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
(2023 Admitted Batch)

Academic Year 2025-2026

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Explore and excel in emerging domains of computer science and business system

PEO2: Develop professional skills that equip employability and higher education in the contemporary areas of Computer Science and Business Systems

PEO3: Empower Research Skills by designing and developing solutions in the field of IT and facilitate to take up higher studies

PEO4: Impart industry ready business skills through collaborations to bridge the gap between industry and academics

PROGRAM OUTCOMES (POs)

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

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

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

4. **Conduct Investigations of Complex Problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

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

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

PROGRAM OUTCOMES (POs)

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

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES

PSO1: Develop efficient computer based systems to solve real life problems.

PSO2: Implement new generation technologies to design and develop industry relevant projects.

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

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

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	4					**23**
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	9	9	3	2					**23**
Professional Core Course (PCC)	-	-	15	14	16	11	11	4	**71**
Professional Elective Course (PEC)	-	-			3	3	3		**9**
Open Elective Course (OEC)	-	-				3	3		**6**
Project/Mini Project/Internship (PI)	-	-				2	3	8	**13**
Humanities and Social Sciences, Management Course (HSMC)	1	2			1				**4**
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	1	1	1	3	1			**9**
Universal Human Value Course (UHV)	-	-	1	1					**2**
Total Credits	**20**	**20**	**23**	**24**	**21**	**20**	**20**	**12**	**160**

MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS
2023-2024 admitted batch

				FIFTH SEMESTER								
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	23CB501	Artificial Intelligence	3	0	2	5	50	50	100	4
2	PCC	23CB502	Data Communications	3	0	0	3	50	50	100	3
3	IPCC	23CB503	System Software and Compiler Design	3	0	2	5	50	50	100	4
4	SEC	23CB504	Aptitude and Technical Skills	0	1	2	4	50	50	100	2
5	PEC	23CB55x	Professional Elective Course - I	3	0	0	3	50	50	100	3
6	PCC	23RIP	Research Methodology and IPR	2	1	0	4	50	50	100	3
7	HSMC	23EVS	Environmental Studies	0	1	0	2	50	50	100	1
8	MC	23NYP3	NSS,YOGA,PE	0	0	2	2	-	-	-	A
Total							28				20

Professional Elective Course I	
Course Code	Course Name
23CB551	Microcontrollers and Embedded System
23CB552	Cloud Computing
23CB553	Internet of Things
23CB554	Engineering Economics and Cost Accounting

				SIXTH SEMESTER								

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
					T	P	Total	CIE	SEE	Total	
1	IPCC	23CB601	Computer Networks	3	0	2	5	50	50	100	4
2	PCC	23CB602	Software Engineering	3	0	0	3	50	50	100	3
3	PCC	23CB603	Data Mining and Warehousing	3	0	0	3	50	50	100	3
4	PI	23CB604	Mini Project	0	0	4	4	50	50	100	2
5	PI	23CB605	Main Project Phase I	0	0	4	4	50	50	100	2
6	PEC	23CB66x	Professional Elective Course - II	3	0	0	3	50	50	100	3
7	OEC	23OECB6X	Open Elective Course - I	3	0	0	3	50	50	100	3
8	MC	23NYP4	NSS,YOGA,PE	0	0	2	2	-	-	-	A
9	SDC	23ASK	Analytical Ability and Soft Skills	0	0	2	2	50	50	100	1
			Total				29				21

23CB604: 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 - II	
Course Code	**Course Name**
23CB661	Business Strategies
23CB662	Blockchain Technology
23CB663	Mobile Communications
23CB664	Computer Graphics and Visualization

Open Elective Course – I	
Course Code	**Course Name**
23OECB61	Business Management
23OECB62	Business Intelligence and Analytics
23OECB63	AI for Business and Finance
23OECB64	Human Computer Interactions

Course Title		ARTIFICIAL INTELLIGENCE		
Course Code	23CB501	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	1
2	Identify an appropriate AI method to analyse the problem and provide solution	2,4	-
3	Develop knowledge based systems and First-Order Logic using search algorithms	3,4	-
4	Design AI Applications to identify the societal implications, potential environmental impact based on ethical considerations.	3, 5, 6, 7	2

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: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic, Knowledge engineering in first-order logic. Inference in first-order logic: propositional versus first-order inference, uniform and lifting, forward chaining, backward chaining, resolution.

MODULE-4	**10Hrs.**

Learning from Examples: Forms of Learning, Supervised Learning, Learning Decision Trees, Ensemble Learning. Reinforcement Learning: Introduction, Passive Reinforcement Learning, Active Reinforcement Learning, Generalization in Reinforcement Learning Natural Language Processing: Language models, Text Classification, Information Retrieval. Robotics: Introduction, Robotics Hardware Robotic perception.

Practical Components:

1. Write a program to implement Breadth-First Search (BFS)

2. Write a program to implement Depth-First Search (DFS)

3. Simulate Tic-Tac-Toe game using a rule-based approach

4. Solve the 4-Queens problem using backtracking

5. Implement a simple Hill Climbing algorithm

6. Demonstrate the use of A Search for a grid-based pathfinding problem

7. Create a basic Prolog program for family relationships (e.g., parent, sibling)

8. Load a CSV file and perform data preprocessing (missing values, normalization)

9. Build a classification model using Decision Tree (Scikit-learn)

10. Write a program to implement 8 puzzle problem using python

11. Write a program to implement water jug problem

12. Write a program to implement A* search algorithm

13. Write a program to implement Missionaries and cannibal's problem

14. Write a program to implement N Queens problem

15. Write a program to implement Monkey and banana Problem

16. Implement of the problem solving strategies wither using forward chaining or backward chaining.

Text Books:
Artificial Intelligence - A Modern Approach, Stuart Russell and Peter Norvig, Third edition, Pearson, 2014

Reference Books:
1. Artificial Intelligence, Elaine Rich, Kevin Knight and Shivashankar B Nair, Third edition, McGraw-Hill Education, 2015
2. Introduction to Artificial Intelligence and Expert Systems, Dan W Patterson, Pearson, 2015

ebook and online course:
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

Course Articulation matrix

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

Course Title	DATA COMMUNICATIONS			
Course Code	**23CB502**	**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 gain knowledge of TCP/IP Protocol Model and Functionalities of Data link Layer and Physical Layer

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

No.	Course Outcomes	POs	PSOs
1.	Perceive the different types of Networks and demonstrate the responsibility each layers of TCP/IP protocol suite.	1,12	-
2.	Enumerate signal transmission along with impairments and performance analysis	2,4	-
3.	Explore the concept of data and signal with different techniques	1,2	-
4.	Investigate and apply bandwidth utilization, transmission media, Switching Techniques and error detection/correction algorithms, Data Link Layer Protocols	2,4	2

Course Contents	
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;

MODULE-2	**10Hrs**

Digital Transmission : Digital-to-Digital conversion: Line Coding, Line Coding Schemes, Block Coding, and Scrambling; Analog-to-Digital conversion: Pulse Code Modulation (PCM), Delta Modulation(DM); **Multiplexing: FDM, WDM, TDM,** Multiplexing ; Spread spectrum

MODULE-3	**10Hrs**

Transmission Media: Twisted pair cable, Coaxial cable, Fiber-Optic cable, Radio waves, Microwaves, Infrared. **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, Polynomials, Cyclic Code Encoder using Polynomials, Cyclic Code Analysis, Checksum: Concept, Other Approaches to the Checksum; Forward Error Correction.

MODULE-4	**10Hrs**

Data Link Control: DLC Services: Framing, Flow and Error control, Connectionless and Connection Oriented; Data Link Layer Protocols: Simple, Stop & Wait, Piggybacking; HDLC; Point to Point Protocol: Services and Framing; **Media Access Control:** Random Access: ALOHA, CSMA, CSMA/CD, CSMA/CA; **Controlled Access:** Reservation, Polling, Token Passing;

Text Books:

Data Communications and Networking, Behrouz A. Forouzan, 5th Edition, Tata McGraw-Hill

Reference Books:
1. Communication Networks – Fundamental Concepts and Key Architectures, Alberto Leon-Garcia, Indra Widjaja, 2nd Edition, Tata McGraw-Hill-2015
2. Data and Computer Communication, William Stallings, 8th Edition, Pearson Education-2015

Online Courses and Video Lectures:
http://nptel.ac.in/keyword_search_result.php?word=data+communication

Course Articulation matrix:

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

Course Title	SYSTEM SOFTWARE AND COMPILER DESIGN		
Course Code	23CB503	L-T-P-C	(3-0-2)4
Exam Hrs.	3	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, Implementation examples.

| **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 evolution of programming languages, The science of building compiler, 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 grammers, 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, Evaluation orders for SDD's, Intermediate code generation- variants of syntax trees, three-address code, Code generation.

MODULE 4	10 Hours

Lex and Yacc: The Simplest Lex Program, Grammars, Parser-Lexer Communication, A YACC Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written Lexers, Using LEX - Regular Expression, Examples of Regular Expressions, A Word Counting Program, Using YACC – Grammars, Recursive Rules, Shift/Reduce Parsing, What YACC Cannot Parse, A YACC Parser - The Definition Section, The Rules Section, The LEXER, Compiling and Running a Simple Parser, Arithmetic Expressions and Ambiguity.

Practical Components: 12 Hours

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.
15. **Modify a Yacc grammar to handle operator precedence** and associativity, resolving shift/reduce conflicts for arithmetic expressions.
16. **Write a complete parser using Lex and Yacc** for evaluating nested expressions and handling parentheses correctly.

Text Books:
1. System Software by Leland. L. Beck, D Manjula, 3rd edition, 2012
2. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman , Compilers-Principles, Techniques and Tools, Pearson, 2nd edition, 2007
3. Doug Brown, John Levine, Tony Mason, lex & yacc, O'Reilly Media, October 2012.

Reference Books:
1. Systems programming – Srimanta Pal , Oxford university press, 2016
2. System programming and Compiler Design, K C Louden, Cengage Learning
3. System software and operating system by D. M. Dhamdhere TMG
4. Compiler Design, K Muneeswaran, Oxford University Press 2013.

Course Articulation matrix

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

Course Title	APTITUDE AND TECHNICAL SKILLS		
Course Code	23CB504	L-T-P-C	(0-1-2) 2
Exam Hrs.	3	Hours / Week	4
SEE	50 Marks	Total Hours	52

Course Objective: To equip students with essential aptitude, programming, and interpersonal skills necessary for cracking placement assessments, coding tests, and HR interviews.

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

No.	Course Outcomes	POs	PSOs
1.	Solve objective-type questions in quantitative aptitude and logical reasoning.	1,12	-
2.	Demonstrate programming skills and problem-solving techniques.	1, 3	-
3.	Apply verbal and interpersonal communication skills in HR interview settings.	9,10,12	-
4.	Crack aptitude and technical rounds during placement processes confidently.	1,2,10	-

Course Contents:	
MODULE 1	**13 Hrs**

Quantitative Aptitude & Mathematical Skills: Number systems, HCF & LCM, Simplifications, Percentages, Ratio & Proportion, Averages, Time & Work, Pipes & Cisterns, Time, Speed & Distance, Boats & Streams, Mixtures & Allegations, Simple & Compound Interest, Profit & Loss, Permutations & Combinations, Probability, Clocks & Calendars, Progressions, Data Interpretation.

MODULE 2	**13 Hrs**

Logical Reasoning & Analytical Skills: Blood relations, Coding-Decoding, Direction sense, Syllogisms, Seating Arrangement (Linear & Circular), Puzzles, Venn Diagrams, Statement & Assumption, Statement & Conclusion, Data Sufficiency, Cubes and Dices, Visual Reasoning.

MODULE 3	**13 Hrs**

Programming & Technical Skills: MCQs and coding problems on: C/C++ basics, Data Structures (Arrays, Strings, Stacks, Queues, Linked Lists), Sorting & Searching Algorithms, OOPs Concepts, Recursion, Time Complexity, SQL Queries, DBMS basics, OS basics, Computer Networks fundamentals.

MODULE 4	13 Hrs

Verbal Ability & HR Skills: Reading Comprehension, Synonyms & Antonyms, Sentence Correction, Fill in the Blanks, Cloze Test, Error Spotting, Para jumbles, HR Questions, Resume Building, Group Discussions, Mock Interviews, Body Language, Email Etiquette, Communication Scenarios.

Text Books:
1. Quantitative Aptitude for Competitive Examinations by R.S. Aggarwal, S. Chand, Revised Edition, 2021
2. A Modern Approach to Logical Reasoning by R.S. Aggarwal, S. Chand, 2nd Edition, 2018
3. Programming in ANSI C by E. Balagurusamy, McGraw Hill, 8th Edition, 2019
4. Objective General English by S.P. Bakshi, Arihant Publications, 4th Edition, 2019

Reference Books:

1. Analytical Reasoning by M.K. Pandey, BSC Publishing, 3rd Edition, 2020
2. Let Us C by Yashavant P. Kanetkar, BPB Publications, 17th Edition, 2020
3. Data Structures Using C by Reema Thareja, Oxford University Press, 2nd Edition, 2014
4. Fundamentals of Database Systems by Ramez Elmasri, Shamkant B. Navathe, Pearson, 7th Edition, 2016
5. Effective Business Communication by Asha Kaul, Pearson, 2nd Edition, 2015

Course Articulation matrix

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

Course Title	RESEARCH METHODOLOGY & INTELLECTUAL PROPERTY RIGHTS		
Course Code	23RIP	L-T-P-C	(2-1-0) 3
CIE	50	Hours/Week	4
SEE	50	Total Hours	40

Course Objective: To give an overview of technical research activities and patenting methodology.
Course outcomes: At the end of course, student will be able to:

No.	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Carry out Literature Review and write technical paper	2,3,4,12	-
2.	Describe the fundamentals of patent laws and the patent drafting procedure.	4,12	-
3.	Elucidate the copyright laws and subject matters of copyright	4,12	-

MODULE-1	10 Hrs.

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 CreativeReading.

MODULE-2	10 Hrs.

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 forCitations, 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,andIntroduction,Methods,Results,andDiscussions,Table,Figures, Acknowledgments, and Closures

MODULE-3	10 Hrs.

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-PatentableMatters. 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. Do I Need First to File a Patent in India. Patent Related Forms. Fee Structure. Types of Patent Applications.

MODULE-4	10 Hrs.

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 ofCopyrights 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.

Text Books:
1. Dipankar Deb, Rajeeb Dey, Valentina E, Balas, "Engineering Research Methodology", Springer,2019.
2. Prof. Rupinder Tewari, Ms. Mamta Bhardwa, "Intellectual Property" , Professor Gurpal Singh Sandhu Honorary Director, Publication Bureau, Panjab University, 2021.

Reference Books:
1. David V. Thiel, "Research Methods for Engineers", Cambridge University Press, 2014.
N.K.Acharya, "Intellectual Property Rights", Asia Law House, 8th Edition, 2021.

MOOC:
https://onlinecourses.swayam2.ac.in/ntr24_ed08/preview

Course Articulation matrix

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

Course Title	ENVIRONMENTAL STUDIES		
Course Code	23EVS	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 itsallied problems	7, 10
2.	Develop strong feelings of concern, sense of ethical responsibility for theenvironment and the motivation to act in protecting and improving it.	6,8
3.	Analyze and evaluate environmental measures in real world situations in termsof ecological, political, economic, societal and aesthetic factors.	6, 8, 9

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Course Contents:

MODULE-1

</div>

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.

<div align="center">

MODULE-2

</div>

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.

<div align="center">

MODULE-3

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Pollution: Effects of pollution-Water Pollution-Air pollution Land pollution-Noise pollution.

<div align="center">

MODULE-4

</div>

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.

Text Books:
1. Environmental Studies, Dr. D.L. Manjunath, Pearson Education, 2006
2. Environmental Studies, Dr. S. M. Prakash, Elite Publishers-2006

Reference Books:
1. Environmental Studies, Benny Joseph, Tata McGraw-Hill, 2005
2. Principles of Environmental Science and Engineering, P. Venugopala Rao, Prentice Hall of India
3. Environmental Science and Engineering, Meenakshi, Prentice Hall of India

Course Articulation matrix

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

Course Title	**NATIONAL SERVICE SCHEME (NSS)**		
Course Code	**23NYP3**	**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 PSO's
1	Understand the importance of his / her responsibilities towards society	6	-
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3, 6	-
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3, 6	-
4	Implement government or self-driven projects effectively in the field.	11	-

MODULE - 1	8 Hrs.

Developing Sustainable Water management system for rural areas and implementation approaches.
Contribution to any national level initiative of Government of India.
For eg. Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.

MODULE - 2	8 Hrs.

Spreading public awareness under rural outreach programs.(minimum5 programs).

MODULE - 3	8 Hrs.

Social connect and responsibilities.

Text Books :

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.

Course Articulation matrix

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

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

CO4	-	-	-	-	-	-	-	-	-	-	3	-	-	-

Course Title	PHYSICAL EDUCATION (PE)				
Course Code	23NYP3		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	Mapping to POs	Mapping to PSOs
1	Understand the Fundamental concepts and skills of Physical Education , Health, Nutrition and Fitness	9, 10,12	-
2	Familiarization of health related Exercises, Sports for overall growth and development.	9,12	-
3	Create a foundation for the professionals in Physical Education and Sports	12	-
4	Participate in competition at regional/ state / national/ international levels.	9,10,12	-
5	Create consciousness among the student Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9,10,12	-

MODULE - 1	4 Hrs.

Orientation - Fitness, Food & Nutrition

MODULE - 2	4 Hrs.

General Fitness & Components of Fitness - Agility – Shuttle Run, Flexibility – Sit and Reach, Cardiovascular Endurance – Harvard step Test

MODULE - 3	16 Hrs.

Specific games (Any one to be selected by the student)
1. Badminton (Fore hand low/high service, back hand service, smash, drop)
2. Basketball (Dribbling, passing, shooting etc.)
3. Athletics (Field events – Throws)

Course Articulation matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	3	2	-	2	-	-
CO2	-	-	-	-	-	-	-	-	2	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	3	2	-	2	-	-
CO5	-	-	-	-	-	-	-	-	3	2	-	2	-	-

Course Title		YOGA		
Course Code	**23NYP3**	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	Mapping to PO's	Mapping to PSO's
1	Understand the Philosophical and Scientific Basis of Yoga	12	-
2	Demonstrate Proficiency in Basic Yoga Practices	9	-
3	Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7, 12	-
4	Apply Yoga Principles for Personal and Professional Growth	10, 12	-

MODULE - 1	8 Hrs.

Ashtanga Yoga
Asana , Pranayama , Pratyahara

MODULE - 2	8 Hrs.

Different types of Asanas
a. Sitting l. Ardha lJshtrasana 2. Vakrasana 3. Yogamudra in Padmasana
b. Standing 1. I.JrdhvaHastothanasana 2. Hastapadasana 3 . ParivrittaTrikonasana 4.Utkatasana
c. Supine line l. Sarvangasana 2. Chakraasana 3. Pavanamuktasana

MODULE - 3	8 Hrs.

Pranayama
Meaning, Need, importance of Pranayama, Different types, Meaning by name, technique, precautionary measures and benefits of each Pranayama, Ujjayi, Sheetali, Sheektari

Course Articulation matrix

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

Professional Elective-I

Course Title	MICROCONTROLLERS AND EMBEDDED SYSTEMS		
Course Code	23CB551	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40

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.

Text Books:
1. Embedded system design: A unified hardware/software, Introduction, Frank Vahid, Tony

Givargis, John Wiley and Sons, Inc, 3rd edition.2006

2. ARM System on Chip Architecture , Steve Furber, 2nd Edition, Addison Wesley Longman Publishers, 2018

Reference Books:

1. Embedded Systems: Architecture and programming, Raj Kamal, Third edition, TMH, 2008
2. ARM System Developer's Guide, Andrew N. Sloss, Dominic Symes and Chris Wright, 1st edition, Morgan   Kaufmann Publications, 2015

EBooks and online course materials:
https://en.wikibooks.org/wiki/Embedded_Systems

Online Courses and Video Lectures:
http://nptel.ac.in/courses/108102045

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

Course Articulation Matrix:

Course Title	CLOUD COMPUTING		
Course Code	**23CB552**	**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:
1. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, McGraw Hill
2. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliances, Tim Mather, Subra Kumarswamy, Shahed Latif,2013

Reference Books:
1. Cloud Computing: Theory and Practice, Dan C. Marinescu, 1st edition, MK Publishers
2. Cloud Computing – A Practical Approach, Anthony T. Velte, Toby J. Velte, Robert Elsenpeter, McGraw Hill

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

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	-	-	-	-	-	-

Course Title	INTERNET OF THINGS		
Course Code	**23CB553**	**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 requirements.

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.

Text Books:
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
2. Internet of Things, Srinivasa K G, 1st edition, CENGAGE Learning India, 2017

Reference Books:
1. Internet of Things: A Hands-on Approach, Arshdeep Bahga, Vijay Madisetti, 1st edition, Universities Press-2015

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	-	-	-	-	-	-	-	-

Course Title	**ENGINEERING ECONOMICS AND COST ACCOUNTING**		
Course Code	**23CB554**	**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 principles and practical techniques in engineering economics to make informed financial decisions, optimize production processes, and effectively manage costs, depreciation, taxation, and inflation in engineering projects.

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

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply economic principles and methods to analyze and solve engineering decision-making problems, understanding the interplay between engineering and economics.	2, 11,	-
2.	Calculate and interpret various financial metrics, including present worth, future worth, and equivalent annual worth, to compare and evaluate engineering projects with different life spans and cash flows.	2, 11,	2
3.	Identify key production functions, costing systems, and cost behaviours, which will enable them to understand and apply appropriate costing techniques in different scenarios.	2, 11,	-
4.	Analyse the impact of inflation, taxation and depreciation on an engineering project.	2,6, 11	2

Course Contents:	
MODULE 1	**10 Hours**

Introduction: Engineering decision – makers, Engineering and Economics, Problem solving and decision making, Intuition and Analysis, Tactics and Strategy, Engineering economic decision maze, Law of demand and supply, Law of returns.

Theory of Production: Production Function and Iso-quants, production with one variable input, average and marginal products, the law of diminishing returns, labor productivity, diminishing returns, substitution among inputs, returns to scale.

MODULE 2	**10 Hours**

Interest and Interest Factors: Interest rate, Simple interest, Compound interest, Cash –flow diagrams, Exercises and discussion.

esent worth Comparisons: Conditions for present worth comparisons, Basic Present worth comparisons.Present worth equivalence, Net present worth, Assets with unequal lives, infinite lives, Future worth comparison, Pay-back comparison, Exercises, Discussions and problems.

MODULE 3	10 Hours

Equivalent Annual Worth Comparisons: Equivalent annual worth comparison methods, Situations for equivalent annual worth comparisons. Consideration of asset life, Comparison of assets with equal and unequal lives, Use of shrinking fund method, Annuity contract for guaranteed income, Exercises and Problems.

Present-Worth Comparisons: Cash flow diagram, Conditions for present worth comparisons, Basic Present worth comparisons, Present-worth equivalence, Net Present worth, Assets with unequal lives, infinite lives, Numerical problems.

MODULE 4	10 Hours

Costing Systems: Elements of Cost, Cost Behavior, Cost Allocation, OH Allocation, Unit Costing, Process Costing, Job Costing, Absorption Costing, Marginal Costing, Cost Volume Profit Analysis, Budgets, ABC Analysis, Application of costing concepts in the Service Sector.

Depreciation and Taxation: Depreciation meaning, Causes of Depreciation, Basic methods of computing depreciation charges, Tax concepts, GST, Inflation: Causes, Consequences and Control of Inflation, Inflation in Economic Analysis.

TEXT BOOKS:

1. Microeconomics,Pindyck, Robert S., and Daniel L. Rubinfeld.
2. J. L. Riggs, Engineering Economics, Tata McGraw Hill, New Delhi.
3. Basics of Engineering Economy, Leland Blank & Anthony Tarquin, McGraw Hill Publication (India) Private Limited

REFERENCE BOOKS

1. Intermediate Microeconomics: A Modern Approach, Hal R, Varian.

2. Modern Economic Theory, By Dr. K. K. Dewett& M. H. Navalur, S. Chand Publications

Course Articulation Matrix

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

VI SEMESTER : Syllabus

Course Title	COMPUTER NETWORKS		
Course Code	23CB601	L-T-P-C	(3-0-2) 4
Exam Hrs.	3	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.	Recognize the importance of the Network Layer Services, different versions of IP and Network addressing mechanisms	1,2	1
2.	Analyze the performance of Unicast and Multicast routing algorithms and their uses	2,4	-
3.	Design and apply the Transport Layer Protocols for different services.	2,3,5	-
4.	Apply and Investigate the use of different QoS models and their applications	2,4	-

Course Content	
MODULE-1	**10Hrs**

Network Layer: Network Layer Services, IPv4 Addresses: Address Space, Classful Addressing, Classless Addressing, DHCP, NAT; **Network Layer Protocols:** Internetwork Protocol: Datagram format, Fragmentation, Options, Security of IPV4 Datagrams; ICMPv4: Messages, Mobile IP: Addressing, Agents, Three Phases, Inefficiency in Mobile IP;

MODULE-2	**10Hrs**

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); **Multicast Routing:** Introduction: Unicasting, Multicasting, Broadcasting; MULTICASTING BASICS: Multicast Addresses, Delivery at Data-Link Layer, Collecting Information about Groups, Multicast Forwarding, Two Approaches to Multicasting;

MODULE-3	**10Hrs**

INTRADOMAIN MULTICAST PROTOCOLS: Multicast Distance Vector (DVMRP), Multicast Link State (MOSPF) Protocol Independent Multicast (PIM); INTERDOMAIN MULTICAST PROTOCOLS: IGMP: Messages, Propagation of Membership Information, Encapsulation; **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;

MODULE-4	**10Hrs**

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 and Association; **Quality of Services:** Data Flow Characteristics; Flow Control to Improve QoS: Scheduling, Traffic Shaping or Policing, Resource Reservation, Admission Control; INTEGRATED SERVICES (INTSERV): Flow Specification, Admission, Service Classes, Resource Reservation Protocol (RSVP), Problems with Integrated Services; DIFFERENTIATED SERVICES (DFFSERV).

Text Books:

Data Communications and Networking, Behrouz A. Forouzan, 5th edition, Tata McGraw-Hill, 2023

Reference Books:
1. Communication Networks–Fundamental Concepts and Key Architectures, Alberto Leon-Garcia, Indra Widjaja, 2nd edition, Tata McGraw-Hill, 2015
2. Data and Computer Communication, William Stallings, 8th edition, Pearson Education, 2014
3. Computer and Communication Networks, Nader F. Mir, 1st 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

List of Laboratory Experiments
1. Learn Networking Commands
2. Simulation of error correction code (like CRC).
3. Simulate thetransmissionofpingmessagesoveranetworktopologyconsistingof6nodes.
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 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. SimulateanEthernetLANusingnnodesandsetmultipletrafficnodesandplotcongestionwindow for different source / destination.

Course Articulation matrix

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

Course Title	SOFTWARE ENGINEERING		
Course Code	23CB602	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, Behavioral models, Model-driven engineering. **Design and Implementation:** Introduction to RUP, Design Principles ,Object-oriented design using the UML, Design patterns, Implementation issues, Open source development.

MODULE-3	**10Hrs**

Requirements Engineering : Requirements Specification, Requirements validation, Requirements Management. Coping with Change. **System Models:** Context models, Interaction models, Structural models, Behavioral models, Model-driven engineering. **Design and Implementation:** Introduction to RUP, Design Principles ,Object-oriented design using the UML, Design patterns, Implementation issues, Open source development

MODULE-4	**10Hrs**

Quality management: Software quality, Reviews and inspections, Software measurement and metrics, Software standards Risk management, Managing People, Teamwork.

Agile Software Development: The Agile Manifesto: Values and Principles. Agile methods: SCRUM and Extreme Programming. Plan-driven and agile development. Agile project management, Scaling agile methods

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.

Text Books:
Software Engineering, Ian Sommerville, 9th edition, Pearson Education-2012

Reference Books:
1. Software Engineering – A Practitioners Approach, Roger S. Pressman,7th edition, Tata McGraw-Hill-2013
2. An Integrated Approach to Software Engineering, Pankaj Jalote,7th edition, Wiley India-2017

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	2	-	-	2	-

Course Title	**DATA MINING AND DATA WAREHOUSING**		
Course Code	23CB603	**L-T-P-C**	(3-0-0)3
Exam Hrs.	3	**Hours / Week**	3
SEE	50 Marks	**Total Hours**	40

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

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 data quality and data pre-processing techniques	1,12	-
2.	Apply data mining algorithm for, Classification, Association and cluster Analysis	2,3	-
3.	Analyse the design of Data Warehouse, Modelling and usage	2,4	2
4.	Apply classification, frequent pattern mining, and clustering techniques to discover meaningful patterns and trends in largedatasets.	2,3	1

Course Contents:	
MODULE 1	**10 Hours**
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 datamining. **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	**10 Hours**
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	**10 Hours**
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	**10 Hours**
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.	
Self-Study: Real-Time Data Mining, Privacy-Preserving Data Mining, Web Mining, Social Network Analysis, Anomaly Detection in Data Mining, Temporal and Spatial Data Mining, Text and Sentiment Analysis, Graph Data Mining, Big Data Analytics, Ethical Considerations in Data Mining, Reinforcement Learning in Data Mining, Scalable Data Mining Algorithms, Data Mining with Cloud Computing, Deep Learning for Data Mining, Data Mining for Cybersecurity.	
Text Books: 1. Data Mining – Concepts and Techniques, Jiawei Han, Micheline Kamber, 4th Edition, Morgan Kaufmann, 2018 **2.** Introduction to Data Mining, Pang-Ning Tan, Michael Steinbach, Vipin Kumar, 1st edition, Pearson Education, 2020	
Reference Books: Insight into Data Mining – Theory and Practice, K.P. Soman, Shyam Diwakar, V. Ajay, 1st edition, PHI, 2006	

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	-	-	-	-	-	-	-	-	-	2
CO4	-	3	2	-	-	-	-	-	-	-	-	-	2	-

23CB604: MINI PROJECT

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. Semiconductor and health care

MINI PROJECT					
Course Code	23CB604	**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
				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.				
SN	Performance Indicators		Marks allocated	Marks awarded
	Project execution	Project specification	5	

		Progress	5	
	Methodology /Result Analysis	System Design	5	
		System Implementation	5	
		System Testing	5	
	Project Report	Organization and Clarity	5	
		Technical content	5	
		Conclusion and Future Work	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.

Course Articulation matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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	-	-	-	-

Course Title	MAIN PROJECT PHASE - I		
Course Code	23CB605	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)

Report Preparation (30 Marks)	Disorganized and contents are not sufficient	Organized but not good content wise	Effecectively 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)	Up to date dairy maintenance(10)

Course Articulation matrix

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

Professional Elective – II

Course Title	BUSINESS STRATEGIES		
Course Code	23CB661	**L-T-P-C**	(3-0-0)3
Exam Hrs.	3	**Hours / Week**	3
SEE	50 Marks	**Total Hours**	40

Course Objective: To develop a strong understanding of strategic management by explaining, analyzing, and evaluating strategy concepts and applying them in real business environments.

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

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Describe strategic management principles, models, and frameworks.	1,2	-
2.	Evaluate external forces influencing business strategy and firm performance.	2,4	-
3.	Analyze interrelations of functional areas for effective strategy planning and execution.	2,3	2
4.	Apply strategy formulation, implementation, and evaluation to business scenarios.	2,6	-

Course Contents:	
Module 1	**10 Hours**

Introduction to Strategic Management and Vision Crafting: Concept and importance of strategic management, strategic decisions, elements of strategic management, need for strategy, company values, levels of strategy, strategic management process, evolving approach to strategy, perspectives on strategy formulation, features of strategic planning. Strategic vision development, communicating vision, crafting mission statements, linking vision and mission with company values, objective levels, crafting objectives.

Module 2	**10 Hours**

Environment Analysis and Strategic Tools: General environment; scanning, monitoring, forecasting, scenario planning, PEST analysis. Competitive environment – Porter's Five Forces, value net, strategic groups, hyper competition. Internal environment – value chain analysis, SWOT analysis. Resource-based view – resources, competencies, core competencies, distinctive capabilities, knowledge management.

Module 3	**10 Hours**

Business and Corporate-Level Strategies: Business-level strategy – generic strategies, resource-based strategy, industry life cycle. Corporate-level strategies – growth strategies, related/unrelated diversification. Portfolio analysis – BCG Matrix, GE-McKinsey Matrix. Strategy evaluation techniques and application.

Module 4	**10 Hours**

Strategy Implementation, Structure and Leadership: Organizational structures – entrepreneurial, functional, divisional, matrix, network. Strategic leadership – learning organizations, emotional intelligence, leadership capabilities and performance, vision, values, culture, strategic change.

Text Books:
1. Strategic Management: Formulation, Implementation and Control, Pearce II, J.A., Robinson R.B., Mittal, A, Latest Edition, McGraw Hill-2018
2. Crafting and Executing Strategy, Thompson, A., Peteraf, M.A., Gamble, J.E., Strickland, A.J., Jain

A.K., Latest Edition, McGraw Hill-2014

Reference Books:
1. Business Policy and Strategic Management, Kajmi, A., 1st Edition, Tata McGraw Hill-2018
2. Strategic Management, Adhikari, D.R., Buddha Publication
3. Strategic Management and Business Policy, Wheelan, T.L., Hunger J.D., Pearson
4. Understanding Strategic Management, Henry, E.A., Oxford
5. Business Policy and Strategic Management, Jauch, L.R., Glueck, W.F., McGraw-Hill

Course Articulation matrix

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

Course Title	BLOCK CHAIN TECHNOLOGY		
Course Code	**23CB662**	**(L-T-P)C**	**(3-0-0) 3**
Exam	**3 Hrs.**	**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: At the end of course, student will be able to:

No.	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the types, benefits and limitations of blockchain and bitcoin.	1,6	-
2	Explore the blockchain decentralization, cryptography concepts and smart contracts	2,8	-
3	Comprehend the blockchain applications outside of currencies	5,11	-
4	Demonstrate topics and participate in quizzes to assess knowledge.	9,12	-

MODULE – 1	10 Hrs.

Blockchain 101: 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 Hrs.

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 Hrs.

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 101: Introduction, Ethereum blockchain, Etherium Network, Ethereum blockchain(bird's eye view)

MODULE -4	10 Hrs.

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.

Text Book:
1. Mastering Blockchain- Distributed ledgers, Decentralization and smart contracts explained , Imran Bashir, 3rd edition, PacktPu, 2017

Reference Books:

1. Bitcoin and Cryptocurrency Technologies: A Comprehensive introduction, Arvind Narayan, Joseph Bonneau, EdwardW. Felten, Andrew Miller, Steven Gold feder and Jeremy Clark, 2nd edition, Princeton University Press, 2016
2. Blockchain Basics:ANon- Technical Introduction in 25 Steps, Daniel Drescher, First Edition, Apress, 2017

E Books:
Mastering Blockchain - Distributed ledgers,Decentralization and smart contracts explained, ImranBashir, 3rd edition, PacktPu, 2017

MOOC Course:
https://onlinecourses.nptel.ac.in/noc22_cs44/preview
https://onlinecourses.swayam2.ac.in/aic21_ge01/preview

Course Articulation Matrix

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

Course Title	MOBILE COMMUNICATIONS		
Course Code	23CB663	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.	1,2,3,12	-
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, tunneling 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.

Text Books:
Mobile Communications, Jochen Schiller, 2nd Edition, Pearson Education, 2015

Reference Books:
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

Course Articulation matrix

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

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Title	COMPUTER GRAPHICS AND VISUALIZATION		
Course Code	23CB664	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.	Analyze 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 listsand 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.

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	2	2	-	-	-	-	-	-	-	-	2

Open Elective – I

Course Title	BUSINESS MANAGEMENT		
Course Code	23OECB61	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, as well as different types of business ownership.	6,7	-
2.	Illustrate knowledge of planning, strategy formulation (e.g., TOWS matrix), and decision-making techniques for managerial effectiveness.	2,10	-
3.	Identify and apply principles of organizational design and staffing, including types of structures and performance appraisal techniques.	1,6	-
4.	Distinguish between various leadership theories, motivation models, and communication processes, with insights into international management approaches like 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, levels of management, Management and Society: Social responsibility of managers, Ethics of managing.

Ownership of Enterprises: Proprietorship, Partnership, types, Joint stock Companies - Private and Public limited companies Public sector companies, Co-operative organizations, types, methods of raising capital.

Module 2	10 Hours

Planning: Definition of planning, Types of plans, steps in planning, MBO, how to Set Objectives, Benefits and weakness of MBO Some Recommendations.

Strategies, Policies and Planning Premises: Nature and Purpose of Strategies and Policies, TOWS matrix: A modern tool for analysis of the situation, 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- three approaches, Programmed and Non-

programmed decisions.	
Module 3	**10 Hours**
Organizing: The nature and purpose of organizing, Formal and informal organization. Organization levels and Span of management, a system approach to organization, principles of organization, principles of organization, Types of organization: line, military or scalar, functional, project/product/departmentation, matrix/grid. **Staffing:** Definition of Staffing, Systems approach to human resources, Situational factors affecting staffing. Selection- 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, Motivations and motivators. Maslows Hierarchy of needs Theory, Herzberz motivation- Hygine theory, mcgregors theory X and theory Y, Leadership: Leadership behavior and Leadership styles. **Communication:** Importance of Communication, Purpose of Communication, Communication process, Types of communication, Effective communication. **International Management:** Managerial functions in international business, Japanese management and Theory Z.	

Text Books:
    1. Principles of Management, Harold Koontz, H. Weihrich, A.R. Aryasri, 4th Edition, Tata McGraw-Hill, New Delhi, 2015
    2. Industrial Engineering and Management, O.P. Khanna, 3rd Edition, Dhanpat Rai and Sons, 2012	

Reference Books:
    1. Essentials of Management, Harold Koontz, H. Weihrich, 5th Edition, Tata McGraw-Hill, 2016
    2. Management of Organizational Behaviour, Hershey Paul, Kenneth Blanchard, 2nd Edition, PHI, 2013	

Online Courses and Video Lectures: **1.** **https://onlinecourses.nptel.ac.in/noc23_mg33/preview**	

Course Articulation matrix

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

Course Title	BUSINESS INTELLIGENCE AND DATA ANALYTICS		
Course Code	23OECB62	L-T-P-C	(3-0-0)3
Exam Hrs.	3	Hours / Week	3
SEE	50 Marks	Total Hours	40

Course Objective:			
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 role of Business Intelligence and Decision Support Systems in organizations.	2,4,5	-
2.	Design real-time analytics and stream processing in business applications.	1,3,4	-
3.	Construct prescriptive analytics techniques and optimization models for decision-making.	3,4	-
4.	Critically assess text, social, and web analytics and address ethical aspects of analytics solutions.	5,6,7	-

Course Contents:	
Module 1	**10 Hours**

Foundations of Business Intelligence: Introduction to BI, evolution and growth of data-driven decision-making, role of data in modern organizations, difference between data, information, and knowledge, BI architecture and data pipeline, overview of structured and unstructured data, basics of databases, introduction to decision support systems.

Module 2	**10 Hours**

Data Understanding and Descriptive Analytics: Types of business data (time series, categorical, cross-sectional), data quality and preprocessing, descriptive statistical methods: mean, median, mode, range, standard deviation, frequency distributions. Data visualization principles, basic charting (bar, line, pie, scatter), introduction to pivot tables and dashboards using Excel/Google Sheets.

Module 3	**10 Hours**

Visualization Tools and Hands-on BI: Overview of Power BI and Tableau environments, loading datasets, building simple reports, use of slicers, filters, KPIs, and calculated fields. Introduction to dashboard interactivity, storytelling with data, designing visually effective dashboards, hands-on exercises using built-in BI datasets (e.g., sales, manufacturing, health).

Module 4	**10 Hours**

Applications and Trends in BI: Real-world use cases of BI in retail, healthcare, finance, manufacturing, and education. Data-driven decision-making in supply chain management, resource optimization, and customer profiling. Introduction to trends in BI: real-time analytics, mobile BI, self-service BI, ethical concerns and responsible data use.

Text Book:
1. Business Intelligence, Analytics, Data Science and AI, Ramesh Sharda, Dursun Delen, Efraim Turban, 5th Edition, Pearson, 2024

Reference Books:
1. Business Intelligence Strategy and Big Data Analytics, Steve Williams, Morgan Kaufmann, 2016
2. Data Analytics and Business Intelligence, Vincent Charles et al., CRC Press, 2023
3. Data Analytics for Business: Lessons for Strategy, Ira J. Haimowitz, Routledge, 2023

Online Courses and Video Lectures:

1. https://www.tableau.com/business-intelligence/what-is-business-intelligence
2. https://cloud.google.com/learn/what-is-business-intelligence
3. https://www.geeksforgeeks.org/what-is-data-analytics/

4. https://onlinecourses.nptel.ac.in/noc24_cs65/preview

Course Articulation matrix

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

Course Title	AI FOR BUSINESS AND FINANCE		
Course Code	**23OECB63**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: To integrate fundamental finance concepts with artificial intelligence and data analytics, enabling students to apply machine learning, R programming, and AI models in investment analysis, portfolio construction, optimization, 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.	Evaluate risk-return characteristics of financial instruments and markets.	2,3	-
2.	Apply AI and machine learning algorithms to financial data.	3,4	-
3.	Develop and optimize portfolios using R-based statistical analysis.	3	-
4.	Analyze and interpret performance using asset pricing models.	3,4	-

Course Contents:

Module 1	10 Hours

Introduction to Financial Markets and Investment Decisions
Risk-Return Analysis, Measures of Risk and Return, Value and Goals of a Firm, Cash Flow Discounting, Investment Decisions, Valuation of Fixed Income Securities and Common Stocks, Portfolio Theory, Asset Pricing Models, Cost of Capital.

Module 2	10 Hours

AI Models and R Programming in Finance
Overview of AI & Machine Learning, Supervised and Unsupervised Learning, Probability Modelling, Inferential Statistics, Hypothesis Testing. R Programming Basics, Exploratory Data Analysis (EDA), Data Visualization, Statistical Analysis with R.

Module 3	10 Hours

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Market Microstructure and Portfolio Construction

Market Types: Order-driven and Quote-driven, Market Efficiency, Risk Preferences, Limit Order Books, Economic Theory of Choice, Interest Rate Compounding. Portfolio Risk and Return (Two & Multi-Asset), Risk Diversification, Correlation Structure, Mean-Variance Framework, Portfolio Construction using R.

Module 4	10 Hours

Portfolio Optimization, Asset Pricing and Performance Evaluation

Efficient Frontier, Minimum Variance Portfolios, Risk-Free Lending & Borrowing, Market Risk and Beta, CAPM, Security Market Line, Single & Multi-Index Models, Fama-French 3-Factor Model, Active vs Passive Management, Performance Measures, Application of Asset Pricing Models.

Text Books:
1. Machine Learning in Finance, M. Dixon, I. Halperin, P. Bilokon, 1st Edition, Springer
2. Advances in Financial Machine Learning, Marcos Lopez, 1st Edition, Wiley

Reference Books:
1. Machine Learning for Asset Managers, Marcos Lopez, 1st Edition, Cambridge University Press
2. Machine Learning for Algorithmic Trading, Stefan Jansen, 2nd Edition, Packt
3. Modern Portfolio Theory, Elton & Gruber, 9th Edition, Wiley

Online Courses and Video Lectures:
1. https://www.investopedia.com/
2. https://www.r-bloggers.com/
3. https://www.coursera.org/specializations/ai-for-finance

Course Articulation matrix

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

Course Title	HUMAN-COMPUTER INTERACTION(HCI)		
Course Code	23OECB64	**L-T-P-C**	(3-0-0)3
Exam Hrs.	3	**Hours / Week**	3
SEE	50 Marks	**Total Hours**	40

Course Objective: To understand the fundamentals of human-computer interaction (HCI), apply user-centered design principles, evaluate user interfaces, and explore emerging trends and technologies in the field.

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 principles and importance of user interface design.	1,2	-
2.	Apply HCI design processes to develop user-centered interfaces.	2,3	1
3.	Evaluate user interfaces using standard HCI evaluation techniques.	3,4	1
4.	Analyze emerging trends and technologies in human-computer interaction.	3,4	-

Course Contents:

Module 1	10 Hours

Introduction to HCI
Definition and importance of Human-Computer Interaction (HCI), benefits of good design, history of screen design, graphical user interfaces: popularity and characteristics, principles of user interface design.

Module 2	10 Hours

HCI Design Process
Human interaction with computers, importance of human characteristics and considerations, human interaction speeds, understanding business functions, screen design goals and planning, organizing screen elements and navigation.

Module 3	10 Hours

Interface Components and Windows
Windows: characteristics, components, and presentation styles, types of windows and their management, device-based and screen-based controls, text, messages, icons, multimedia, and color usage in interfaces.

Module 4	10 Hours

HCI in the software process, usability engineering, iterative design and prototyping, design rules, standards, and heuristics, evaluation techniques: expert analysis and user participation, universal design principles, multi-modal interaction.

Text Books:
1. Human-Computer Interaction, Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, 3rd Edition, Pearson Education, 2004
2. Designing the User Interface, Ben Shneiderman, Catherine Plaisant, 5th Edition, Pearson Education, 2009
3. The Essential Guide to User Interface Design, Wilbert O. Galitz, 3rd Edition, Wiley DreamTech, 2007

Reference Books:
1. User Interface Design and Evaluation, Debbie Stone et al., 1st Edition, Morgan Kaufmann, 2005
2. About Face: The Essentials of Interaction Design, Alan Cooper et al., 4th Edition, Wiley, 2014

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	-	-	-	-	-	-	-	-	-

Course Title	NATIONAL SERVICE SCHEME (NSS)		
Course Code	23NYP4	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	Mapping to PO's	Mapping to PSO's
1	Understand the importance of his / her responsibilities towards society	6	-
2	Analyze the environmental and societal problems/issues and will be able to design solutions for the same.	3, 6	-
3	Evaluate the existing system and to propose practical solutions for the same for sustainable development.	3, 6	-
4	Implement government or self-driven projects effectively in the field.	11	-

MODULE - 1	8 Hrs.

Plantation and adoption of plants. Know your plants.

MODULE - 2	8 Hrs.

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

MODULE - 3	8 Hrs.

Govt. school Rejuvenation and helping them to achieve good infrastructure.

Suggested Learning Resources:

Books :

1. NSS Course Manual, Published by NSS Cell, VTU Belagavi.
2. Government of Karnataka, NSS cell, activities reports and its manual.
3. Government of India, NSS cell, Activities reports and its manual.

Course Articulation matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	-	-	-	-	3	-	-	-	-	-	-	-	-

CO2	-	-	2	-	-	3	-	-	-	-	-	-	-	-
CO3	-	-	2	-	-	3	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	3	-	-	-

Course Title		**PHYSICAL EDUCATION (PE)**		
Course Code	**23NYP4**	**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	9,10,12	-
2	Familiarization of health related Exercises, Sports for overall growth and development.	9,12	-
3	Create a foundation for the professionals in Physical Education and Sports	12	-
4	Participate in competition at regional/ state / national/ international levels.	9,10,12	-
5	Create consciousness among the student Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.	9,10,12	-
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	PO12	PSO1	PSO2

CO1	-	-	-	-	-	-	-	-	3	2	-	2	-	-
CO2	-	-	-	-	-	-	-	-	2	-	-	3	-	-
CO3	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	-	-	-	3	2	-	2	-	-
CO5	-	-	-	-	-	-	-	-	3	2	-	2	-	-

Course Title	**YOGA**		
Course Code	**23NYP4**	**(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	4. Understand the Philosophical and Scientific Basis of Yoga	12	-
2	5. Demonstrate Proficiency in Basic Yoga Practices	9	-
3	6. Analyze the Role of Yoga in Managing Stress and Enhancing Lifestyle	7, 12	-
4	7. Apply Yoga Principles for Personal and Professional Growth	10, 12	-

MODULE - 1	**8 Hrs.**

Ashtanga Yoga
 l. 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	PO12	PSO1	PSO2
CO1	-	-	-	-	-	-	-	-	-	-	-	3	-	-
CO2	-	-	-	-	-	-	-	-	3	-	-	-	-	-
CO3	-	-	-	-	-	-	3	-	-	-	-	2	-	-
CO4	-	-	-	-	-	-	-	-	-	2	-	3	-	-