	2014
3	Computer and Communication Networks	Nader F. Mir	1 st edition	Pearson Education	2014

Online Courses and Video Lectures:

1. <http://nptel.ac.in/courses/106105081/>
2. <https://www.edx.org/course/computer-networks-internet-kironx-fhlcnx>

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	2	14	28
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	14+14 = 28
Total Learning Hours/Semester				120

Activity Based Learning (28 Hours)

ABL	Hours
ABL 1 –Network Design, Analysis & Documentation (14 Hours) Computer Networks Case Study & Network Design Documentation (14 Hours)	14
Activity	Hours
1. Select a real-world computer networking scenario (e.g., TCP/IP-based campus network, packet-switched communication system, IPv4/IPv6 enterprise network, DHCP-enabled LAN, routing-based WAN).	2 hrs
2. Conduct literature review and analyze concepts related to Data Communications, Network Models, TCP/IP Protocol Suite, Physical Layer, Switching, ARP, IPv4/IPv6, Routing Protocols (RIP, OSPF, BGP), and Transport Layer protocols. Define the problem statement and project scope.	3 hrs
3. Meet with the faculty guide to finalize the case study, network topology, protocol layers, and implementation approach.	1 hr



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4. Prepare network documentation including Network Topology Diagram, Use Case Diagram, Activity Diagram, DFD-0, DFD-1, Sequence Diagram, and protocol/data flow mapping showing Physical, Data Link, Network, and Transport Layer interactions. 6 hrs 5. Submit the Network Design Report (SRS) and present the case study with protocol analysis, routing strategy, and network architecture.	
ABL 2 – Network Simulation & Performance Evaluation (14 Hours) 1. Implement networking-based simulations/programs covering concepts such as Line Coding, CRC Error Detection, ARP, IPv4 Addressing & Subnetting, DHCP, NAT, Routing Algorithms (Distance Vector, Link State), RIP, OSPF, BGP, UDP/TCP communication, TCP Flow & Congestion Control, or IPv6 using Packet Tracer, NS2/NS3, Wireshark, or programming tools. 6 hrs 2. Test and evaluate network performance using metrics such as throughput, delay, packet loss, routing cost, congestion window, protocol efficiency, and error detection performance. 3 hrs 3. Submit source code/simulation files, output screenshots, observations, and a technical report with performance analysis. 3 hrs 4. Demonstrate the implementation, explain the network protocols used, and attend viva/presentation.	14
Total Learning Hours/Semester	28

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab CIE and Viva	2
Semester End Exam	3
Total	8

Laboratory Plan (integrated course):

Lab Program	Program Details
1	Learn Networking Commands
2	Simulation of error correction code (like CRC).
3	Simulate the transmission of ping messages over a network topology consisting of 6 nodes
4	Simulate a three nodes point-to-point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets dropped.
5	Simulate a three nodes point-to-point network with duplex links between them. Set the queue size and vary the bandwidth and find the number of packets sent with different types



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	of traffic.
6	Implement distance vector algorithm to find the suitable path for transmission between sender and receiver.
7	Simulation of Link State Routing algorithm.
8	Simulation of Routing Information Protocol.
9	Simulate an Ethernet LAN using n nodes, change error rate and data rate and compare throughput.
10	Simulate an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.

Course Articulation matrix

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



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Course Title	SYSTEM SOFTWARE AND COMPILER DESIGN		
Course Code	24CB503	L-T-P-C	(3-0-2)4
Exam Hrs.	3Hrs.	Hours / Week	5
SEE	50 Marks	Total Hours	40L + 12P
Course Objective: To equip students with a clear understanding of system software, language processors, syntax analysis, and hands-on experience with Lex and Yacc in parser and compiler design. Course Outcomes (COs): Upon completion of the course, students shall be able to			
No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe the components of system software and architecture of different instructional machines.	1,2	-
2.	Comprehend the structure and phases of language processors, including lexical analysis and syntax analysis	2,4	-
3.	Apply parsing techniques and syntax error handling strategies in syntax analysis	2,3	-
4.	Create and apply Lex Yacc tools to design and implement simple parsers and compilers, showcasing their ability to construct practical applications.	3,5	-
Course Contents:			
MODULE 1			10 Hours
Introduction to System Software, Machine Architecture, Simplified Instructional Computer (SIC) and SIC/XE, traditional machines, RISC machines. Assemblers: Basic assembler functions – simple SIC assembler, assembler algorithms and data structures, machine dependent assembler features – instruction formats and addressing modes, program relocation, machine independent assembler features, assembler design options- one-pass assemblers, Multi-pass assemblers.			
MODULE 2			10 Hours
Language Processors: The structure of a compiler, phases of a compiler, lexical analysis, translation of an assignment statement, syntax analysis, semantic analysis, intermediate code generation, code optimization, code generation, grouping of phases into passes, The Applications of compiler technology. Lexical Analysis: The role of lexical analyzer, lexical analysis versus parsing, tokens, patterns and lexemes, lexical errors, Input buffering, Specifications of token, strings and languages, operations on languages, recognition of tokens.			
MODULE 3			10 Hours
Syntax Analysis: Introduction, role of the parser, representative Grammars, syntax error handling, error-recovery strategies, Context Free Grammars, notional conventions, derivations, context-free grammars, parse trees and derivations, ambiguity, lexical versus syntactic analysis, writing a grammar, left factoring, Top Down Parsers, Bottom -Up Parsers. Syntax Directed Translation: Syntax directed definitions, Intermediate code generation- variants of syntax trees, three-address code.			
MODULE 4			10 Hours
Code generation: Issues in the design of a code generator, a simple code generator. Lex and Yacc: The Simplest Lex Program, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, Using LEX - Regular Expression, Examples of Regular Expressions, Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, A YACC Parser - The Definition Section, The Rules Section, The LEXER, Compiling and Running a Simple Parser.			



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Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	System Software	Leland. L. Beck, D Manjula	3rd	Pearson	2012
2	Compilers-Principles, Techniques and Tools Systems	Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman Gehrke	2nd	Pearson	2007
3	lex & yacc	Doug Brown, John Levine, Tony Mason	3rd	O'Reilly Media	2013

Reference Books:

Sl. No	Book Title	Authors	Publisher	Year
1	Systems programming	Srimanta Pal	Oxford university press	2016
2	System programming and Compiler Design,	K C Louden	Cengage Learning	2016
3	System software and operating system	D. M. Dhamdhere	TMG	2016
4	Compiler Design	K Muneeswaran	Oxford University Press	2013

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	2	14	28
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	15+13 = 28
Total Learning Hours/Semester				120

Activity Based Learning (28 Hours)

ABL	Hours
ABL 1 – SIC/XE Architecture, Assembler Design and Compiler Phases (15 Hours) 1. Study SIC and SIC/XE machine architecture, instruction formats, and addressing modes – 3 hrs 2. Analyze assembler functions and construct symbol table, literal table, and opcode table – 3 hrs 3. Design and simulate a two-pass assembler for SIC machine instructions – 4 hrs 4. Simulate input buffering and lexical error handling techniques – 3 hrs 5. Submit lexical analyzer source code and output report – 2 hrs	15
ABL 2 – Syntax Analysis, Intermediate Code Generation and Lex and Yacc(13 Hours) 1. Construct Context Free Grammars (CFG) for arithmetic and control flow expressions – 3 hrs 2. Design top-down and bottom-up parsers for given grammars – 4 hrs 3. Generate syntax trees, parse trees, and three-address intermediate code – 3 hrs 4. Develop simple LEX programs for token identification and word counting applications – 3 hrs	13
Total Learning Hours/Semester	28



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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab Evaluation	2
Semester End Exam	3
Total	8

Laboratory Plan (integrated course):

Lab Program	Program Details
1	Write a program to simulate basic SIC instructions such as LDA, STA, ADD, and SUB, along with memory loading and instruction execution.
2	Develop a simple one-pass assembler that reads a SIC-like assembly language and converts it directly into machine code in a single pass.
3	Extend the assembler to support various addressing modes including immediate, indirect, and indexed addressing using SIC/XE format
4	Simulate the instruction format decoding logic for SIC and SIC/XE to demonstrate how different formats and opcodes are interpreted.
5	Implement a simple compiler pipeline that translates an assignment statement like $a = b + c$ through lexical analysis, parsing, and intermediate code generation.
6	Write a tokenizer in C or Python to identify identifiers, numbers, and operators from a simple arithmetic expression.
7	Simulate input buffering for lexical analysis using a two-buffer system that supports forward and backward scanning.
8	Design a lexical error detection program that scans input for invalid characters and reports lexical errors.
9	Write a recursive descent parser for arithmetic expressions based on a simple grammar and output the parse tree or error messages.
10	Generate and print a parse tree for a valid arithmetic expression using a manually or programmatically written parser.
11	Translate arithmetic expressions into three-address code by building syntax trees and converting each operation to a temporary variable instruction.
12	Demonstrate ambiguity in grammar by writing conflicting rules and resolving them using techniques like left factoring and precedence rules.
13	Create a Lex program to tokenize input expressions by identifying numbers, identifiers, operators, and ignoring whitespace.
14	Develop a Lex and Yacc-based calculator that reads arithmetic expressions and outputs the computed result.



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MINI PROJECT			
Course Code	24CB504	L-T-P-C	(0-0-4)2
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	-
Course Objective: Design and implement solution for an identified real world problem.			
Course Outcomes (COs): Upon completion of course the students will be able to:			
No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify the requirements of a chosen real world problem	1,2,6,7	1
2.	Design the solution for the chosen problem and document the same.	1,3,4,10	1,2
3.	Implement the proposed method using appropriate tools	3,5,8,11	1,2
4.	Present and demonstrate the proposed work along with documentation	1,5,9,10	-

- A team of **FOUR** students must develop the mini project. However, during the final evaluation, each student must demonstrate the project individually.
- The team must submit a **Brief Project Report** (25 to 30 Pages) after completion with the following contents
 - Introduction
 - Requirements
 - Development Process and Models Adopted
 - Analysis and Design Models
 - Implementation
 - Testing

The project report will be evaluated for 25 marks, Demonstration for 50 marks and Viva Voce for 25 marks.

Rubrics for Evaluation of Mini Project					
Phase I (Project Proposal Submission and Evaluation Scheme):					
After finalizing the topic with the guidance of Supervisor, students should submit the project proposal along with Synopsis not exceeding 10 pages. Approval of synopsis is done for 15 marks by concerned project committee.					
Sl. No	Performance Indicators	Needs Improvement (0-1 mark)	Average (2-3 marks)	Good (4-5 marks)	Max marks
1	Literature Survey	Survey of literature is not recent or no literature survey	Survey of literature is not clear	Literature survey is sufficient.	5
2	Synopsis writing	Objective of the work is not identified.	Objective of the work is identified but no evidence of Inter disciplinary approach found.	Objective of the work is identified with evidence of Inter disciplinary approach found.	5
3	Presentation	Contents not delivered completely.	Contents not delivered clearly.	Contents delivered clearly with confidence.	5



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3	Presentation	Contents not delivered completely.	Contents not delivered clearly.	Contents delivered clearly with confidence.	5
Total					15

Phase II (Project Progress):

Evaluation of project phase II is carried out by evaluation committee.

Sl. No.	Performance Indicators	Needs Improvement (0-1 marks)	Average (2-3 marks)	Good (4-5 marks)	Max marks
1.	System design and development	System specification is not identified.	System specification is identified but not satisfactory.	System specification is identified correctly.	5
2.	Identification of appropriate tool for application	Application tools are not identified.	Application tools identified but not used.	Application tools identified and used.	5
3.	Oral presentation	Entire contents not delivered.	Contents not delivered clearly.	Contents delivered clearly with confidence.	5
Total					15

Phase III (Project Demonstration with Report):

Evaluation of this phase is done by evaluation committee.

Sl. No	Performance Indicators	Needs Improvement (0-1 marks)	Average (2-3 marks)	Good (4-5 marks)	Total marks allocated
1.	Design and Implementation	Not done	Incomplete.	Complete.	5
2.	Demonstration	Incomplete	Complete but not satisfactory.	Complete and satisfactory	5
3.	Documentation	Organization and clarity of report and technical content is not clear and complete	Organization and clarity of report and technical content is clear but not complete.	Organization and clarity of report and technical content is clear and complete.	5
4.	Oral presentation	Presentation with ppt is not clear.	Presentation with ppt is clear but not satisfactory	Presentation with ppt is clear and satisfactory.	5
Total					20

Semester End Evaluation

Evaluation committee consists of panel of examiners containing external as well as internal evaluators. This evaluation is carried out for 50 marks.



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SN	Performance Indicators		Marks allocated	Marks awarded
1	Project execution	Project specification	5	
		Progress	5	
2	Methodology /Result Analysis	System Design	5	
		System Implementation	5	
		System Testing	5	
3	Project Report	Organization and Clarity	5	
		Technical content	5	

Final presentation		10	
Total Marks		50	
Rubrics for Semester End Exam			
	Marks	Overall criteria	
1.	48-50	Project is reaching professional standards.	
2.	40-47	Project is excellent and may contain publishable material. Presentation is excellent.	
3.	35-39	Project and presentation are very good. All design aims are met.	
4.	30-34	Project and presentation are good. Most design aims are met.	
5.	25-29	Minimum core of design aims has been met. Presentation is satisfactory.	
6.	20-24	Design aims and implementation are met partially. Presentation is moderate.	
7.	0-20	Most design aims are not met and implementation does not work. Presentation is not satisfactory.	
		Conclusion and Future Work	5

Course Articulation matrix

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



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Course Title	UI/UX LABORATORY		
Course Code	24CB505	L-T-P-C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	24
Course Objective: To gain a solid understanding of fundamental UI/UX principles, including visual design, user-centred design, usability, and user experience. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
Sl. No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply design principles and guidelines to create visually appealing and user-friendly interfaces for websites and mobile applications.	3	-
2.	Develop wire frames and interactive prototypes using design tools to visualize and communicate interface concepts and user flows.	3,5	-

Laboratory Plan

Lab Program	Program Details
1	Designing a Login Form: Design a user-friendly login form for a mobile app. Consider the layout, input fields, button design, and error handling to create an intuitive and visually appealing login experience.
2	Creating a Navigation Menu: Design a navigation menu for a website that includes dropdown menus and a responsive design. Ensure the menu is easy to navigate and visually consistent across different screen sizes
3	Redesigning a Landing Page: Redesign a landing page for a product or service. Improve the visual hierarchy, use compelling imagery, and optimize the layout to encourage user engagement and conversions.
4	Creating a Contact Form: Design a contact form for a website that captures essential user information. Consider input validation, error messages, and a confirmation message to enhance the user experience
5	Designing a Product Card: Create a visually appealing product card for an e-commerce website. Include product images, title, price, and call-to-action buttons to entice users to learn more and make a purchase.
6	Improving Form Usability: Evaluate an existing form on a website for usability issues and propose improvements. Focus on optimizing the form's layout, labelling, and input validation to enhance user comprehension and completion rates.
7	Enhancing Mobile App On boarding: Design an on boarding experience for a mobile app. Create a series of screens that introduce users to the app's features and guide them through the setup process in a clear and engaging manner.
8	Designing an Error Page: Design a visually appealing and helpful error page for a website. Consider the tone of the message, provide relevant information or suggestions, and include navigational elements to guide users back on track.
9	Redesigning a Checkout Process: Redesign the checkout process for an ecommerce Website. Simplify the steps, provide clear instructions, and optimize the layout and form inputs to streamline the purchasing experience.



Proposed Assessment Plan (for 50 marks of CIE):	
Remarks	Marks
Laboratory CIE	20
Laboratory Record Submission	10
Conduction of experiments	20
Total	50

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Lab conduction	2	14	28
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	-	-	-
4.	Evaluation of Learning Process	-	-	02
Total Learning Hours/Semester				30

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	2	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	2	-	-	-	-	-	-	-	-



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Professional Elective Course -I

Course Title	MICROCONTROLLERS AND EMBEDDED SYSTEMS		
Course Code	24CB551	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40L
Course Objective: To make familiar with programming a microcontroller based embedded systems. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
No.	Course Outcomes	Mapping to POs	Mapping to PSOs
CO1	Apply the concept of embedded systems components of microcontroller and their interactions	1,5	1
CO2	Analyse the interfacing of peripherals with microcontroller.	1,2,5	-
CO3	Distinguish process architecture and programming model	1,5	-
CO4	Illustrate various Instructions & Develop assembly level program for simple applications	2,3	-
Course Contents:			
MODULE 1			10 Hours
Introduction: Embedded system overview, design challenges, common design metrics, processor technology, IC technology, design technology, trade-offs. General Purpose and application Specific Instruction Set Processors: Introduction, Basic architecture, operation, Programmer's view, development environment- example, DSP, selecting a microcontroller, general purpose processor design.			
MODULE 2			10 Hours
Standard single purpose processor: Introduction, timers, counters and watch dog timers, UART, Pulse width modulation, LCD controller, keypad controller, stepper motor controller, analog to digital converters, real time clocks. Interfacing: Introduction, communication basics, arbitration, multilevel bus architectures, advanced communication principles, serial protocols, parallel protocols, wireless protocols.			
MODULE 3			10 Hours
The ARM Architecture: The RISC Machine, Architectural inheritance, The ARM programmer's model. ARM Assembly Language Programming: Data processing instructions, Data transfer instructions, Control flow instructions and writing simple assembly language programs.			
MODULE 4			10 Hours
ARM Organization and Implementation: 3-stage pipeline ARM organization, ARM instruction execution. Architectural Support for High-Level Languages: Abstraction in software design, Data types, Expressions, Conditional statements and Loops, Functions and procedures, Use of memory, Programming examples.			

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Embedded System Design: A Unified Hardware/Software Intro duction	Frank Vahid, Tony Givargis	3rd Edition	John Wiley & Sons	2006
2	ARM System-on-Chip Architecture	Steve Furber	2nd Edition	Addison-Wesley	2000*

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
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1	Embedded Systems: Architecture, Programming and Design	Raj Kamal	3rd Edition	Tata McGraw-Hill (TMH)	2011*
2	ARM System Developer's Guide: Designing and Optimizing System Software	Andrew N. Sloss, Dominic Symes, Chris Wright	1st Edition	Morgan Kaufmann	2004*

EBooks and online course materials:

https://en.wikibooks.org/wiki/Embedded_Systems

Online Courses and Video Lectures:

<http://nptel.ac.in/courses/108102045>

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	13+13 = 26
Total Learning Hours/Semester				90

Activity Based Learning (26 Hours)

ABL	Hours
ABL 1 – Embedded System Fundamentals and Peripheral Interfacing (13 Hours)	
1. Study embedded system architecture, design metrics, processor technologies, and design trade-offs through case studies of real-world embedded applications – 3 hrs	13
2. Explore the architecture and programming model of general-purpose and application-specific processors (DSP/Microcontrollers) and compare their features – 3 hrs	
3. Interface and program standard peripherals such as timers, counters, UART, PWM, ADC, RTC, LCD, and keypad using an embedded development board or simulator – 5 hrs	
4. Demonstrate serial, parallel, and wireless communication protocols by interfacing embedded devices and analyzing data transfer – 2 hrs	
ABL 2 – ARM Architecture and Assembly Language Programming (13 Hours)	
1. Develop ARM assembly language programs using data processing, data transfer, and control flow instructions for basic arithmetic and logical operations – 4 hrs	13
2. Implement ARM assembly programs involving loops, conditional statements, functions, and memory operations using an ARM simulator or development board – 4 hrs	
3. Analyze ARM processor organization, instruction pipeline, and instruction execution through simulation and performance observation – 3 hrs	
4. Develop and test simple embedded applications integrating ARM programming concepts and prepare a report on implementation and performance – 2 hrs	
Total Learning Hours/Semester	26



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Course Title		MOBILE COMMUNICATIONS	
Course Code	24CB552	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To apply knowledge of Mobile Communications and Technologies in real-time applications.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explore the applications, marketing and reference model of Mobile communication system.	1,2,3	-
2.	Classify the different types of transmissions, medium access control techniques and satellite Systems.	1, 2	-
3.	Develop the suitable wireless and/or mobile network for a given scenario.	3,4,5	-
4.	Study the performance of protocols involved in mobile network layer, mobile ad-hoc networks and transport layer.	2,4	-
Course Contents:			
MODULE 1			10 Hours
Introduction to Mobile Communications: Applications, history of wireless communication, a market for mobile communications, some open research topics, a simplified reference model. Wireless Transmission: Frequencies for radio transmission, signals, antennas, signal propagation, multiplexing, modulation, cellular systems.			
MODULE 2			10 Hours
Medium Access Control (MAC): Motivation for specialized MAC, TDMA, CDMA, comparison of S/T/F/CDMA. Satellite Systems: History, applications, basics, routing, localization, handover. Broadcast Systems: Overview, cyclical repetition of data, DAB, DVB, convergence of broadcasting and mobile communications.			
MODULE 3			10 Hours
Wireless LAN: Infrared vs. radio transmission, infrastructure and ad hoc networks, IEEE 802.11 – system architecture and protocol architecture. Mobile Network Layer: Mobile IP – goals, assumptions, requirements, entities and terminology, IP packet delivery, agent discovery, registration, tunnelling and encapsulation, optimizations. DHCP (Dynamic Host Configuration Protocol)			
MODULE 4			10 Hours
Mobile Ad-Hoc Networks: Routing, destination-sequenced distance vector, dynamic source routing, alternative metrics, overview of ad-hoc routing protocols. Mobile Transport Layer: Traditional TCP, classical TCP improvements, TCP over 2.5G/3G wireless networks, performance-enhancing proxies.			

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Mobile Communications	Jochen Schiller	2nd Edition	Pearson Education	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Mobile Computing – Technology, Applications and Service Creation	Asoke K. Talukder, Roopa R. Yavagal	2nd Edition	Tata McGraw-Hill	2012
2	Mobile Computing Principles – Designing and Developing Mobile Applications with UML and XML	Reza B'Far	5th Edition	Cambridge University Press	2013



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Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	13+13 = 26
Total Learning Hours/Semester				90

Activity Based Learning (26 Hours)

ABL	Hours
ABL 1 – Mobile Communication Fundamentals and Wireless Technologies (13 Hours) 1. Study the evolution of mobile communication systems, wireless communication architecture, applications, and research trends – 2 hrs 2. Analyze wireless transmission concepts including radio frequencies, signal propagation, modulation, multiplexing, and cellular systems – 3 hrs 3. Compare Medium Access Control (MAC) protocols such as TDMA, CDMA, FDMA, and SDMA through simulations or case studies – 3 hrs 4. Study satellite and broadcast communication systems, their architecture, routing, localization, handover, DAB, and DVB technologies – 3 hrs 5. Prepare and present a report comparing different wireless communication technologies and their applications – 2 hrs	13
ABL 2 – Mobile Networks, WLAN and Ad-Hoc Routing (13 Hours) 1. Configure and analyze IEEE 802.11 Wireless LAN architecture, infrastructure mode, and ad hoc networks using simulation tools – 3 hrs 2. Study Mobile IP concepts including packet delivery, agent discovery, registration, tunneling, encapsulation, and DHCP operations – 3 hrs 3. Implement and compare Mobile Ad-Hoc Network (MANET) routing protocols such as DSDV and DSR using network simulation tools – 4 hrs 4. Analyze Mobile Transport Layer protocols, TCP enhancements, and TCP performance over wireless networks through experiments and case studies – 3 hrs	13
Total Learning Hours/Semester	26

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 3) Details of activity 1 4) Details of activity 2	20
Total		50

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab Evaluation	2
Semester End Exam	3
Total	8

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Course Title	INTERNET OF THINGS		
Course Code	24CB553	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To introduce IoT systems, architectures, and tools for building smart applications.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Evaluate the evolution of IoT, IoT networking components, and addressing strategies in IoT.	1,2	-
2.	Analyze various sensing devices and actuator types.	1,3	-
3.	Develop IoT solutions using appropriate platforms and tools.	3,5	-
4.	Apply data analytics and machine learning techniques in IoT applications.	2,4,5	-
Course Contents:			
MODULE 1			10 Hours
Introduction and M2M Communication: Introduction, Physical design of IoT, Logical Design of IoT, IoT enabling technologies, IoT Levels & Deployment Templates. Introduction to M2M, Difference between IoT and M2M, SDN and NFV for IoT, IoT System Management with NETCONF-YANG, Simple Network Management Protocol (SNMP), Network operator requirement.			
MODULE 2			10 Hours
IoT Design and Python for IoT: IoT Design Methodology, Case Study: Weather Monitoring System, Logical Design using Python: Installing Python, Data Types, Control flow, Functions, Modules, File handling, Operations, Classes, Python Packages for IoT.			
MODULE 3			10 Hours
IoT Devices and Applications: IoT Devices: Raspberry Pi, Linux on Pi, Pi interfaces, Python programming on Pi. Case Studies: Smart Cities, Home Automation, Agriculture. Integration of sensors, actuators, and communication for IoT systems.			
MODULE 4			10 Hours
Data Analytics and Cloud for IoT: Data Analytics: Apache Hadoop, MapReduce, Apache Oozie, Spark, Storm. Cloud Integration and Fog Computing, Applications of data analytics in real-time IoT scenarios.			

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Internet of Things: A Hands-on Approach	Arshdeep Bahga, Vijay Madisetti	1st Edition	Universities Press	2015
2	Introduction to IOT	Sudeep Mishra, Anandarup Mukherjee, Arijit Roy	1st Edition	Cambridge University Press	2021

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	IoT Fundamentals: Networking Technologies, Protocols, and Use Cases	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry	1st Edition	Pearson Education (Cisco Press)	2017



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Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	13+13 = 26
Total Learning Hours/Semester				90

Activity Based Learning (26 Hours)

ABL	Hours
ABL 1 – IoT Fundamentals, M2M Communication and IoT Design (13 Hours) 1. Study IoT architecture, physical and logical design, enabling technologies, IoT levels, and deployment templates – 3 hrs 2. Compare IoT and M2M communication models, and analyze the role of SDN, NFV, NETCONF-YANG, and SNMP in IoT systems – 3 hrs 3. Design an IoT solution using the IoT Design Methodology for a real-world application (e.g., Weather Monitoring System) – 3 hrs 4. Develop Python programs for IoT applications using data types, control structures, functions, modules, file handling, and classes – 4 hrs	13
ABL 2 – IoT Devices, Data Analytics and Cloud Integration (13 Hours) 1. Configure Raspberry Pi, interface sensors and actuators, and develop Python programs for data acquisition – 4 hrs 2. Develop simple IoT applications for Smart Home, Smart Agriculture, or Smart City using Raspberry Pi – 3 hrs 3. Analyze IoT data using Hadoop, MapReduce, Apache Spark, and Apache Oozie through case studies or demonstrations – 3 hrs 4. Integrate IoT applications with Cloud and Fog Computing platforms and prepare a report on real-time IoT data analytics applications – 3 hrs	13
Total Learning Hours/Semester	26

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab Evaluation	2
Semester End Exam	3
Total	8



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Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	3	2	-	-	-	-	-	-	-	-	-	-	-
C02	3	-	2	-	-	-	-	-	-	-	-	-	-
C03	-	-	3	-	2	-	-	-	-	-	-	-	-
C04	-	3	-	2	2	-	-	-	-	-	-	-	-



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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title		CLOUD COMPUTING	
Course Code	24CB554	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To expose students to frontier areas of cloud computing, service models, and applications. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain concepts of cloud computing	1,12	-
2.	Recognize the different virtualization techniques, architectures, and types of clouds.	2,3	-
3.	Determine the cloud platforms and adopt Cloud Computing services and tools in real life scenarios.	2,7	-
4.	Integrate new standards for access management, security, and privacy at different levels of cloud services.	6,8	-
Course Contents:			
MODULE 1			10 Hours
Introduction: Cloud computing at a glance, historical developments, building cloud computing environments, computing platforms and technologies. Principles of Parallel and Distributed Computing: Eras of computing, parallel vs. distributed computing, elements of parallel computing, elements of distributed computing, technologies for distributed computing.			
MODULE 2			10 Hours
Virtualization: Introduction, characteristics of virtualized environments, taxonomy of virtualization techniques, virtualization and cloud computing, pros and cons of virtualization technology. Cloud Computing Architecture: Introduction, cloud reference model, types of clouds, economics of the cloud, open challenges.			
MODULE 3			10 Hours
Cloud Platforms in Industry: Amazon Web Services, Google App Engine, Microsoft Azure. Advanced Topics in Cloud Computing: Energy efficiency in clouds, market-based management of clouds, federated clouds/interclouds, third-party cloud services.			
MODULE 4			10 Hours
Infrastructure Security and Identity & Access Management (IAM): Infrastructure security at the network level, host level, and application level. Identity and Access Management (IAM): Trust boundaries and IAM, why IAM?, IAM challenges, IAM definitions, IAM architecture and practices, preparing for cloud, IAM standards and protocols for cloud services, IAM practices in the cloud, cloud authorization management. Security Management in the Cloud: Security management standards, security management in the cloud, availability management in SaaS, PaaS, and IaaS models, access control, security vulnerabilities, patch and configuration management. Privacy: What is privacy? What is the data lifecycle? Key privacy concerns in cloud computing, and responsibilities for protecting privacy.			
Text Books: - Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill - Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliances, Tim Mather, Subra Kumaraswamy, Shahed Latif, 2013			
Reference Books: - Cloud Computing: Theory and Practice, Dan C. Marinescu, 1st edition, MK Publishers - Cloud Computing – A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw Hill			



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Online Courses and Video Lectures:

1. <https://www.youtube.com/watch?v=Eg4AAGCE7X4>
2. <https://www.coursera.org/learn/cloud-computing>
3. <https://www.edx.org/course/introduction-cloud-computing-microsoft-cloud200x>

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	13+13 = 26
Total Learning Hours/Semester				90

Activity Based Learning (26 Hours)

ABL	Hours
ABL 1 – Cloud Computing Environment Design and Virtualization Study (15 Hours) 1. Study and compare cloud computing models (IaaS, PaaS, SaaS) with real-world examples and identify their applications in industry – 2 hrs 2. Design a cloud computing environment architecture showing clients, services, virtualization layer, and cloud resources using block diagrams – 3 hrs 3. Perform a virtualization case study by analyzing virtualization technologies (VMware, Hyper-V, VirtualBox, KVM) and preparing a comparative report – 4 hrs 4. Create a cloud reference model and deployment model analysis (Public, Private, Hybrid, Community Cloud) with advantages and limitations – 2 hrs 5. Compile findings and prepare a cloud architecture report highlighting benefits, challenges, and business applications – 2 hrs	13
ABL 2 – Cloud Platform, Security and IAM Implementation Project (12 Hours) 1. Study major cloud platforms (AWS, Microsoft Azure, Google Cloud Platform) and compare their services, pricing, and deployment options – 3 hrs 2. Design a cloud-based application architecture integrating compute, storage, database, and networking services from a selected cloud platform – 3 hrs 3. Develop a cloud security and IAM framework including users, roles, permissions, authentication, and authorization policies – 3 hrs 4. Conduct a comparative evaluation of cloud providers based on security, scalability, availability, cost, and privacy features; prepare a final report and presentation – 4 hrs	13
Total Learning Hours/Semester	26

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab Evaluation	2



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Semester End Exam	3
Total	8

Course Articulation matrix

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



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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title		ENVIRONMENTAL STUDIES	
Course Code	24EVS	L-T-P	(0-1-0)1
Exam	3 Hrs	Hours/Week	2
SEE	50 Marks	Total Hours	28 Hours
Course Objective: The students will be able to develop a sense of responsibility about the environment, natural resources, their conservation and understand the concept, structure and function of different ecosystems and the ill effects of environmental pollution and other environmental issues like population growth, Acid rain, global warming etc., Course outcomes: At the end of course, student will be able to:			
No.	Course Outcomes		PO's
1.	Acquire an awareness of and sensitivity to the total environment and its allied problems		7, 10
2.	Develop strong feelings of concern, sense of ethical responsibility for the environment and the motivation to act in protecting and improving it.		6,8
3.	Analyze and evaluate environmental measures in real world situations in terms of ecological, political, economic, societal and aesthetic factors.		6, 8, 9
Course Contents:			
MODULE-1			
Environment: Definition, about the Earth, Earth's Structure i.e. Atmosphere and its parts, Hydrosphere, Lithosphere and Biosphere, Ecosystem, Balanced ecosystem, Effects of human activities on environment Agriculture Housing Industry Mining and Transportation.			
MODULE-2			
Natural Resources: Water resources, Availability and Quality, Water borne diseases, Water induced diseases, Fluoride Problem in drinking water. Mineral Resources-Forest Resources-Material Cycles-Carbon, Nitrogen and Sulphur Cycles.			
MODULE-3			
Pollution: Effects of pollution-Water Pollution-Air pollution Land pollution-Noise pollution.			
MODULE-4			
Current Environmental issues of importance: Acid Rain, Ozone layer depletion - Population Growth, Climate change and Global warming. Environmental Impact Assessment and Sustainable Development Environmental Protection -Legal aspects. Water Act and Air Act.			

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Studies	Dr. D. L. Manjunath	1st Edition	Pearson Education	2006
2	Environmental Studies	Dr. S. M. Prakash	1st Edition	Elite Publishers	2006

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Environmental Studies	Benny Joseph	2nd Edition	Tata McGraw-Hill	2005
2	Principles of Environmental Science and Engineering	P. Venugopala Rao	1st Edition	Prentice Hall of India	2006
3	Environmental Science and	Meenakshi	1st Edition	Prentice Hall of	2004



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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

	Engineering			India	
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Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	3	-	-	3	-	-	-
CO2	-	-	-	-	-	3	-	3	-	-	-	-	-
CO3	-	-	-	-	-	3	-	3	3	-	-	-	-



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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title	RESEARCH METHODOLOGY AND IPR		
Course Code	24RIP	(L-T-P)C	(3-0-0) 3
CIE	50	Hours/Week	3
SEE	50	Total Hours	42L + 48ABL = 90

Course Objective: To understand research methodology, technical writing, and IPR concepts in engineering research.

Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Carry out Literature Review and write technical paper	2,3,4,8,12	-
2	Describe the fundamentals of patent laws and the patent drafting procedure.	6,8,10,12	-
3	Elucidate the copyright laws and subject matters of copyright	6,8, 10,12	-

MODULE-1	10 Hrs
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Introduction: Meaning of Research, Objectives of Engineering Research, and Motivation in Engineering Research, Types of Engineering Research. **Ethics in Engineering Research:** Ethics in Engineering Research Practice, Types of Research Misconduct, Ethical Issues Related to Authorship.

Literature Review and Technical Reading, New and Existing Knowledge, Analysis and Synthesis of Prior Art, Bibliographic Databases, Web of Science, Google and Google Scholar, Effective Search: The Way Forward, Introduction to Technical Reading Conceptualizing Research, Critical and Creative Reading.

MODULE-2	10 Hrs
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Attributions and Citations: Giving Credit Wherever Due, Citations: Functions and Attributes, Impact of Title and Keywords on Citations, Knowledge Flow through Citation, Citing Datasets, Styles for Citations, Acknowledgments and Attributions.

Technical Writing and Publishing : Free Writing and Mining for Ideas, Attributes and Reasons of Technical Writing, Patent or Technical Paper?— The Choice, Writing Journal Paper :Structure and Approach : Title, Abstract, and Introduction, Methods, Results, and Discussions, Table, Figures, Acknowledgments, and Closures

MODULE-3	11Hrs
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Introduction To Intellectual Property: Role of IP in the Economic and Cultural Development of the Society, IP Governance, IP as a Global Indicator of Innovation, Origin of IP, Major Amendments in IP Laws and Acts in India. **Patents:** Conditions for Obtaining a Patent Protection, To Patent or Not to Patent an Invention. Rights Associated with Patents. Enforcement of Patent Rights. Inventions Eligible for Patenting. Non- Patentable Matters. Patent Infringements. **Process of Patenting:** Prior Art Search. Choice of Application to be Filed. Patent Application Forms. Jurisdiction of Filing Patent Application. Publication. Pre-grant Opposition. Examination. Grant of a Patent. Validity of Patent Protection. Post-grant Opposition. DoI Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications.

MODULE-4	11Hrs
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Copyrights and Related Rights: Classes of Copyrights. Criteria for Copyright. Ownership of Copyright. Copyrights of the Author. Copyright Infringements. Copyright Infringement is a Criminal Offence. Copyright Infringement is a Cognizable Offence. Copyrights and Internet. Non-Copyright Work. Copyright Registration. Judicial Powers of the Registrar of Copyrights. Fee Structure. Copyright Symbol. Validity of Copyright. Copyright Profile of India. Copyright and the word 'Publish'. Transfer of Copyrights to a Publisher. Copyrights and the Word 'Adaptation'. Copyrights and the Word 'Indian Work'. Joint Authorship. Copyright Society. Copyright Board. Copyright Enforcement Advisory Council (CEAC). **Trademarks:** Eligibility Criteria. Who Can Apply for a Trademark. Acts and Laws. Designation of Trademark Symbols. Classification of Trademarks. Registration of a Trademark is Not Compulsory. Validity of Trademark. Types of Trademark Registered in India. Trademark Registry. Process for Trademarks Registration.

Self study: Case Studies on Patents. Case study of Curcuma (Turmeric) Patent, Case study of Neem Patent, IP Organizations in India.



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Prescribed Text Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Research Methodology	Dipankar Deb, Rajeeb Dey, Valentina E, Balas	-	Springer	2019
2	Intellectual Property	Prof. Rupinder Tewari, Ms. Mamta Bhardwa	6 th	Publication Bureau, Panjab University	2021

Reference Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Research Methods for Engineers	David V. Thiel	-	Cambridge University Press	2014
2	Intellectual Property Rights	N.K. Acharya	8 th	Asia Law House	2021

E Books and online course materials:

1. <https://sl1nk.com/y4ggnaa>
2. <https://dst.gov.in/sites/default/files/E-BOOK%20IPR.pdf>

Online Courses and Video Lectures:

1. <http://digimat.in/nptel/courses/video/127106227/L05.html>
2. https://onlinecourses.swayam2.ac.in/e-learning/preview/aic25_ge09

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Student Study Hours – Self Learning	1	14	14
3	Evaluation of Learning Process	-	-	07
4	Activity Based Learning (ABL)	-	-	14+13=27
Total Learning Hours / Semester				90

Proposed Assessment Plan (50 marks):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted Activity 1: Students select any research topic and perform a literature review, identifying existing knowledge, synthesizing prior art, and	10



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	compiling relevant citations leading to structured survey paper ready for publication.												
	Activity 2: Students analyze real world case studies for legal issues and propose solutions to infringement cases.		10										
Total			50										
Activity Based Learning (27 Hours)													
ABL 1: Drafting survey paper (14 Hrs.)													
Drafting survey paper	Research Topic Selection		02										
	Literature review & Identifying existing knowledge		05										
	Synthesizing prior art & compiling relevant citations		04										
	Presentation of structured paper		03										
ABL 1: Total			14										
ABL 2: Students analyse real world case studies (13 Hrs.)													
Real world case studies analysis	Legal issues		04										
	Propose solutions to infringement cases		04										
	Presentation, demonstration, viva-voce		05										
ABL 2: Total			13										
ABL1 + ABL2: Total			27										
Evaluation of Learning Process (07 Hours)													
Type of Evaluation			Hours										
CIE (1, 2 and 3)			03										
Activity (1 and 2)			01										
Semester End Exam			03										
Total			07										
Course Articulation Matrix													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	2	-	-	-	-	3	-	1	-	2	-	-
CO2	-	2	-	2	2	-	1	-	3	-	1	-	-
CO3	-	3	1	3	2	-	-	-	2	-	2	-	-



Course Outcomes: At the end of the course, the student will be able to:

MODULE 1				CIV			

Plantation and adoption of plants. Know your plants.

Organize National integration and social harmony events /workshops /seminars. (Minimum 02 programs).

Govt. school Rejuvenation and helping them to achieve good infrastructure.	5 Mins.
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Suggested Learning Resources:

Books :

4. NSSC, M. 1 D.11.1.11. NSSC 11 VTUP 1.

- Course Articulation matrix**

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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title	YOGA		
Course Code	24NYP3	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
No.	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	1. Understand the Philosophical and Scientific Basis of Yoga	11	-
2	2. Demonstrate Proficiency in Basic Yoga Practices	9	-
3	3. Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7, 11	-
4	4. Apply Yoga Principles for Personal and Professional Growth	10, 11	-
MODULE - 1			8 Hrs.
Ashtanga Yoga 1. Dharana 2. Dhyana (Meditation) 3. Samadhi			
MODULE - 2			8 Hrs.
Different types of Asanas a. Sitting 1. Bakasana 2. Hanumanasana 3. Ekapada Rajakapotasana 4. Yogarnudra in Vajrasana b. Standing 1. Vatayanasana 2. Garudasana c. Balancing 1. Veerabhadrasana 2. Sheershasana			
MODULE - 3			8 Hrs.
Pranayama 1. Bhastrika 2. Bhramari			

Course Articulation matrix

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



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Course Title	PHYSICAL EDUCATION (PE)		
Course Code	24NYP3	L-T-P-C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
#	Course outcomes	POs	PSOs
1	Understand the Fundamental concepts and skills of Physical Education , Health, Nutrition and Fitness	9,11	-
2	Familiarization of health related Exercises, Sports for overall growth and development.	9,11	-
3	Create a foundation for the professionals in Physical Education and Sports	10	-
4	Participate in competition at regional/ state / national/ international levels.	9,10,11	-
5	Create consciousness among the student Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9,10,11	-
MODULE - 1			4 Hrs.
Orientation - Postural deformities, Stress management			
MODULE - 2			16 Hrs.
Specific games (Any one to be selected by the student) 1. Throw ball 2. Table Tennis 3. Athletics (Field Events- Jumps) – Any event as per availability of Ground.			
MODULE - 3			4 Hrs.
Aerobics			

Course Articulation matrix

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



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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS
VI SEMESTER

Course Title	FINANCIAL MANAGEMENT		
Course Code	24CB601	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To equip students with fundamental knowledge of financial management, accounting principles, financial statements, ratio analysis and budgetary control. To develop skills in applying inflation-adjusted decision-making and inventory-control techniques for effective managerial decisions.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Evaluate financial management principles, sources of finance and fundamental accounting concepts through the preparation and examination of journal entries, ledger accounts and trial balances.	2,11	-
2.	Prepare and interpret trading accounts, profit and loss accounts and balance sheets to evaluate the financial position of an organisation.	3,11	-
3.	Analyse financial performance using ratio analysis and prepare different types of budgets for effective managerial control.	3,11	-
4.	Apply inflation-adjusted economic decision models and inventory-control techniques to support financial and operational decision-making.	3,12	-

Course Contents:

MODULE 1	10 Hours
Introduction to Financial Management: Definition, functions, objectives, scope and basic financial concepts; capital-budgeting decisions; advantages and disadvantages of equity shares, preference shares and debentures. Financial Accounting: Definition, importance, principles, concepts and conventions; double-entry bookkeeping system; bases of accounting - cash basis and accrual basis; journal, ledger and trial balance.	
MODULE 2	10 Hours
Preparation and Interpretation of Financial Statements: Objectives, importance and limitations; trading account, profit and loss account and balance sheet; grouping of assets and liabilities; preparation of final accounts without adjustments; interpretation of financial statements.	
MODULE 3	10 Hours
Financial Ratio Analysis: Introduction, objectives, classification, advantages and limitations; computation and interpretation of liquidity, profitability, leverage and activity ratios. Budgetary Control: Meaning of budget and budgetary control; objectives, essential features and merits; steps in budgetary control; types of budgets; preparation of flexible budgets; limitations of budgetary control.	
MODULE 4	10 Hours
Inflation-Adjusted Decisions: Introduction; procedure for adjusting inflation; inflation-adjusted economic life of a machine; limitations of the existing model; determination of economic life with and without inflationary effects. Inventory Control: Introduction; purchase model with instantaneous replenishment and without shortages; manufacturing model without shortages; purchase model with shortages; manufacturing model with shortages.	



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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Prescribed Textbooks:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Financial Accounting for Management	Kakani Ramachandran	3rd	McGraw Hill, India	2021
2	Financial ACCT - Financial Accounting	Godwin, Alderman and Sanyal	-	Cengage Learning	2016

Reference Books:

Sl. No.	Book Title	Authors	Publisher	Year
1	Management Accounting: Information for Decision Making and Strategy Execution	Anthony A. Atkinson, Robert S. Kaplan, S. Mark Young, Ella Mae Matsumura and G. Arunkumar	Pearson Education, India	2014
2	Fundamentals of Accounting	R. L. Gupta and V. K. Gupta	Sultan Chand & Sons	2018
3	Financial Accounting	Khatari	McGraw Hill, India	2021
4	Management Accounting	M. Y. Khan and P. K. Jain	McGraw Hill, India	2019

Teaching - Learning - Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Student Study Hours - Self Learning	1	14	14
3.	Evaluation of Learning Process	-	-	08
4.	Assignment Based Learning (Assignment 1 & Assignment 2)	-	-	14+ 12 = 26
Total Learning Hours/Semester				90

Assignment Based Learning (26 Hours)

Assignment	Hours
ABL 1 - Financial Accounting and Statement Preparation (14 Hours) 1. Examine the functions, objectives and scope of financial management and compare equity shares, preference shares and debentures as sources of finance - 3 hrs 2. Record a set of business transactions in the journal by applying accounting concepts, conventions and the double-entry system - 4 hrs 3. Post journal entries to ledger accounts and prepare a trial balance - 4 hrs 4. Prepare the trading account, profit and loss account and balance sheet without adjustments for a given case - 3 hrs	14

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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title		SOFTWARE ENGINEERING	
Course Code	24CB602	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours/Week	3
SEE	50 Marks	Total Hours	40
Course Objective: Students able to acquire knowledge of working mechanisms of different types of Networks, Address Mechanisms and Protocols.			
Course Outcomes (Cos): Upon completion of the course, students shall be able to:			
No.	Course Outcomes	POs	PSOs
1.	Design a software system, component, or process to meet desired needs within realistic constraints.	1,3	-
2.	Assess professional and ethical responsibility and function on multi-disciplinary teams	6,8	-
3.	Use the techniques, skills, and modern engineering tools necessary for engineering practice	3,5	-
4.	Analyze and maintain software systems or parts of software systems	5, 9,10	1
Course Content			
MODULE-1			10Hrs
Introduction: Software Crisis, Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies. Software Processes: Models: Waterfall Model, Incremental Model and Spiral Model, Process activities. Requirements Engineering: Requirements Engineering Processes. Requirements Elicitation and Analysis, Functional and non-functional requirements. The software Requirements Document.			
MODULE-2			10Hrs
Requirements Engineering : Requirements Specification, Requirements validation, Requirements Management. Coping with Change. System Models: Context models, Interaction models, Structural models, Behavioural models, Model-driven engineering. Design and Implementation: Object-oriented design using the UML, Design patterns.			
MODULE-3			10Hrs
Implementation issues, open source development. Software Testing: Development testing, Test-driven development, Release testing, User testing, Software Evolution: Evolution process, Program evolution dynamics, software maintenance, Legacy system management.			
MODULE-4			10Hrs
Quality management: Software quality, Reviews and inspections, Software measurement and metrics, Software standards, Risk management. Agile Software Development: The Agile Manifesto: Values and Principles. Agile methods: SCRUM and Extreme Programming. Plan-driven and agile development.			
Self Study: DevOps Practices and Principles, Microservices Architecture, Continuous Integration and Continuous Deployment (CI/CD), Software Configuration Management, Cybersecurity in Software Development, User Experience (UX) Design, Human-Computer Interaction (HCI), Cloud-Based Software Development, Mobile Application Development, Software Documentation Best Practices.			

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Software Engineering	Ian Sommerville	9th Edition	Pearson Education	2012



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Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Software Engineering: A Practitioner's Approach	Roger S. Pressman	7th Edition	Tata McGraw-Hill	2013
2	An Integrated Approach to Software Engineering	Pankaj Jalote	7th Edition	Wiley India	2017

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	13+13 = 26
Total Learning Hours/Semester				90

Activity Based Learning (26 Hours)

ABL	Hours
ABL 1 – Software Process Models, Requirements Engineering and System Design (13 Hours) 1. Study Software Engineering principles, software process models (Waterfall, Incremental, Spiral), and software engineering ethics through case studies – 3 hrs 2. Perform requirements elicitation, analysis, specification, validation, and prepare a Software Requirements Specification (SRS) document for a selected application – 4 hrs 3. Develop UML diagrams (Use Case, Class, Sequence, Activity, and State Diagrams) to model the proposed software system – 4 hrs 4. Analyze different system models and compare software process models for suitable application scenarios – 2 hrs	13
ABL 2 – Software Design, Quality Assurance and Agile Development (13 Hours) 1. Design an object-oriented software system using UML and apply appropriate design patterns for the selected application – 4 hrs 2. Study implementation issues, open-source software development practices, and Rational Unified Process (RUP) through case studies – 3 hrs 3. Perform software quality assurance activities including reviews, inspections, software metrics, risk management, and team management – 3 hrs 4. Simulate Agile software development using Scrum or Extreme Programming (XP), including sprint planning, task allocation, and project tracking – 3 hrs	13
Total Learning Hours/Semester	26

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20



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Total	50
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Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab Evaluation	2
Semester End Exam	3
Total	8

Course Articulation matrix

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



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Course Title		BLOCK CHAIN TECHNOLOGY	
Course Code	24CB603	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: To provide a comprehensive understanding of block chain technology, including cryptographic foundations, consensus algorithm, block chain models.			
Course Outcomes (COs): Upon completion of the course, students shall be able to:			
Sl. No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the types, benefits and limitations of blockchain and bitcoin.	1,2	-
2.	Explore the blockchain decentralization, cryptography concepts and smart contracts	2,3	-
3.	Comprehend the blockchain applications outside of currencies	2,3	-
4.	Analyze the application of blockchain in real world such as voting, border control, smart contracts.	9,11	-
Course Contents:			
Module 1		10 Hours	
Blockchain: Distributed systems, History of blockchain: Introduction to Blockchain: Electronic cash, Block Chain, Generic elements of a blockchain, Benefits and limitations of blockchain, Types of blockchain, Distributed ledger, Distributed ledger technology, public blockchain, private blockchain, shared ledger, Fully private and proprietary blockchains, Tokenized blockchains, Tokenless blockchains, Consensus, Consensus mechanism, Types of consensus mechanisms, Consensus in blockchain, CAP theorem and blockchain.			
Module 2		10 Hours	
Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Disintermediation, Contest-driven decentralization, Routes to decentralization, How to decentralize, The decentralization framework examples, Blockchain and full ecosystem decentralization, Decentralized organizations. Introducing Bitcoin: Bitcoin definition, Digital Keys and addresses, Transactions, Blockchain, Mining, Bitcoin Payments.			
Module 3		10 Hours	
Alternative Coins: Theoretical foundations, Alternatives to Proof of work, Various stake types, Difficulty adjustments and retargeting algorithms, Bitcoin limitations, Privacy and anonymity, Extended protocols on top of bitcoin, Development of altcoins, Namecoin, Litecoin Smart Contracts: Definition, Ricardian contracts. Ethereum: Introduction, Ethereum blockchain, Ethereum Network, Ethereum blockchain (bird’s eye view).			
Module 4		10 Hours	
Blockchain-Outside of Currencies: Internet of Things, Physical object layer, Device layer, Network layer, Management layer, Application layer, Government, Border control, Voting, Citizen identification, Health, Finance, Insurance, Post trade settlement, Financial crime prevention, Media.			



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Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Mastering Blockchain: Distributed Ledgers, Decentralization, and Smart Contracts Explained	Imran Bashir	3rd Edition	Packt Publishing	2017
2	Mastering Blockchain: A Deep Dive into Distributed Ledgers, Consensus Protocols, Smart Contracts, DApps, Cryptocurrencies, Ethereum, and More	Imran Bashir	3rd Edition	Packt Publishing	2020

Reference Books

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction	Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder, Jeremy Clark	2nd Edition	Princeton University Press	2016
2	Blockchain Basics: A Non-Technical Introduction in 25 Steps	Daniel Drescher	1st Edition	Apress	2017

E Books and online course materials:

1. <https://www.packtpub.com/product/mastering-blockchain-third-edition/9781839213199>

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc22_cs44/preview

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	07
5.	Activity Based Learning (ABL1 & ABL2)	-	-	15+12 = 27
Total Learning Hours/Semester				90



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Activity Based Learning (26 Hours)

ABL	Hours
ABL 1-- Blockchain Case Study & Architecture Analysis Assignment (15 Hours) 1. Select a blockchain platform/application (Bitcoin, Ethereum, Supply Chain, Healthcare, Voting System, etc.) and study its architecture--3 hrs 2. Analyze blockchain components: distributed ledger, blocks, transactions, consensus mechanism, decentralization, and security features--4 hrs 3. Compare different blockchain types (Public, Private, Consortium, Tokenized, Tokenless) and prepare a comparative report--3 hrs 4. Study Bitcoin/Ethereum transaction flow, mining/validation process, and smart contract applications; present findings with diagrams and use cases--3 hrs 5. Report submission and presentation--2 hrs	15
ABL 2 – Blockchain Simulation & Application Development Assignment (12 Hours) 1. Select a blockchain application scenario (Voting System, Supply Chain Tracking, Healthcare Records, Digital Identity, IoT, etc.)--2 hrs 2. Design blockchain workflow including nodes, transactions, consensus, and security mechanisms--3 hrs 3. Develop a simple blockchain simulation or smart contract using Ethereum/Solidity or blockchain tools--3 hrs 4. Analyze results, security considerations, and performance; submit code/screenshots/output--2 hrs 5. Presentation and justification of design choices--2 hrs	12
Total Learning Hours/Semester	27 hours

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Presentation and Viva	1
Semester End Exam	3
Total	7



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Course Articulation Matrix

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



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Course Title	PARALLEL COMPUTING		
Course Code	24CB604	L-T-P	(3-0-2)3
Exam	3Hrs.	Hours/Week	3
SEE	50Marks	Total Hours	40

Course objectives:

Students will be able to understand parallel computing concepts and apply parallel programming techniques using MPI, OpenMP, and GPU programming to develop efficient high-performance computing applications.

Course Outcomes: At the end of course, student will be able to:

Course Outcomes	Mapping to POs	Mapping to PSOs
CO1: Describe the fundamentals of parallel programming, parallel computer architectures, memory models, and interconnection networks.	1	-
CO2: Apply GPU programming concepts and analyze the performance of parallel programs using speedup, efficiency, scalability, and Amdahl's Law.	3	-
CO3: Develop distributed-memory parallel programs using MPI by employing point-to-point and collective communication techniques.	3	1
CO4: Apply shared-memory programming techniques using OpenMP to implement parallel algorithms while addressing synchronization, scheduling, tasking, and cache-related issues.	2	1

MODULE-1

Introduction to parallel programming, Parallel hardware and parallel software – Classifications of parallel computers, SIMD systems, MIMD systems, Interconnection networks, Cache coherence, Shared-memory vs. distributed-memory, Coordinating the processes/threads, Shared-memory, Distributed-memory.

MODULE-2

GPU programming, Programming hybrid systems, MIMD systems, GPUs, Performance – Speedup and efficiency in MIMD systems, Amdahl's law, Scalability in MIMD systems, Taking timings of MIMD programs, GPU performance.

MODULE-3

Distributed memory programming with MPI – MPI functions, The trapezoidal rule in MPI, Dealing with I/O, Collective communication, MPI-derived datatypes, Performance evaluation of MPI programs, A parallel sorting algorithm.

MODULE-4

Shared-memory programming with OpenMP – openmp pragmas and directives, The trapezoidal rule, Scope of variables, The reduction clause, loop carried dependency, scheduling, producers and consumers, Caches, cache coherence and false sharing in openmp, tasking, tasking, thread safety.

Self study:

Sl.NO	Experiments
1	Write a OpenMP program to sort an array on n elements using both sequential and parallel mergesort(using Section). Record the difference in execution time.



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2	Write an OpenMP program that divides the Iterations into chunks containing 2 iterations, respectively (OMP_SCHEDULE=static,2). Its input should be the number of iterations, and its output should be which iterations of a parallelized for loop are executed by which thread. For example, if there are two threads and four iterations, the output might be the following: a. Thread 0 : Iterations 0 — 1 b. Thread 1 : Iterations 2 — 3
3	Write a OpenMP program to calculate n Fibonacci numbers using tasks.
4	Write a OpenMP program to find the prime numbers from 1 to n employing parallel for directive. Record both serial and parallel execution times.
5	Write a MPI Program to demonstration of MPI_Send and MPI_Recv.
6	Write a MPI program to demonstration of deadlock using point to point communication and avoidance of deadlock by altering the call sequence
7	Write a MPI Program to demonstration of Broadcast operation.
8	Write a MPI Program demonstration of MPI_Scatter and MPI_Gather
9	Write a MPI Program to demonstration of MPI_Reduce and MPI_Allreduce (MPI_MAX, MPI_MIN, MPI_SUM, MPI_PROD)

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	An Introduction to Parallel Programming	Peter S. Pacheco, Matthew Malensek	2nd Edition	Morgan Kaufmann	2021
2	Parallel Programming in C with MPI and OpenMP	Michael J. Quinn	1st Edition	McGraw-Hill	2004

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Parallel Programming	Calvin Lin, Lawrence Snyder	1st Edition	Pearson	2008
2	Using OpenMP: Portable Shared Memory Parallel Programming	Barbara Chapman, Gabriele Jost, Ruud van der Pas	1st Edition	MIT Press (Scientific and Engineering Computation Series)	2007
3	Using MPI: Portable Parallel Programming with the Message-Passing Interface	William Gropp, Ewing Lusk, Anthony Skjellum	3rd Edition	MIT Press (Scientific and Engineering Computation Series)	2014

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	13+13 = 26



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Total Learning Hours/Semester	90
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Activity Based Learning (26 Hours)

ABL	Hours
ABL 1 – Fundamentals of Parallel Programming and GPU Computing (13 Hours)	
1. Study the architecture and classification of parallel computers (SIMD, MIMD), interconnection networks, and compare shared-memory and distributed-memory systems using diagrams and case studies – 3 hrs 2. Explore process/thread coordination, cache coherence, and memory models by implementing simple multithreaded programs – 3 hrs 3. Develop basic GPU programs using CUDA/OpenCL to perform vector addition or matrix operations and compare execution with sequential programs – 4 hrs 4. Evaluate the performance of parallel programs by computing speedup, efficiency, scalability, and verifying Amdahl's Law using experimental results – 3 hrs	13
ABL 2 – MPI and OpenMP Programming (13 Hours)	
1. Develop distributed-memory parallel programs using MPI functions for point-to-point communication and implement the trapezoidal rule – 4 hrs 2. Implement MPI collective communication, MPI-derived datatypes, and perform performance evaluation of MPI programs including a parallel sorting algorithm – 3 hrs 3. Develop shared-memory parallel programs using OpenMP directives, reduction clause, scheduling, and variable scoping for numerical applications – 4 hrs 4. Analyze OpenMP programs for thread safety, tasking, cache coherence, false sharing, and loop-carried dependencies, and prepare a performance comparison report – 2 hrs	13
Total Learning Hours/Semester	26

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab Evaluation	2
Semester End Exam	3
Total	8

[illegible]



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Course Title	MAIN PROJECT PHASE - I		
Course Code	24CB605	L-T-P-C	(0-0-4) 2
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	-

Course Objective: To be able to identify a relevant problem that requires technical solution and conduct survey for the same.

Course Outcomes (COs): Upon the completion of the course the students will be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Identify a problem through extensive literature survey leading to propose appropriate method.	1,2	-
2.	Design the proposed method to solve the problem	3,4	1,2
3.	Analyse and compare the results with existing methods	2,4,5	-
4.	Present and demonstrate the proposed work along with documentation of the work carried out.	1,5,9,10	-

Course Contents:

During VII semester, candidates in consultation with the guides shall carry out literature survey to finalize the topic of the project. ***The same project will be continued in Eighth semester.*** Students are expected to present the project synopsis, system analysis, requirements specification and **should publish a technical paper on Literature Survey. The evaluation will be carried out in three stages**

- Project Stage 1 – Team Formation , Topic Selection & Guide allotment (No marks)
- Project Stage 2 – Extensive Literature Survey , Problem Definition
- Project Stage 3 – Preliminary Design, Report Preparation and Publication

The evaluation of the project phases shall be carried out by the evaluation committee comprising of project guide & other faculty members. The committee will be constituted by the project coordinator in consultation with the Head of the department. ***For Multidisciplinary projects guides will be allotted from each concerned branch.***

Performance Indicators	Low (40%)	Medium(70%)	High(100%)
Literature Survey and Problem Definition (20 Marks)	Literature Survey not pertaining to the title of the project (8)	Incomplete literature survey and improper problem definition (14)	Extensive literature survey with clear state of the art problem definition (20)
Preliminary Design (10 Marks)	Has no strategies Solving (4)for coherent problem	Has some strategies for problem – solving, but does not apply them consistently (7)	Formulates forsolving (10) strategies problems
Presentation (10 marks)	Disorganized and ineffective presentation (4)	Organized, but ineffective presentation (7)	Effective organized presentation (10)



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Report Preparation (30 Marks)	Disorganized and contents are not sufficient	Organized but not good content wise	Effectively organized well framed
Paper Publication (20 Marks)	Paper submitted & awaiting results (8)	National conference International Conference (14)	Journal (20)
Punctuality (Project Dairy Maintenance) (10 marks)	Not meeting the guide regularly (4)	Meeting regularly but doesn't document details of every session (7)	Upto date dairy maintenance(10)

Course Articulation matrix

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



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PROFESSIONAL ELECTIVE COURSE -II

Course Title	DATA MINING AND DATA WAREHOUSING		
Course Code	24CB661	L-T-P	(3-0-0)3
Exam	3Hrs.	Hours/Week	3
SEE	50Marks	Total Hours	40

Course Objective: Students will be able to select appropriate data mining techniques to extract useful patterns.

Course Outcomes: At the end of course, student will be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1	Describe the data quality and data pre-processing techniques	1	-
2	Apply data mining algorithm for, Classification, Association and cluster Analysis	3	-
3	Describe the design of Data Warehouse, Modelling and usage	1	-
4	apply classification, frequent pattern mining, and clustering techniques to discover meaningful patterns and trends in large datasets.	2	1

MODULE-1

10Hrs.

Introduction: Data: Why Data Mining? What is Data Mining? What kinds of data can be mined?, What kinds of pattern can be mined?, Which technologies are used? Major issues in data mining. **Getting to know the data:** Data objects and attribute types, Basic statistical description of data: measuring the central tendency, Measuring the dispersion of data, measuring data similarity and dissimilarity.

MODULE-2

10Hrs.

Data Pre-processing: An overview, Data cleaning, Data integration, Data Reduction: overview of data reduction strategies, wavelet transforms, Principal component analysis, attributes subset selection, Data Transformation: min-max normalization and Z-score normalization. **Data Warehouse and online Analytical processing:** Data Warehouse: Basic Concepts ,Data Warehouse modelling : Data cube and OLAP , Data warehouse design and usage: A business analysis frame work for data warehouse design, Data warehouse design process, Data warehouse usage for information processing.

MODULE-3

10Hrs.

Classification: Preliminaries, General Approach to Solving a Classification Problem, Decision Tree Induction, Rule-based classification, K- Nearest-neighbour Classifier. Mining frequent patterns. **Association and correlations:** Basic Concepts and Methods: Basic Concepts, Frequent item set mining methods: Apriori Algorithm, generating association rules from frequent item sets, Improving the efficiency of Apriori, A Pattern growth Approach for Mining Frequent item sets.

MODULE-4

10Hrs.

Cluster Analysis: Basic Concepts and Methods, Cluster Analysis, Partitioning Methods, Agglomerative versus divisive hierarchical clustering, DBSCAN. **Data Mining Trends and research frontiers:** Data Mining Applications , Data mining and society, Data mining trends.



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Self-Study: Bayesian Belief Networks, Classification by Backpropagation, Support Vector Machines.

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Data Mining: Concepts and Techniques	Jiawei Han, Micheline Kamber, Jian Pei	4th Edition	Morgan Kaufmann	2018
2	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach, Vipin Kumar	2nd Edition	Pearson Education	2020

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Insight into Data Mining: Theory and Practice	K. P. Soman, Shyam Diwakar, V. Ajay	1st Edition	PHI Learning	2006

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning (ABL1 & ABL2)	-	-	13+13 = 26
Total Learning Hours/Semester				90

Activity Based Learning (26 Hours)

ABL	Hours
ABL 1 – Data Understanding, Preprocessing and Data Warehousing (13 Hours) 1. Explore different types of data, data mining functionalities, and real-world applications using sample datasets – 2 hrs 2. Perform exploratory data analysis (EDA) by calculating measures of central tendency, dispersion, similarity, and dissimilarity – 3 hrs 3. Apply data preprocessing techniques including data cleaning, integration, normalization, dimensionality reduction (PCA), and attribute selection using suitable tools – 5 hrs 4. Design a simple data warehouse and perform OLAP operations (Roll-up, Drill-down, Slice, and Dice) on a business dataset – 3 hrs	13
ABL 2 – Classification, Association Rule Mining and Clustering (13 Hours) 1. Implement Decision Tree and K-Nearest Neighbour (KNN) classification algorithms and evaluate their performance on standard datasets – 4 hrs 2. Generate frequent itemsets and association rules using the Apriori algorithm and analyze the discovered patterns – 3 hrs 3. Perform clustering using Partitioning and DBSCAN algorithms and compare the clustering results using appropriate evaluation measures – 4 hrs 4. Study recent trends and applications of Data Mining through case studies and prepare a report on real-world data mining solutions – 2 hrs	13



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Total Learning Hours/Semester	26
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Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Lab Evaluation	2
Semester End Exam	3
Total	8

Course Articulation Matrix

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

Course Title	BUSINESS MANAGEMENT		
Course Code	24CB662	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3



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SEE	50 Marks	Total Hours	40
Course Objective: To equip students with foundational knowledge and practical insights into key principles, functions, and strategies of management in modern organizations. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Analyze key management concepts, including managerial roles, social responsibility and ethics, and different forms of business ownership.	6,7	-
2.	Apply planning, management by objectives, strategy formulation using the TOWS matrix, and decision-making techniques to managerial situations.	2,10	-
3.	Apply principles of organizational design and staffing, including organizational structures, employee selection and performance appraisal techniques.	1,6	-
4.	Compare leadership theories, motivation models, communication processes, and international management approaches including Japanese Theory Z.	1,10	-
Course Contents:			
MODULE 1			10 Hours
Management, Science, Theory and Practice: Definition of management, its nature and purpose; managerial skills and organizational hierarchy; managing - science or art; contributions of F.W. Taylor and Henry Fayol; functions of managers and levels of management. Management and society: social responsibility of managers and ethics of managing. Ownership of Enterprises: Proprietorship; partnership and its types; joint-stock companies - private and public limited companies; public-sector companies; cooperative organizations and their types; methods of raising capital.			
MODULE 2			10 Hours
Planning: Definition of planning, types of plans, steps in planning, management by objectives (MBO), setting objectives, benefits and weaknesses of MBO, and recommendations. Strategies, Policies and Planning Premises: Nature and purpose of strategies and policies; TOWS matrix as a modern tool for situational analysis; major kinds of strategies and policies. Decision Making: Importance and limitations of rational decision making; rationality in decision making; evaluation of alternatives; selecting an alternative through three approaches; programmed and non-programmed decisions.			
MODULE 3			10 Hours
Organizing: Nature and purpose of organizing; formal and informal organization; organization levels and span of management; systems approach to organization; principles of organization; types of organization - line, military or scalar, functional, project/product/departmentation, and matrix/grid. Staffing: Definition of staffing; systems approach to human resources; situational factors affecting staffing; selection and matching the person with the job; skills and personal characteristics needed by managers; selection process, techniques and instruments; purpose of performance appraisal.			
MODULE 4			10 Hours



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Leading: Human factors in managing; motivation and motivators; Maslow's hierarchy of needs theory; Herzberg's motivation-hygiene theory; McGregor's Theory X and Theory Y; leadership behaviour and leadership styles. **Communication:** Importance and purpose of communication; communication process; types of communication; effective communication. **International Management:** Managerial functions in international business; Japanese management and Theory Z.

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Management	Harold Koontz, H. Weihrich and A.R. Aryasri	4th	Tata McGraw-Hill	2015
2	Industrial Engineering and Management	O.P. Khanna	3rd	Dhanpat Rai and Sons	-
3	Management of Organizational Behaviour	Hershey Paul and Kenneth Blanchard	-	-	2012

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Essentials of Management	Harold Koontz and H. Weihrich	5th	Tata McGraw-Hill	2015

Online Courses and Video Lectures:

1. Principles of Management - https://onlinecourses.nptel.ac.in/noc23_mg33/preview

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	07
5.	Activity Based Learning (ABL1 & ABL2)	-	-	15+12 = 27
Total Learning Hours/Semester				90

Activity Based Learning (26 Hours)



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ABL	Hours
ABL 1- Management Fundamentals, Business Ownership, Planning and Decision-Making (15 Hours) 1. Study managerial functions, levels, skills, and the contributions of F.W. Taylor and Henry Fayol using an organization of choice – 3 hrs 2. Compare the forms of business ownership and recommend a suitable form for a given business venture – 3 hrs 3. Frame organizational objectives and prepare a management-by-objectives plan for a selected business – 3 hrs 4. Construct a TOWS matrix and formulate suitable strategies and policies for a case organization – 4 hrs 5. Analyze a managerial problem using programmed or non-programmed decision-making and submit a brief report – 2 hrs	15
ABL 2 – Organizing, Staffing, Leadership and Communication (13 Hours) 1. Design an organization structure, hierarchy, departmentalization and span of management for a case organization – 3 hrs 2. Prepare a job description, selection process and performance-appraisal format for a managerial position – 3 hrs 3. Analyze employee motivation and leadership using Maslow, Herzberg, McGregor and suitable leadership styles – 3 hrs 4. Develop an effective organizational communication plan and compare international management practices with Japanese Theory Z – 4 hrs	13
Total Learning Hours/Semester	28 hours

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 3) Details of activity 1 4) Details of activity 2	20
Total		50

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Presentation and Viva	1
Semester End Exam	3
Total	7



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



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Course Code	24CB663	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To introduce students to basic computer graphics concepts and visualization using OpenGL and geometric transformations.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe core concepts of computer graphics with OpenGL	1,2	-
2.	Apply concepts of geometric transformations, projections, and illumination to render image.	2,3	-
3.	Analyse line clipping and polygonal clipping algorithms	2,4	-
4.	Design a 2D/3D image using graphical concepts through OpenGL	2,3,4,5	2

Course Contents:

Module 1	10 Hours
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; The synthetic camera model; The programmer's interface: Pen Plotter Model, Graphics architectures; Graphics Programming: The Sierpinski gasket; Programming two - dimensional applications. The OpenGL: The OpenGL API; Primitives and attributes;	
Module 2	10 Hours
The OpenGL (Continued): Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket. Input and Interaction: Interaction; Input devices; Clients and Servers; Display lists; Display lists and modeling; Programming event-driven input; Menus, Animating interactive programs.	
Module 3	10 Hours
Geometric Objects and Transformations: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Frames in OpenGL; Modeling a colored cube; Affine transformations; Rotation, translation and scaling; Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices	
Module 4	10 Hours
Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera Positioning of the Camera Frame; Simple projections; Projections in OpenGL; Hidden-Surface Removal, Lighting and Shading: Light and Matter; Light Sources; The Phong Lighting Model; Polygonal Shading; Light sources in OpenGL; Specification of materials in OpenGL Implementation: Clipping; Line- Segment Clipping; Bresenham's Algorithm	

Text Books:

1. Interactive Computer Graphics A Top-Down Approach with OpenGL Edward Angel 5 th Addison-Wesley 2013

Reference Books:

1. Computer Graphics Using OpenGL F.S. Hill,Jr, 2 nd Pearson education 2011
2. Computer Graphics James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes 1 st Addison-wesley.



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Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	07
5.	Activity Based Learning (ABL1 & ABL2)	-	-	15+12 = 27
Total Learning Hours/Semester				90

Activity Based Learning (26 Hours)

ABL	Hours
ABL 1 – Introduction to Computer Graphics and OpenGL Basics (10 Hours) 1. Study the fundamentals of computer graphics, graphics systems, image types (physical and synthetic), imaging systems, and applications by preparing a concept map with real-world examples – 3 hrs 2. Analyze the graphics architecture, synthetic camera model, and programmer's interface (Pen Plotter Model) by illustrating the graphics rendering pipeline – 2 hrs 3. Develop the Sierpinski Gasket using OpenGL and demonstrate two-dimensional graphics programming concepts – 3 hrs 4. Experiment with OpenGL API by implementing basic primitives (points, lines, polygons) and applying different attributes such as color and size – 2 hrs	15
ABL 2 – OpenGL Programming, Input and Interaction (10 Hours) 1. Implement OpenGL programs demonstrating color, viewing transformations, and control functions using interactive graphics applications – 3 hrs 2. Develop recursive graphics programs including the 2D and 3D Sierpinski Gasket to understand recursion and fractal generation – 2 hrs 3. Design an event-driven OpenGL application using input devices, menus, display lists, and interactive controls – 3 hrs 4. Create an animated graphics application incorporating user interaction, display lists, and event handling mechanisms – 2 hrs 5. Study scalars, points, vectors, coordinate systems, and frames by constructing geometric models in OpenGL – 3 hrs	13
Total Learning Hours/Semester	28 hours



Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Presentation and Viva	1
Semester End Exam	3
Total	7

[illegible]



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Course Title	BUSINESS STRATEGIES		
Course Code	24CB664	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To provide students with a comprehensive understanding of strategic management concepts, environmental and resource analysis, and the formulation of business- and corporate-level strategies. To develop the ability to implement and control strategic plans with emphasis on sustainability, strategic leadership and performance evaluation.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Explain the fundamentals, core areas and theoretical perspectives of strategic management and the processes linking context, content and implementation.	1,6	-
2.	Analyse competitive environments, resources and capabilities to identify industry success factors and sources of sustainable competitive advantage.	6,8	-
3.	Develop and evaluate business-level and corporate-level strategic options using appropriate strategic frameworks and tools.	6,7	2
4.	Apply strategy implementation and control mechanisms, including the Balanced Scorecard, green strategies and sustainability initiatives.	6,7	-

Course Contents:

MODULE 1	10 Hours
Strategic Management: Introduction; meaning and scope of strategic management; main topics covered in strategy; core areas of strategic management; context, content and process; linking the three core areas. Review of Theory and Practice: Prescriptive and emergent strategic management in theory and practice; selected prescriptive and emergent theories; purpose of the organisation; shareholders, stakeholders and above-average returns. (Case studies are excluded.)	
MODULE 2	10 Hours
Analysing the Strategic Environment: Exploring the competitive environment; fundamentals of the strategic environment; degree of environmental turbulence; analysis of the general environment and stages of market growth; industry key success factors; Porter's analysis of the competitive industry environment; cooperative environment; in-depth competitor analysis; customer analysis and market segmentation. Analysing Resources and Capabilities: Purpose and analysis of organisational resources and capabilities; make-or-buy decision; resource analysis and value addition; Porter's value chain and value system; resource-based view; identification of resources and capabilities that deliver sustainable competitive advantage; improving competitive advantage; analysis of human and other organisational resources. (Case studies are excluded.)	
MODULE 3	10 Hours
Developing Business-Level Strategy Options: Purpose and SWOT analysis - contribution of Andrews; Porter's generic strategies; market-options matrix; expansion-method matrix; resource-based strategic options; cost-reduction strategies. (Case studies are excluded.) Developing Corporate-Level Strategy Options: Benefits and costs of diversification; degrees of diversification; role of the corporate centre and the parenting principle; management of a diversified product portfolio; corporate-level options including acquisition and restructuring.	



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MODULE 4	10 Hours
Implementing and Controlling the Strategic Plan: Nature and limitations of implementation; objectives, task setting and communication of strategy; resource allocation; information, monitoring and control; Balanced Scorecard - contribution of Kaplan and Norton; prescriptive strategic planning. (Case studies are excluded.) Green Strategy and Sustainability: Main concepts of green strategy and sustainability; environmental analysis; analysis of resources and capabilities; stakeholders and organisational purpose; knowledge, technology and innovation; strategic options and choice; implementation of green strategies. (Case studies are excluded.)	

Prescribed Textbooks:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1	Strategic Management	Richard Lynch	7th	Pearson	2015

Reference Books:

Sl. No.	Book Title	Authors	Publisher	Year
1	Strategic Management Essentials	Robert Grant, Peter A. Murray, Stuart Orr, Bella Butler and Pieter-Jan Bezemer	Wiley	2021
2	Essentials of Strategic Management	J. David Hunger and Thomas L. Wheelen	Prentice Hall	2011

MOOCs:

1. <https://pll.harvard.edu/course/business-strategy>
2. <https://online.hbs.edu/subjects/strategy/>

Teaching - Learning - Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Student Study Hours - Self Learning	1	12	12
3.	Evaluation of Learning Process	-	-	08
4.	Assignment Based Learning (Assignment 1 & Assignment 2)	-	-	15 + 13 = 28
Total Learning Hours/Semester				90

Assignment Based Learning (28 Hours)

Assignment	Hours
Assignment 1 - Strategic Environment and Resource Analysis (15 Hours) 1. Compare prescriptive and emergent approaches to strategic management and explain their relevance to a selected organisation - 3 hrs 2. Conduct a general-environment analysis and Porter's industry analysis for a selected business sector - 4 hrs 3. Analyse competitors, customers, market segments and industry key success factors - 4 hrs 4. Perform value-chain and resource-capability analysis to identify sources of sustainable competitive advantage - 4 hrs	15



Proposed Assessment Plan (for 50 marks of CIE):

Evaluation of Learning Process (8 Hours)

Course Articulation Matrix

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



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OPEN ELECTIVE COURSE -I

Course Title	INDUSTRIAL MANAGEMENT		
Course Code	24OECB61	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40

Course Objective: To equip students with foundational knowledge and practical insights into key principles, functions, and strategies of management in modern organizations.

Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Analyze key management concepts, including managerial roles, social responsibility and ethics, and different forms of business ownership.	6,7	-
2.	Apply planning, management by objectives, strategy formulation using the TOWS matrix, and decision-making techniques to managerial situations.	2,10	-
3.	Apply principles of organizational design and staffing, including organizational structures, employee selection and performance appraisal techniques.	1,6	-
4.	Compare leadership theories, motivation models, communication processes, and international management approaches including Japanese Theory Z.	1,10	-

Course Contents:

MODULE 1	10 Hours
Management, Science, Theory and Practice: Definition of management, its nature and purpose; managerial skills and organizational hierarchy; managing - science or art; contributions of F.W. Taylor and Henry Fayol; functions of managers and levels of management. Management and society: social responsibility of managers and ethics of managing. Ownership of Enterprises: Proprietorship; partnership and its types; joint-stock companies - private and public limited companies; public-sector companies; cooperative organizations and their types; methods of raising capital.	
MODULE 2	10 Hours
Planning: Definition of planning, types of plans, steps in planning, management by objectives (MBO), setting objectives, benefits and weaknesses of MBO, and recommendations. Strategies, Policies and Planning Premises: Nature and purpose of strategies and policies; TOWS matrix as a modern tool for situational analysis; major kinds of strategies and policies. Decision Making: Importance and limitations of rational decision making; rationality in decision making; evaluation of alternatives; selecting an alternative through three approaches; programmed and non-programmed decisions.	
MODULE 3	10 Hours



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Organizing: Nature and purpose of organizing; formal and informal organization; organization levels and span of management; systems approach to organization; principles of organization; types of organization - line, military or scalar, functional, project/product/departmentation, and matrix/grid.

Staffing: Definition of staffing; systems approach to human resources; situational factors affecting staffing; selection and matching the person with the job; skills and personal characteristics needed by managers; selection process, techniques and instruments; purpose of performance appraisal.

MODULE 4

10 Hours

Leading: Human factors in managing; motivation and motivators; Maslow's hierarchy of needs theory; Herzberg's motivation-hygiene theory; McGregor's Theory X and Theory Y; leadership behaviour and leadership styles.

Communication: Importance and purpose of communication; communication process; types of communication; effective communication.

International Management: Managerial functions in international business; Japanese management and Theory Z.

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Principles of Management	Harold Koontz, H. Weihrich and A.R. Aryasri	4th	Tata McGraw-Hill	2015
2	Industrial Engineering and Management	O.P. Khanna	3rd	Dhanpat Rai and Sons	-
3	Management of Organizational Behaviour	Hershey Paul and Kenneth Blanchard	-	-	2012

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Essentials of Management	Harold Koontz and H. Weihrich	5th	Tata McGraw-Hill	2015

Online Courses and Video Lectures:

1. Principles of Management - https://onlinecourses.nptel.ac.in/noc23_mg33/preview

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	07
5.	Activity Based Learning (ABL1 & ABL2)	-	-	15+12 = 27
Total Learning Hours/Semester				90

Activity Based Learning (28 Hours)



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ABL	Hours
ABL 1- Management Fundamentals, Business Ownership, Planning and Decision-Making (15 Hours) 1. Study managerial functions, levels, skills, and the contributions of F.W. Taylor and Henry Fayol using an organization of choice – 3 hrs 2. Compare the forms of business ownership and recommend a suitable form for a given business venture – 3 hrs 3. Frame organizational objectives and prepare a management-by-objectives plan for a selected business – 3 hrs 4. Construct a TOWS matrix and formulate suitable strategies and policies for a case organization – 4 hrs 5. Analyze a managerial problem using programmed or non-programmed decision-making and submit a brief report – 2 hrs	15
ABL 2 – Organizing, Staffing, Leadership and Communication (13 Hours) 1. Design an organization structure, hierarchy, departmentalization and span of management for a case organization – 3 hrs 2. Prepare a job description, selection process and performance-appraisal format for a managerial position – 3 hrs 3. Analyze employee motivation and leadership using Maslow, Herzberg, McGregor and suitable leadership styles – 3 hrs 4. Develop an effective organizational communication plan and compare international management practices with Japanese Theory Z – 4 hrs	13
Total Learning Hours/Semester	28 hours

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		50

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1, 2 and 3)	3
Presentation and Viva	1
Semester End Exam	3
Total	7



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COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
C01	-	-	-	-	-	3	3	-	-	-	-	-	-
C02	-	3	-	-	-	-	-	-	-	2	-	-	-
C03	3	-	-	-	-	2	-	-	-	-	-	-	-
C04	3	-	-	-	-	-	-	-	-	2	-	-	-



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Course Title	INVESTMENT MANAGEMENT		
Course Code	24OECB62	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40
Course Objective: The objective of the course is to provide knowledge on various investment avenues, secondary market operations and valuation of securities along with portfolio construction and evaluation. Course Outcomes (COs): Upon completion of the course, students shall be able to:			
No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Understand the capital market and various Instruments avenues in financial market	1	-
2.	Assess the risk and return of various securities.	2	-
3.	Demonstrate the use of fundamental analysis and technical analysis in evaluating Stock market investments and mutual funds.	2,4	-
4.	Apply the concept of CAPM and MPT while constructing optimal portfolio.	2,5	-
Course Contents:			
MODULE 1			10 Hours
Investment: Concepts of investment, attributes, forms of investment, Objectives of financial investment, Sources of investment information. Features of a good investment, Investment Process. Economic vs. Financial Investment, Investment and speculation. Securities Market: Primary Market - Factors to be considered to enter the primary market, Secondary Market Major Players in the secondary market, Functioning of Stock Exchanges, Trading and Settlement Procedures, Leading Stock Exchanges in India. Stock Market Indicators- Types of stock market Indices, Indices of Indian Stock Exchanges. (Calculations) Analysis of Risk and Return: Concept of Risk, Types of Risk- Systematic risk, Unsystematic risk, Calculation of Risk and returns.			
MODULE 2			10 Hours
Portfolio Risk and Return: Expected returns of a portfolio, Calculation of risk and return of individual security and portfolio with 2 assets and more than 2 assets. Valuation of Securities: Bond Valuation: meaning, features and types of bonds, Bond pricing theorems, bond valuation, duration of bond and immunization of interest risk, determination of yield curves. Equity shares: Concept, Valuation, Dividend Valuation models and CAPM Preference Shares: Concept, Features, Yields. Fundamental Analysis: Concept of intrinsic value, Objectives, and beliefs of fundamental analysts, EIC framework. Economic analysis, Industry Analysis and Company Analysis.			
MODULE 3			10 Hours
Technical Analysis: Concept, Theories- Dow Theory, Eliot wave theory. Charts-Types, Trend and Trend Reversal Patterns. Mathematical Indicators –Moving averages, ROC, RSI, Market Indicators. Market Efficiency and Behavioural Finance: Random walk and Efficient Market Hypothesis, Forms of Market Efficiency, Empirical test for different forms of market efficiency. Behavioural Finance – Meaning and biases. Modern Portfolio Theory: Markowitz Model -Portfolio Selection, Opportunity set, Efficient Frontier.			
MODULE 4			10 Hours



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Beta Measurement and Sharpe Single Index Model Capital Asset pricing model: Basic Assumptions, CAPM Equation, Security Market line, Extension of Capital Asset pricing Model - Capital market line, SML VS CML. Sharpe's Optimum Portfolio Construction. **Portfolio Management Strategies and Performance Evaluation:** Portfolio Management Strategies: Active and Passive Portfolio Management strategy. **Mutual Funds:** Concept of Mutual Funds, Participants in Mutual Funds, Advantages of Investment in Mutual Fund, Measure of Mutual Fund Performance. **Portfolio performance Evaluation:** Measures of portfolio performance.

Prescribed Textbooks:

1. Investment Analysis and Portfolio management, Prasanna Chandra, Tata McGraw Hill, 3/e, 2010.
2. Security Analysis & Portfolio Management, S Kevin, Tata McGraw Hill, 2014.
3. Security Analysis & Portfolio Management, Punithavathy Pandian, Vikas Publications, 2/e, 2018.

References

1. Investments –Zvi Bodie, Kane, Marcus & Mohanty, TMH, 8th Edition, 2010.
2. Investment management (Security Analysis and & Portfolio Management), Bhalla V.K., Vikas Publications, 19/e, 2018.

Activity Based Learning (28 Hours)	Hours
ABL 1 – Investment Fundamentals, Securities Market and Security Analysis (15 Hours) 1. Study the concepts of investment, forms of investment, investment objectives, investment process, and compare economic investment with financial investment using real-life investment options – 3 hrs 2. Analyze the functioning of the primary and secondary securities markets, trading and settlement procedures, stock exchanges, and calculate major Indian stock market indices using available market data – 3 hrs 3. Calculate the risk and return of individual securities by identifying systematic and unsystematic risks using historical stock price data – 3 hrs 4. Perform valuation of bonds, equity shares, and preference shares using suitable valuation models, and interpret the investment decisions based on the results – 3 hrs 5. Conduct a fundamental analysis of a listed company using the Economic–Industry–Company (EIC) framework and prepare an investment recommendation report – 3 hrs	15
ABL 2 – Technical Analysis, Portfolio Management and Performance Evaluation (13 Hours) 1. Analyze stock price movements using technical analysis tools such as Dow Theory, Elliott Wave Theory, chart patterns, moving averages, ROC, and RSI for a selected company – 3 hrs 2. Construct and evaluate an investment portfolio by calculating expected return, portfolio risk, and applying Markowitz Portfolio Theory and the Efficient Frontier concept – 3 hrs 3. Evaluate the risk-return relationship using Beta, Sharpe Single Index Model, Capital Asset Pricing Model (CAPM), Security Market Line (SML), and Capital Market Line (CML) – 3 hrs 4. Compare active and passive portfolio management strategies, evaluate the performance of selected mutual funds using performance measures, and prepare a portfolio performance evaluation report – 4 hr	13
Total Assignment Hours	28



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Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Student Study Hours – Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	07
5.	Activity Based Learning (ABL1 & ABL2)	-	-	15+12 = 27
Total Learning Hours/Semester				90

Course Articulation matrix

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



Course Outcomes: At the end of the course, the student will be able to:

8 Hrs.

8 Hrs.

8 Hrs.

Suggested Learning Resources:

4. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
5. Government of Karnataka, NSS cell, activities reports and its manual.
6. Government of India, NSS cell, Activities reports and its manual.

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



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Course Title	YOGA		
Course Code	24NYP4	(L-T-P) C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
No.	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	5. Understand the Philosophical and Scientific Basis of Yoga	11	-
2	6. Demonstrate Proficiency in Basic Yoga Practices	9	-
3	7. Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7	-
4	8. Apply Yoga Principles for Personal and Professional Growth	10, 11	-
MODULE - 1			8 Hrs.
Ashtanga Yoga 1. Dharana 4. Dhyana (Meditation) 5. Samadhi			
MODULE - 2			8 Hrs.
Different types of Asanas d. Sitting 1. Bakasana 2. Hanumanasana 3. Ekapada Rajakapotasana 4. Yogarnudra in Vajrasana e. Standing 1. Vatayanasana 2. Garudasana f. Balancing 1. Veerabhadrasana 2. Sheershasana			
MODULE - 3			8 Hrs.
Pranayama 3. Bhastrika 4. Bhramari			

Course Articulation matrix

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



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Course Title	PHYSICAL EDUCATION (PE)		
Course Code	24NYP4	L-T-P-C	(0-0-2)
Exam	-	Hours/Week	2
SEE	-	Total Hours	24
Course Outcomes: At the end of the course, the student will be able to:			
#	Course outcomes	POs	PSOs
1	Understand the Fundamental concepts and skills of Physical Education , Health, Nutrition and Fitness	9,10	-
2	Familiarization of health related Exercises, Sports for overall growth and development.	9	-
3	Create a foundation for the professionals in Physical Education and Sports	12	-
4	Participate in competition at regional/ state / national/ international levels.	9,10	-
5	Create consciousness among the student Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9,10	-
MODULE - 1			4 Hrs.
Orientation - Postural deformities, Stress management			
MODULE - 2			16 Hrs.
Specific games (Any one to be selected by the student) 4. Throw ball 5. Table Tennis 6. Athletics (Field Events- Jumps) – Any event as per availability of Ground.			
MODULE - 3			4 Hrs.
Aerobics			

Course Articulation matrix

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



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