MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)

Autonomous Programme

Bachelor of Engineering

Department of
COMPUTER SCIENCE AND BUSINESS SYSTEMS

SCHEME and SYLLABUS

(2025 Admitted Batch)

Academic Year 2026-2027

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

VISION OF THE INSTITUTE

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

MISSION OF THE INSTITUTE

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

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 globality 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

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

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

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

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

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

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

PROGRAM OUTCOMES (POs)

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

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

PROGRAM OUTCOMES (POs)

7. **Ethics**: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

8. **Individual and collaborative team work**: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary settings.

9. **Communication**: Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

10. **Project management and finance**: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

11. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage independent and life-long learning in the broadest context of technological change. (WK8).

PROGRAM SPECIFIC OUTCOMES (PSO)

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

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

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

Semester-wise Credit Distribution

Curricular Component / Semester	I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	8	8	-	1	3	-	-	-	**20**
Applied Science Course (ASC)	-	-	3	-	-	-	-	-	**3**
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	9	9	-	-	-	-	-	-	**18**
Professional Core Course (PCC)	-	-	17	15	11	7	4		**54**
Professional Elective Course (PEC)	-	-	-	-	3	3	6	3	**15**
Open Elective Course (OEC)	-	-	-	-		3	-	3	**6**
Project/Mini Project/Internship (PI)	-	-	-	-	-	3	7	9	**19**
Humanities and Social Sciences, Management Course (HSMC)	1	2	-	3	3	3	3	-	**15**
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	1	1	1	1	1	-	-	**7**
Skill Development Course (SDC)	-	-	2	2	2	1	1	-	**8**
Universal Human Value Course (UHV)	-	-	-	-	-	A	-	-	**A**
Total Credits	**20**	**20**	**23**	**22**	**23**	**21**	**21**	**15**	**165**

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

COURSE TYPES

Basic Science Course	BSC
Applied Science Course	ASC
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
Skill Development Course	SDC
Universal Human Value Course	UHV
Non-credit Mandatory Course	MC

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

Scheme of Evaluation (Theory Courses)

Assessment	Marks
CIE 1 – conducted for 50 marks and scale down to 15 marks	**15**
CIE 2 – conducted for 50 marks and scale down to 15 marks	**15**
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 (12+8)
SEE	50	20

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

	THIRD SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching & Learning Scheme					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1	ASC	25MACB301	Computational Statistics	28	28	0	34	90	50	50	100	3
2	IPCC	25CB302	Data Structure and its applications	42	0	28	50	120	50	50	100	4
3	PCC	25CB303	Operating Systems	42	0	0	48	90	50	50	100	3
4	PCC	25CB304	Business Economics	42	0	0	48	90	50	50	100	3
5	PCC	25CB305	Oops With Java	42	0	0	48	90	50	50	100	3
6	PCC	25CB306	Digital Design and Computer Organisation	28	0	28	34	90	50	50	100	3
7	PCCL	25CB307	Unix and Shell Programming Laboratory	0	0	28	2	30	50	50	100	1
8	AEC	25CB308X	Ability Enhancement Course Laboratory **	0	0	28	2	30	50	50	100	1
9	SDC	25SCR	Community Project (Project-Based Learning)/ Societal Project	0	0	0	30	30	50	50	100	1
10	AEC	25PT1	Placement Training I	14	0	0	16	30	100	-	100	A
11	SEC	25SKL1	Skill Lab I	0	0	28	2	30	50	50	100	1
12	NCMC	25NYP1	NSS, YOGA, PE	0	0	0	28	28	100	-	100	A
13	NCMC	25BCM301	Bridge Mathematics-I (Non-Credit Mandatory Audit Course for Diploma entry students)	14	0	0	14	28	100	-	100	A
Total												23

Ability Enhancement Course (Laboratory)	
Course Code	**Course Name**
25CB308A	R Programming
25CB308B	Data Analytics with Excel
25CB308C	Data Visualization with Python
25CB308D	Version Controller with GiT
TW & SL – Term Work and Self Learning **TH/S - Total Hours per Semester**	

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

	FOURTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching & Learning Scheme					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1	HSMC	25CB401	Entrepreneurship and Business Development	42	0	0	48	90	50	50	100	3
2	PCC	25CB402	Design and Analysis of Algorithms	42	0	0	48	90	50	50	100	3
3	PCC	25CB403	Database Management Systems	28	28	0	34	90	50	50	100	3
4	PCC	25CB404	Theoretical Foundations of Computation	42	0	0	48	90	50	50	100	3
5	PCC	25CB405	Machine Learning	42	0	0	48	90	50	50	100	3
6	PCC	25CB406	Web programming	14	28	0	18	60	50	50	100	2
7	PCCL	25CB407	Design and Analysis of Algorithms lab	0	0	28	2	30	50	50	100	1
8	AEC	25CB408X	Ability Enhancement Course Laboratory **	0	0	28	2	30	50	50	100	1
9	BSC	25CB409	Biology for Engineers	14	0	0	16	30	50	50	100	1
10	SDC	25EVS	Environmental Science Project	0	0	0	30	30	50	50	100	1
11	AEC	25PT2	Placement Training II	14	0	0	16	30	100	-	100	A
12	SEC	25SKL2	Skill Lab II	0	0	28	2	30	50	50	100	1
13	NCMC	25NYP1	NSS, YOGA, PE	0	0	0	28	28	100	-	100	A
14	NCMC	25BCM301	Bridge Mathematics-I (Non-Credit Mandatory Audit Course for Diploma entry students)	14	0	0	14	28	100	-	100	A
Total												22

Ability Enhancement Course (Laboratory)	
Course Code	**Course Name**
25CB408A	Julia
25CB408B	Power Bi
25CB408C	Computer and Network Configuration
25CB408D	Technical writing using LaTex

TW & SL – Term Work and Self Learning
TH/S - Total Hours per Semester

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

Course Title	**COMPUTATIONAL STATISTICS**		
Course Code	**25MACB301**	**L-T-P-C**	**(3-0-0) 3**
Exam Hrs.	**3 Hours**	**Hours / Week**	**03**
SEE	**50 Marks**	**Total Hours**	**42L + 48ABL = 90**

Course Objective: To equip students with a solid foundation in computational statistics, enabling them to analyze and interpret data, make informed decisions based on statistical evidence, and effectively communicate statistical findings.

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

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply concepts of probability distributions, joint probability distributions, Markov chains, sampling theory, statistical estimation, and hypothesis testing to formulate and solve mathematical, statistical, and engineering problems.	1	-
2.	Analyze probabilistic models and statistical data using Markov chains, regression analysis, analysis of variance, sampling techniques, and hypothesis testing to support data-driven decision-making and problem-solving.	2	-
3.	Develop mathematical and statistical models for real-life engineering and analytical problems.	2,3	-
4.	Apply concepts of probability distributions, joint probability distributions, Markov chains, sampling theory, statistical estimation, and hypothesis testing to formulate and solve mathematical, statistical, and engineering problems.	1	-

Course Contents:

Module 1	**8 Hours**

Continuous Random Variables: Probability density function, Cumulative distribution function, Mean and Variance. Exponential distribution, Uniform distribution, and Normal distribution.
Applications: AI-based traffic systems, face-recognition system
Self-study: Measures of central tendency: mean, median, and mode.

Module 2	**12 Hours**

Joint Probability Distribution: Joint distributions of discrete random variables-Marginal probability distribution, Independent random variables, expectation, co-variance, and correlation.
Markov Chains: Introduction to stochastic process Probability vector, Stochastic matrices, Regular stochastic matrices, transition probability matrix, higher transition-probabilities, stationary distribution of regular Markov chains.
Applications: Application of Markov chain to determine the voting tendencies, Recommendation Analysis on OTT platforms
Self-study: Joint probability distribution-Continuous random variables.

Module 3	**12 Hours**

Sampling and its Properties: Sampling methods and techniques, Point estimation and confidence intervals, Sample size determination.
Hypothesis Testing: Introduction to hypothesis testing- Null and alternative hypotheses, Type I and Type II errors, significance level, and p-values. Parametric Tests: One-sample and two-sample-z-tests, t-tests. Chi-square test for independence of test.
Applications: Cloud server performance analysis, Cyber-security login analysis
Self-study: drying time problem, F-test Analysis of variance.

Module 4	**10 Hours**

Regression Analysis- Simple linear regression. Assumptions and interpretation. Coefficient of determination (R-squared). Multiple Regression Analysis

Analysis of Variance (ANOVA): One-way ANOVA and two-way ANOVA.

Self-study: Model assumptions and diagnostics, Variable selection techniques (stepwise, backward, forward), Analysis of Categorical Data

Note–Theorems and properties without proof. Applicable to all the modules.
Self-study is not included in SEE

Prescribed Textbooks:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Statistics	S C Gupta	7th ISBN-10:9350517698	Himalaya Publishing House	
2.	Statistics for Business: Decision Making and Analysis	Robert Stine	2nd ISBN-9780136759102	Pearson	2017
3.	Probability, Statistics and Random Process	T Veerarajan	3rd	Tata McGraw Hill Co.	2008

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Statistics for Business	Perumal Mariappan	-	CRC press	2019
2.	Probability and Statistics	Murray R. Spiegel, John J. Schiller & R. Alu Srinivasan	4	McGraw-Hill	2012

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

E Books and online course materials:

1. https://www.coursera.org/learn/the-power-of-statistics
2. https://nptel.ac.in/courses/110107114

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/stanford-statistics
2. https://www.coursera.org/learn/machine-learning-probability-and-statistics
3. https://onlinecourses.nptel.ac.in/noc21_ma74

Teaching - Learning – Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Class Room Teaching & Learning	3	14	42
2	Integrated Lab Component	-	-	-
3	Student Study Hours – Self Learning	1	14	14
4	Activity Based Learning (ABL1 & ABL2)	-	-	27
5	Evaluation of Learning Process	-	-	07

Total Learning Hours / Semester	**90**

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

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Activity Based Learning (27 Hours)

ABL 1 (14 Hours) : Activity 1 details		**Hours**
Writing Assignment with Problems on concerned to real world applications.	Submission of the final assignment report and evaluation. (Questions of Blooms level L3 and Higher)	14
Total		**14**
ABL 2 (13 Hours): Activity 2 details		
Problem Solving Assignment	Understand the input data requirements	1
	Formulate the methodology	4
	Design the solution	4
	Solving the problem and submission	4
Total		**13**

Evaluation of Learning Process(7Hours)

Type of Evaluation	**Hours**
CIE (1, 2 and 3)	3
Lab component	1
Semester End Exam	3
Total	**7**

Course Articulation Matrix

Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PSO 1**	**PSO2**
CO1	3	-											
CO2	-	3											
CO3	-	2	1										

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

Course Title	**DATA STRUCTURES AND ITS APPLICATIONS**		
Course Code	**25CB302**	**L-T-P-C**	**(3-0-2) 4**
Exam Hrs.	**3**	**Hours / Week**	**5**
SEE	**50 Marks**	**Total Hours**	**40L+14P**

Course Objective: Students will be able to implement appropriate data structures for solving problems.

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 various types of Data Structures	1	-
2.	Implement operations of linear and non-linear data structure	2	-
3.	Apply suitable data structures to solve a problem	2,3	-
4.	Develop programs using linear and non-linear data structures for a given scenario.	2,3	2

Course Contents:

Module 1	**13 Hours**

Introduction to Data Structures: Definition, Classification of Data Structures, Dynamic Memory Allocation – Introduction, Dynamic memory allocation, malloc, calloc, free and realloc.

The Stack – Definition, Primitive operations, Example. Representing stacks in C: Implementing the pop operation, testing for exceptional conditions, implementing the push operation.

Infix, postfix and prefix: Basic definitions and examples, evaluating a postfix expression, Program to evaluate a post fix expression, converting an expression from infix to postfix, Program to convert an expression from infix to postfix.

Module 2	**13 Hours**

Recursion - finding GCD, Fibonacci Series, Recursion Types, Tower of Hanoi, and Recursion versus iteration.

Queues - Definition, Array representation of Queues, Operations on Queues, Types of Queues- Circular Queue and its implementation in C, Applications of Queues.

Linked List: Introduction to linked list, linked list versus arrays, singly linked list operations - Insert, Delete, Display, Search and Traverse.

Module 3	**13 Hours**

Other Lists structures: Circular Lists - C Implementation by adding and deleting nodes, Doubly Linked List - C implementation by adding and deleting nodes, Circular doubly linked list, Linked list Applications: Linked Implementation of stacks and Queues, Polynomial Representation.

Module 4	**13 Hours**

Trees: Basic Terminology, Types, Representation using array and Linked List. Creating a binary tree from a general tree, traversing a binary tree- In-order, Pre-order, Post order, Level order, Constructing a binary tree from traversal results. Efficient Binary Trees: Binary Search trees - definition, Operations- Create, Insert, delete, display, finding height, Finding number of nodes.

Self -Study Components:
Implementation of data structures in real-life applications: compiler design, memory management, file system, browser history

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

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures Using C	Reema Thareja	Second edition	Oxford Press	2017

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures Using C and C++	Yedidyah, Augenstein, Tannenbaum	2nd Edition	Pearson Education	2003
2.	Data Structures A Pseudocode Approach with C	Richard F. Gilberg and Behrouz A. Forouzan		Cengage Learning	2005
3.	Classic Data Structures	Debasis Samanta	2nd Edition	PHI	2009
4	Balagurusamy E	Programming in ANSI C	7th Edition	Tata McGraw Hill	2017

MOOCs:

1. http://nptel.ac.in/keyword_search_result.php?word=data+structures

PART A	
1.	Design and Implement a menu driven Program in C for the following Array operations: 1.Creating an Array of N Integer Elements 2.Display of Array Elements with Suitable Headings 3.Inserting an Element (ELEM) at a given valid Position (POS) 4.Deleting an Element at a given valid Position (POS)
2.	Illustrate the concepts of malloc(), calloc(), realloc() for the dynamic allocation of memory.
3.	Write a C Program to create a class called STACK to store Integers for the following operations (Array Implementation of Stack with maximum size MAX) a.) Push an Element on to Stack b.)Pop an Element from Stack c.) Demonstrate Overflow and Underflow situations on Stack.
4.	Write recursive C Programs for Searching an element in a given list of integers using the Binary search method. Solving the Towers of Hanoi
5.	Develop a Program in C for converting an Infix Expression to Postfix Expression. Program should support for both parenthesized and free parenthesized expressions with the operators: +, -, *, /, % (Remainder), ^ (Power) and alphanumeric operands.
6.	Create a Queue, perform different operations such as Insert, Delete and Display.
7.	Write a menu driven C Program to simulate the working of a Circular Queue of integers using an array. Provide the following operations: a.) Insert b.) Delete c.) Display
8.	Write a menu driven C Program using dynamic variables and pointers, to construct a Singly linked list of integers and perform insertion and deletion operations.

9	Write a menu driven C Program using dynamic variables and pointers to construct a Stack of integers using Singly linked list and to perform the following operations: a. Push b. Pop c. Display.
10.	Write a menu driven C Program to construct a binary search tree of integers. To traverse the tree using all the methods i.e., In-order, Pre-order and Post-order.
PART B	
1.	Files are placed one over another in my study room. The file which is at the top is the first one to be removed, i.e. the file which has been placed at the bottom most position remains in the pile of files for the longest period of time. Help me out to add a file and remove the bottom most file from the pile of files.
2.	Consider an algebraic expression which needs to be evaluated by a computer system. Operating System (OS) consumes less time to evaluate if it is in postfix form of the expression. Thus, help your OS to evaluate by converting the expression into its postfix form.
3.	Assume you have converted an algebraic expression into its postfix form to process the expression fast. This expression need to be evaluated for a given set of values. Implement the above.
4.	Assume you come across a toll gate while you are on your way to home town. Illustrate the working of the toll gate using suitable data structure
5.	a) Suppose you want to search a text book in a huge library where books are arranged in alphabetical order. Optimize your search by using recursion. b) Implement Tower of Hanoi problem using recursion.
6.	Consider a traffic signal controlled by a computer system. Traffic signal has three colors: Red, yellow and Green. All these glow in a circular fashion based on the traffic. Implement the above using suitable data structure.
7.	The parking lot has a fixed number of parking spaces. Cars can enter the parking lot and occupy an available space, and they can also exit the parking lot, freeing up the space for other cars. Designing a parking lot management system using a circular queue.
8.	Consider a treasure hunt task where a series of clues are given. Clue1 gives hint to clue2, clue2 Provides hint for clue3 and so on until you can get a hint to the final treasure. Develop an illustration to demonstrate the above scenario.
9	Consider a list of numbers. Find i. Maximum number ii. Minimum number iii. Sum of all the numbers.
10.	The phonebook will contain a list of contacts sorted in ascending order based on their names. Each contact will have a name and a phone number. Developing a phonebook management system using an ordered linked list.

Course Articulation Matrix

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

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

Teaching - Learning – Evaluation Scheme:

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

Activity Based Learning (43 Hours)

ABL	Hours
ABL 1 – Case Study & SRS Document Preparation (14 hrs) 1. Selection of a real-world application scenario (e.g., expression evaluator, parking system, library management) 2. Literature review + problem definition and scope finalization (2 hrs) 3. Meeting with faculty to finalize the case and modules (1 hrs) 4. UML modeling: Use Case, Activity, DFD-0 & DFD-1, Sequence Diagrams with data structure mapping (10 hrs) **5.** Final SRS report submission and group presentation (1 hrs)	14
ABL 2 – Problem-Solving Based Assignment (14 hrs) 1. Implement real-world data structure solutions (e.g., postfix evaluator using stack, polynomial addition using linked list, AVL tree simulation) **2.** Submission of code, output snapshots, and report Evaluation based on functionality, complexity analysis, and viva presentation	14
Total Learning Hours/Semester	**28**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (7 Hours)

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

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

Course Title	**OPERATING SYSTEMS**		
Course Code	**25CB303**	**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 explore the working mechanism of operating systems.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	POs	PSOs
1.	Describe various concepts and functionalities of operating systems	1,2	-
2.	Apply different Process scheduling, CPU scheduling algorithms and synchronization problems.	3	-
3.	Analyze different mechanisms for handling deadlocks and memory management Algorithms.	3	2
4.	Implement various, disk scheduling, and page replacement algorithm.	2,3,5	2

Course Contents:

Module 1	**10 Hours**
Introduction to Operating Systems, System Structures: What Operating Systems Do? Computer System Architecture; Operating System Structure; Operating System Operations; Operating System Services; System Calls; Types of System Calls; System Programs, Process Management: Process Concept; Operations on Processes; Inter-Process Communication. Multi-Threaded Programming: Overview; Multithreading Models.	
Module 2	**10 Hours**
Process Management (contd..): Process Scheduling: Basic Concepts; Scheduling Criteria; Scheduling Algorithms; Process Synchronization: The Critical Section Problem; Peterson's Solution; Synchronization Hardware; Semaphores; Classic problems of Synchronization, Monitors- Usage, Dining-Philosophers solution using monitors.	
Module 3	**10 Hours**
Deadlocks: System Model; Deadlock Characterization; Methods for Handling Deadlocks; Deadlock Prevention; Deadlock Avoidance; Deadlock Detection and Recovery from Deadlock. Memory Management: Memory Management Strategies: Background; Swapping; Contiguous Memory Allocation; Paging; Structure of Page Table; Segmentation.	
Module 4	**10 Hours**
Virtual Memory Management: Background; Demand Paging; Page Replacement. Storage Management: Secondary Storage Structures, Protection: Mass Storage Structures; Disk Structure; Disk Scheduling; Swap Space Management. Protection: Goals of Protection, Principles of Protection, Domain of Protection- Domain Structure, Access Matrix, Implementation of Access Matrix.	
Self Study: Case Study Applications – OS architecture comparison (Linux, Windows), shell interface, resource allocation scenarios	

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	8th Edition	John Wiley & Son	2012

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Operating systems - A concept based Approach	D.M. Dhamdhere	3rd Edition	Tata McGraw-Hill	2006
2.	Introduction to Operating Systems: Concepts and Practice	P.C.P. Bhatt	2nd Edition	PHI	2008
3.	Operating Systems Internals and Design Principles	William Stallings	8th Edition	Tata McGraw-Hill Education	2007

MOOCs: Fundamentals of Operating System https://nptel.ac.in/courses/106/105/106105214/

Course Articulation Matrix

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	**3**	**14**	**42**
2.	Integrated Lab Component	**-**	**-**	**-**
3.	Student Study Hours – Self Learning	**1**	**14**	**14**
4.	Evaluation of Learning Process	**-**	**-**	**07**
5.	Activity Based Learning (ABL1 & ABL2)	**-**	**-**	**18+9 = 27**
Total Learning Hours/Semester				**90**

Activity Based Learning (27 Hours)

ABL 1 – Case Study & SRS Document Preparation (18 hrs)	**Hours**
1. Selection of a real-time OS problem (e.g., multi-user deadlock) 2. Literature review + Problem statement (3 hrs) 3. Meetings with faculty to finalize topic (2 hrs) 4. UML diagrams (Use Case, Activity, DFD, Sequence) and report (12 hrs) 5. Final report submission and presentation (1 hr)	18
Total	**18**
ABL 2 – Simulation-Based Assignment (9 hrs)	
1. Implement simulation models (e.g., Round Robin scheduler) 2. Implement simulation models (e.g., Round Robin scheduler) 3. Submission with code and demo 4. Submission with code and demo 5. Evaluation based on performance metrics and viva	**09**

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

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (7 Hours)

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

Course Articulation Matrix

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

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

Course Title	**BUSINESS ECONOMICS**		
Course Code	**25CB304**	**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 apply various economic principles to analyse and interpret market behaviour in real-world contexts.

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 fundamentals of engineering economics, demand-supply laws, cost elements, and breakeven analysis.	6,10	-
2.	Apply interest formulas and perform present worth, future worth, and payback comparisons for engineering decisions.	2,10	1
3.	Evaluate alternatives using annual worth methods, depreciation techniques, and taxation concepts.	2,10	1
4.	Analyze costing systems and perform cost-volume-profit analysis and budgeting in both industrial and service sectors.	6,10	-

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, Elements of Costs, other costs/revenues, breakeven analysis with numerical, Profit/Volume Ratio (P/V ratio) with numerical.

Elementary Economic Analysis: Introduction, simple economic analysis, material selection, design selection, building selection, Process planning/process modifications.

Module 2	**10 Hours**

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

Present 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**

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.

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

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.
Self-Study Components: Impact of Inflation on Engineering Costs, GST in Engineering Procurement, Break-Even Analysis of a Real-World Product, Depreciation Methods in Financial Reports, NPV and EAW Using Online Tools

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Engineering Economics	R. Panneerselvam	Latest	PHI	2015
2	Principles of Economics	N. Gregory Mankiw	Latest	Cengage Learning	2023

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Microeconomics	Pindyck & Rubinfeld	Latest	Pearson	2022
2	Modern Economics	H.L. Ahuja	Latest	S. Chand	2022

E Books and online course materials:

1. https://books.google.com/books/about/Managerial_Economics_8th_Edition.html?id=H7FDDAAAQBAJ
2. https://www.cengage.com/c/principles-of-economics-10e-mankiw/9780357722718/

Online Courses and Video Lectures:

1. https://nptel.ac.in/courses/110105067/
2. https://www.coursera.org/learn/principles-of-economics

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	**3**	**14**	**42**

2.	Integrated Lab Component	**-**	**-**	**-**
3.	Student Study Hours – Self Learning	**1**	**14**	**14**
4.	Evaluation of Learning Process	**-**	**-**	**07**
5.	Activity Based Learning (ABL1 & ABL2)	**-**	**-**	**15+12 = 27**
Total Learning Hours/Semester				**90**

Activity Based Learning (27 Hours)

ABL	Hours
ABL 1 – Case Study & Financial Modeling Assignment (15 Hours) 1. Prepare a break-even chart for a small business scenario and analyze P/V ratio impact with cost variations. 2. Create a cash flow diagram and perform present worth analysis to compare two equipment purchase options. 3. Compare two real-world investment options (e.g., machines) using EAW and shrinking fund method; present justification. 4. Prepare a multi-method depreciation schedule for an asset and simulate impact of inflation and GST on costing.	**15**
ABL 2 – Simulation & Cost-Based Decision Assignment (12 Hours) 1. Select a decision scenario (e.g., lease vs buy, replacement vs repair) 2. Create models using Present Worth or Annual Worth 3. Submit analysis with code/spreadsheet + output 4. Present findings with justification	**12**
Total Learning Hours/Semester	**27 hours**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (7 Hours)

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

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

Course Articulation Matrix

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

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

Course Title	**OBJECT ORIENTED PROGRAMMING WITH JAVA**		
Course Code	**25CB305**	**L-T-P-C**	**(3-0-0) 3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: Design and develop java application programs using object-oriented concepts.
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 fundamentals of Object Oriented Programming and Java syntax	1	-
2.	Implement the concepts of Object Oriented Programming to design programs	2,3	-
3.	Apply Interfaces to design programs	3,4	2
4.	Handle Exceptions in Java	5	2

Course Contents:

Module 1	**10 Hours**

Java Programming Fundamentals: Java and Java Applications, Java Development Kit (JDK), The Byte Code, The Java Buzzwords, A first Simple program, handling syntax errors, The Java Keywords, Identifiers in Java.
Data Types and Operators: Java's Primitive Types, A Closer Look at Variables, The Scope and Lifetime of Variables, Operators: Arithmetic, Bitwise, Relational, Boolean Logical, Assignment Operators, the '?' Operator, Type conversion and Casting, Arrays, Strings.
Object Oriented Concepts and Java: Concepts of Object-Oriented programming language: Object, Class, Message passing, inheritance, encapsulation, and polymorphism Difference between OOP and other conventional programming – advantages and disadvantages of OOPS.

Module 2	**10 Hours**

Introducing Classes, Objects and Methods: Class Fundamentals, Declaring Objects, Object Reference Variables, Methods, Constructors, the "This" keyword, , Overloading Methods and constructors, Argument Passing, Returning Objects, Access Control, Understanding Static, Nested and Inner Classes.
Program Control Statements: Input characters from the Keyboard, if statement, Nested ifs, if-else-if Ladder, Switch Statement, Nested switch statements, for Loop, Enhanced for Loop, While Loop, do-while Loop, Nested Loops, Use of break and continue.

Module 3	**10 Hours**

Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors and inheritance, Using super to C all Superclass constructors, Using super to Access Superclass Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Superclass References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism, Why overridden Methods, Using Abstract Classes, Using final, The object class.

Module 4	**10 Hours**

Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Implementing Multiple Interfaces,. Packages: Package Fundamentals, Packages and Member Access, Importing Packages,
Exception Handling: Exception-Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and Catch, Multiple catch Clauses, throw, finally, Java's Built-in Exceptions,

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Java Fundamentals, A comprehensive Introduction	Herbert Schildt, Dale Skrien. Tata McGraw Hill	7th		2013
2	Java –The complete Reference	Herbert Schildt	8th	Tata McGraw Hill Education Pvt.Ltd	

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Programming in JAVA2	Dr K Somasundaram		Jaico publications	
2	Java How to Program	Deitel and Deitel	6^{th}	Pearson	
3	Java Programming	Hari Mohan Pandey		Pearson Education	2012

E Books and online course materials:

1. http://nptel.ac.in/courses/106106147/
2. http://www.nptelvideos.com/java/java_video_lectures_tutorials.php
3. https://www.youtube.com/watch?v=0KL_zftem4g
4. https://www.coursera.org/specializations/object-oriented-programming

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	3	-	-	-	-	-	-	-	-	-	-
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

Teaching - Learning – Evaluation Scheme:

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

Activity Based Learning (27 Hours)

ABL	Hours
ABL 1 – Mini Project: OOP Design & Implementation *(15 Hours)* Create a Java application implementing classes, inheritance, interfaces, and exception handling. **Steps:** 1. Project topic finalization (e.g., Library Management System, Online Quiz, Student Report Generator) – 2 hrs 2. Class, inheritance & interface design – 4 hrs 3. Code development – 5 hrs 4. Exception handling and final testing – 2 hrs 5. Report writing and demo presentation – 2 hrs	**15**
ABL 2 – Code Lab Challenges (12 Hours) Problem-solving challenges based on: • Inheritance and polymorphism • Nested loops with logic building • Exception handling practice sets • Submit and demo code to faculty	**12**
Total Learning Hours/Semester	**27 hours**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30

Activity Details	Details of activities to be conducted 3) Details of activity 1 4) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	**Hours**
CIE (1 and 2)	3
Report Valuation and Presentation	1
Semester End Exam	3
Total	**7**

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

Course Title	**DIGITAL DESIGN AND COMPUTER ORGANISATION**		
Course Code	**25CB306**	**L-T-P-C**	**(2-0-2) 3**
Exam Hrs.	**3**	**Hours / Week**	**4**
SEE	**50 Marks**	**Total Hours**	**28L+28P = 56**

Course Objective: Students will be able to design and implement various analog and digital circuits.

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

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Demonstrate logic circuits using Digital Trainer Kit and analog circuits.	1,2	-
2.	Design and demonstrate various combinational logic circuits, counters and registers using flip flops.	1,2,3	1
3.	Implement and document the designed digital and analog circuits	3,4,5	2

Course Contents:

Module 1	8 Hours
Digital Logic : The Basic Gates, The Universal Gates, Boolean Laws and Theorems, Sum-of-Products Method, Truth Table to Karnaugh Map, Pairs Quads, and Octets, Karnaugh Simplifications - Overlapping, Eliminating Redundant Groups, Don't Care Condition	
Module 2	**8 Hours**
Data-Processing Circuits: Multiplexers, Decoders, Half Adder and full adder **Flip-Flops:** RS flip flop, Gated flip flop , Edge triggered flip-flop, D flip flop , Edge-triggered D flip flop , Edge- triggered flip flop , JK Master-slave flip flop . Various Representation of flip flops.	
Module 3	**6 Hours**
Registers: Types of Registers Counters: Counter Design as a Synthesis problem, Asynchronous and Synchronous Counters**. Direct Memory Access**: Bus Arbitration. **Data Organization:** Numbers, Arithmetic operations and characters, Memory Locations and Addresses: Byte addressability, Big-endian & Little-endian assignments.	
Module 4	**6 Hours**
The Memory System: Basic Concepts, Cache Memories: Mapping functions, Multiplication of Positive numbers: Booth Algorithm, Bit-pair Recoding of Multipliers; Integer division, IEEE Standard for Floating-point numbers, Arithmetic operations on Floating-point numbers.	

MOOC:
http://www.nptelvideos.in/2012/11/computer-organization.html

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Class Room Teaching & Learning	2	14	28
2.	Integrated Lab Component	2	14	28
3.	Self-Study Hours-Self Learning	1	14	14
4.	Evaluation of Learning Process	-	-	06
5.	Activity Based Learning	-	-	14
Total Learning Hours/Semester				**90**

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

PART-A
1. Verification of Boolean laws
2. Convert a given 4 bit binary number to its equivalent 4 bit gray code using logic gates, construct the truth table, implement the logic diagram and verify the output.
3. Convert a given 4 bit gray number to its equivalent 4 bit binary code using logic gates, construct the truth table, implement the logic diagram and verify the output.
4. Design and implement a binary to BCD converter using logic gates and verify its truth table.
5. Design and implement a BCD to excess-3 converter using logic gates and verify its truth table.
6. Design and implement a excess-3 to BCD converter using logic gates and verify its truth table.
7. Design and verify the operation of half adder and full adder circuits using logic gates on a digital trainer kit.
8. Design and verify the operation of half subtracter and full subtractor circuits using logic gates on a digital trainer kit.
PART-B
1. In a battery powered computer, the diskette driver motor 1 should be ON if a. There is a diskette in the drive. b. The diskette drive door is closed. c. Diskette drive motor 2 is not ON. d. The battery low signal is not present and e. The computer has started a read operation, or the computer has started a write operation. Design a circuit to solve the above scenario using basic gates.
2. You will gain weight if you eat too much or you do not exercise enough, and your metabolism rate is too low. Design a system such that it alarms you when you gain weight using NAND gates.
3. The cooling system should turn ON when: a. Server temperature is high, and b. Either CPU utilization is high or humidity is high. Design a circuit to solve the above scenario using basic gates.
4. The circuit breaker will trip if a. The hair drier is turned ON. b. The microwave oven is used. c. All the lights in the room are ON or d. There is a short circuit in any appliance. Solve the above issue using relevant MUX.
5. Consider a computer operator who needs to generate a sequence 1011 continuously which is transmitted across the network. Design a circuit to implement this job.
6. Consider a scenario where in you want to take print out of few selected random pages in sequence numbered from 0 to 15. Design a circuit to achieve this task using J-K Flip-flops.
7. Assume you are generating and transmitting binary data from one place to another. Check whether the sent data is transmitted properly.
8. Assume you to send a secret message consisting of number form 1 to 9 and letter from A to secret message is encoded using excess-3 code. Design a circuit using ADDER IC to send secret message to your friend.

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

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Digital Principles and Applications	Donald P Leach, Albert Paul Malvino & Goutam Saha	7th	Tata McGraw Hill	2011
2.	Computer Organization	Carl Hamacher, Z. Vranesic & S. Zaky	5th	McGraw Hill	2012
Reference Books:					
1.	Computer Organization and Architecture	William Stallings	9th	Pearson India	2013
2.	Digital Logic and Computer Design	M Morris Mano	1st	Pearson	2013

Course Articulation Matrix

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

Activity Based Learning (27 Hours)

ABL	Hours
ABL 1 – Digital Logic Design & Simulation (7 Hours) • Select a digital circuit problem (e.g., Voting Machine, Security Alarm, Traffic Light Controller) – **1 hr** • Prepare truth table and simplify Boolean expression using Karnaugh Map – **2 hrs** • Design the logic circuit using basic/universal gates – **2 hrs** • Simulate and verify the circuit using Digital Logic Simulator/Logisim – **1 hr** • Prepare report and demonstrate the working of the circuit – **1 hr**	**7**
ABL 2 – Sequential Circuits & Computer Organization Lab (7 Hours) • Sequential circuit design (Flip-Flops & Registers) – **2 hrs** • Counter design and simulation – **1 hr** • Arithmetic algorithms and memory organization exercises – **2 hrs** • □ Final testing, report submission, and demonstration – **2 hrS**	**7**
Total Learning Hours/Semester	**14 hours**

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

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (6 Hours)

Type of Evaluation	**Hours**
CIE (1 and 2)	3
Semester End Exam	3
Total	**6**

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

Course Title	**UNIX AND SHELL PROGRAMMING LABORATORY**		
Course Code	**25CB307**	**L-T-P-C**	**(0-0-2)1**
Exam Hrs.	**3**	**Hours / Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: Design and Learn various unix utilities and shell scripting
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.	Execute and document the commands related to Shell basics, vi editor.	1,3,5,9,10	-
2.	Design the solutions for a given problem using the concepts of shell concepts and document.	1,3,5,9,10	-

Course Contents:

	PART A
1.	Executed Fundamental UNIX shell script commands: Ls ,cat, cd, od, mkdir, echo, date, mv, cal, wc, pwd, rmdir, rm, touch, sort, read, clear, ps-u, ps whoami, alias, find, test, expr, set, shift, type, grep, sed, awk, tr, chmod, job, cut, paste, top, env, Bash
2.	Write a shell script that takes a valid directory name as an argument and recursively descends all sub-directories, finds the maximum length of any file, and prints it.
3.	Write a shell script that accepts a pathname and creates all the components in that pathname as directories (e.g., mpc a/b/c/d).
4.	Write a shell script that accepts two filenames as arguments, checks if their permissions are identical, and outputs either the common permissions or each filename with its permissions.
5.	Create a script file called file-properties that reads a filename entered by the user and outputs its properties.
6.	Write a shell script that accepts one or more filenames as arguments and converts all of them to uppercase if they exist in the current directory.
7.	Write a shell script that accepts a filename as an argument and displays its creation time if the file exists, otherwise shows an error message.
8.	Write a shell script that, when executed, displays “Good Morning”, “Good Afternoon”, or “Good Evening” depending on the current time.
9.	Write a shell script that accepts a filename, starting, and ending line numbers as arguments, and displays all lines between the given line numbers.
10.	Create a shell script that functions as a countdown timer.
	PART B
1.	Design a Menu-Driven File Management Utility to create, copy, move, rename, delete, search, and display files/directories. Students may choose the menu structure and features.
2.	Develop a Student Record Management System using text files. The system should support operations such as add, search, update, delete, and display records.
3.	Design a File Organizer that automatically groups files into folders based on file extension (e.g., .txt, .pdf, .sh) or any other user-defined criterion.

4.	Develop a Simple Text Processing Tool that performs operations such as counting words, finding keywords, removing duplicate lines, or searching patterns. Students can choose the required operations.
5.	Design a System Information Dashboard that displays CPU information, memory usage, disk usage, logged-in users, and running processes in a formatted manner.
6.	Develop a File Permission Auditor that checks file permissions in a directory and identifies files with inappropriate permissions. Students may suggest or apply corrections.
7.	Design a Backup Utility that copies selected files/directories into a backup folder with the current date and time. Students may include automatic backup options.
8.	Develop a Log Analyzer that extracts useful information from a log or text file, such as error messages, login attempts, or frequently occurring words.
9.	Design a Personal Task Manager that allows users to add, delete, update, search, and display daily tasks stored in a text file. Students may choose the menu and data format.
10.	Develop a Mini Linux Utility by combining any three or more UNIX commands into a single shell application that solves a practical problem. Students should identify the problem and design the solution.

Course Articulation Matrix

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

Proposed Assessment Plan:	
Remarks	**Marks**
Continuous Evaluation in every lab session by the Course Coordinator	30
Laboratory CIE - conducted for 50 marks and scaled down to 20	20
Total	50

Teaching - Learning – Evaluation Scheme:

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

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

Ability Enhancement Course-I

Course Title	**R PROGRAMMING**		
Course Code	**25CB308A**	**L-T-P-C**	**(0-0-2) 1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: To learn and Practice Programming techniques using R Programming.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Prepare the dataset in suitable format with required preprocessing.	1	1
2.	Apply suitable R programming language constructs to write a program.	2,3,5	-
3	Use visualization packages and file handlers for data analysis.	1,2	-

Practice Programs:

1. Installation of R Studio
2. Write an R Program to take input from the user (name and age) and display the values. Also print the version of R installation.
3. Write an R Program to get the details of the objects in memory.
4. Write an R Program to create a sequence of numbers from 20 to 50 and find the mean and product of numbers from 20 to 60 and sum of numbers from 51 to 91.
5. Write an R Program to multiply two vectors of integer's type and length 3.

Part -A

1. Demonstrate the steps for installation of R and R Studio. Perform the following:
   a) Assign different type of values to variables and display the type of variable. Assign different types such as Double, Integer, Logical, Complex and Character and understand the difference between each data type.
   b) Demonstrate Arithmetic and Logical Operations with simple examples.
   c) Demonstrate generation of sequences and creation of vectors.
   d) Demonstrate Creation of Matrices
   e) Demonstrate the Creation of Matrices from Vectors using Binding Function.
   f) Demonstrate element extraction from vectors, matrices and arrays
2. Assess the Financial Statement of an Organization being supplied with 2 vectors of data: Monthly Revenue and Monthly Expenses for the Financial Year. You can create your own sample data vector for this experiment) Calculate the following financial metrics:
   a. Profit for each month.
   b. Profit after tax for each month (Tax Rate is 30%).
   c. Profit margin for each month equals to profit after tax divided by revenue.
   d. Good Months – where the profit after tax was greater than the mean for the year.
   e. Bad Months – where the profit after tax was less than the mean for the year.
   f. The best month – where the profit after tax was max for the year.
   g. The worst month – where the profit after tax was min for the year.

   Note: a. All Results need to be presented as vectors b. Results for Dollar values need to be calculated with $0.01 precision, but need to be presented in Units of $1000 (i.e 1k)

with no decimal points c. Results for the profit margin ratio need to be presented in units of % with no decimal point. d. It is okay for tax to be negative for any given month (deferred tax asset) e. Generate CSV file for the data.

3. Develop a program to create two 3 X 3 matrices A and B and perform the following operations a) Transpose of the matrix b) addition c) subtraction d) multiplication
4. Develop a program to find the factorial of given number using recursive function calls.
5. Develop an R Program using functions to find all the prime numbers up to a specified number by the method of Sieve of Eratosthenes.
6. The built-in data set mammals contain data on body weight versus brain weight. Develop R commands to:
   a) Find the Pearson and Spearman correlation coefficients. Are they similar?
   b) Plot the data using the plot command.
   c) Plot the logarithm (log) of each variable and see if that makes a difference.
7. Develop R program to create a Data Frame with following details and do the following operations.

Item code	Item category	Item price
1001	Electronics	700
1002	Desktop Supplies	300
1003	Office Supplies	350
1004	USB	400
1005	CD Drive	800

   a) Subset the Data frame and display the details of only those items whose price is greater than or equal to 350.
   b) Subset the Data frame and display only the items where the category is either “Office Supplies” or “Desktop Supplies”
   c) Create another Data Frame called “item-details” with three different fields item code, ItemQtyonHand and ItemReorderLvl and merge the two frames
8. Let us use the built-in dataset air quality which has Daily air quality measurements in New York, May to September 1973. Develop R program to generate histogram by using appropriate arguments for the following statements.
   a) Assigning names, using the air quality data set.
   b) Change colours of the Histogram
   c) Remove Axis and Add labels to Histogram
   d) Change Axis limits of a Histogram
   e) Add Density curve to the histogram
9. Design a data frame in R for storing about 20 employee details. Create a CSV file named “input.csv” that defines all the required information about the employee such as id, name, salary, start date, dept. Import into R and do the following analysis.
   a) Find the total number rows & columns
   b) Find the maximum salary
   c) Retrieve the details of the employee with maximum salary
   d) Retrieve all the employees working in the IT Department.
   e) Retrieve the employees in the IT Department whose salary is greater than 20000 and write these details into another file “output.csv”
10. Using the built-in dataset mtcars which is a popular dataset consisting of the design and fuel consumption patterns of 32 different automobiles. The data was extracted from the 1974 Motor Trend US magazine and comprises fuel consumption and 10 aspects of

automobile design and performance for 32 automobiles (1973-74 models). Format A data frame with 32 observations on 11 variables : [1] mpg Miles/(US) gallon, [2] cyl Number of cylinders [3] disp Displacement (cu.in.), [4] hp Gross horsepower [5] drat Rear axle ratio,[6] wt Weight (lb/1000) [7] qsec 1/4 mile time, [8] vs V/S, [9] am Transmission (0 = automatic, 1 = manual), [10] gear Number of forward gears, [11] carb Number of carburetors

Develop R program, to solve the following:

a) What is the total number of observations and variables in the dataset?

b) Find the car with the largest hp and the least hp using suitable functions

c) Plot histogram / density for each variable and determine whether continuous variables are normally distributed or not. If not, what is their skewness?

d) What is the average difference of gross horsepower (hp) between automobiles with 3 and 4 number of cylinders (cyl)? Also determine the difference in their standard deviations.

e) Which pair of variables has the highest Pearson correlation?

Part - B

1. Design an R program to analyse personal or household expenses and visualise spending patterns.
2. Develop a financial performance analysis system using revenue and expense data with suitable profitability measures.
3. Model a real-world resource allocation problem using matrices and perform appropriate matrix operations.
4. Develop a recursive R program to solve a selected mathematical or computational problem.
5. Analyse prime number patterns using the Sieve of Eratosthenes and compare it with another method.
6. Select a real-world dataset and investigate relationships between numerical variables using correlation and data transformation.
7. Design an inventory management system to identify reorder requirements, stock value and category-wise details.
8. Analyse an environmental dataset using suitable statistical summaries and data visualisation techniques.
9. Develop an employee data analytics system to support salary, department and performance-related decisions.
10. Perform exploratory data analysis on an automobile dataset to study factors affecting vehicle performance and fuel efficiency.

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO 2**
CO1	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	-	2	3	-	2	-	-	-	-	-	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	-

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

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**DATA ANALYTICS WITH EXCEL**		
Course Code	**25CB308B**	**L-T-P-C**	**(0-0-2) 1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: To perform Data analytics using Excel.
Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Excel functions and tools to perform data entry, formatting, sorting, filtering, data cleaning, validation, lookup operations, and statistical analysis on structured datasets.	1,2,5	2
2.	Analyze and present data using Pivot Tables, Pivot Charts, What-If Analysis, Data Analysis ToolPak, charts, conditional formatting, and interactive dashboards for effective decision-making.	2,5,10	1

List of Experiments:

1. Create a worksheet in Microsoft Excel to enter sample data, format cells, apply borders, use autofill, and perform basic workbook and worksheet operations.
2. Prepare a dataset in Excel and apply sorting, filtering, custom sorting, and advanced filtering to organize and retrieve required information.
3. Use basic Excel functions such as SUM, AVERAGE, MIN, MAX, COUNT, COUNTA, ROUND, and SQRT to perform simple numerical analysis on a given dataset.
4. Apply conditional and logical functions such as IF, Nested IF, AND, OR, IFERROR, COUNTIF, SUMIF, and AVERAGEIF to analyze data based on specific conditions.
5. Clean text-based data using Excel text functions such as UPPER, LOWER, PROPER, TRIM, CLEAN, CONCAT, TEXTJOIN, LEFT, RIGHT, and MID.
6. Perform date and time-based analysis using Excel functions such as DATE, TODAY, NOW, DATEVALUE, TIMEVALUE, DATEDIF, YEAR, MONTH, and DAY.
7. Create data validation rules in Excel using drop-down lists, input messages, error alerts, duplicate checking, and restricted data entry conditions.
8. Use lookup and reference functions such as VLOOKUP, HLOOKUP, XLOOKUP, INDEX, and MATCH to retrieve and compare data from different tables.
9. Create Pivot Tables and Pivot Charts to summarize, group, filter, and analyze large datasets using fields, calculated values, and category-wise aggregation.
10. Create different types of charts such as column charts, bar charts, line charts, pie charts, histograms, and scatter plots to visually represent data.
11. Apply conditional formatting features such as highlight cell rules, top/bottom rules, data bars, color scales, and icon sets to identify patterns and trends in data.
12. Perform What-If Analysis in Excel using Goal Seek, Scenario Manager, and Data Tables to support business decision-making.
13. Calculate descriptive statistical measures such as mean, median, mode, variance, standard deviation, range, and correlation using Excel functions.
14. Use Excel Data Analysis ToolPak to perform descriptive statistics, correlation analysis, covariance, and basic regression analysis on a given dataset.
15. Design an interactive Excel dashboard using Pivot Tables, Pivot Charts, slicers, timelines, KPI cards, summary tables, and charts.

16. Complete a mini project using a real-world dataset by cleaning the data, applying formulas, creating Pivot Tables, generating charts, preparing a dashboard, and submitting a short analytical report.

Part - B

1. Design a personal or household budget workbook to record expenses, calculate savings, and analyse monthly spending patterns.
2. Develop a sales analysis worksheet to sort, filter, summarise, and identify high-performing products, regions, or salespersons.
3. Create an employee payroll system using suitable arithmetic, logical, conditional, date, and lookup functions.
4. Design a student performance analysis workbook to calculate grades, ranks, attendance, subject-wise results, and overall performance.
5. Develop an inventory management workbook to monitor stock levels, identify reorder items, calculate inventory value, and validate data entry.
6. Create a data-cleaning solution for a customer or employee dataset using text, date, duplicate-removal, and error-handling functions.
7. Design a business decision model using Goal Seek, Scenario Manager, and Data Tables to analyse alternative financial outcomes.
8. Analyse a real-world dataset using descriptive statistics, correlation, regression, and suitable charts.
9. Develop an interactive dashboard using Pivot Tables, Pivot Charts, slicers, timelines, KPI cards, and conditional formatting.
10. Complete a mini-project using a real-world dataset involving data cleaning, formula application, statistical analysis, visualisation, dashboard creation, and interpretation of findings.

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**
CO1	3	2	-	-	3	-	-	-	-	-	-	-	2
CO2	-	3	-	-	3	-	-	-	-	2	-	2	-

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**DATA VISUALIZATION WITH PYTHON**		
Course Code	**25CB308C**	**L-T-P**	**(0-0-2)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: To explore principles and techniques of data visualization using Python.
Course Outcomes(COs): Upon completion of the course, students shall be able to:

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Demonstrate the use of IDLE or PyCharm IDE to create Python Applications	1, 5	-
2.	Apply various visualization techniques using suitable python libraries.	2, 5	2
3	Implement, document and present the data visualization projects for the chosen problems.	4, 11	2

List of programming using Python libraries

1. Write a Python program to read data from a CSV file and create a line plot to visualize the trend over time. Customize the plot with appropriate labels, title, and colors.
2. Load a dataset containing information about students' scores in different subjects. Create a scatter plot to visualize the relationship between two variables (e.g., math score vs. science score). Use Seaborn to enhance the plot with appropriate styling and add labels.
3. Given a dataset with multiple variables, create a figure with two subplots: one displaying a line plot and the other showing a bar chart. Customize the subplots with appropriate titles, legends, and colors.
4. Load a dataset containing information about employees' salaries across different departments. Create a box plot and a violin plot to visualize the distribution of salaries by department. Customize the plots and add appropriate labels and titles.
5. Load a dataset containing stock prices over time. Create a line plot to visualize the stock prices and add appropriate labels and titles. Format the x-axis tick labels to display the dates properly.
6. Load a dataset containing temperature readings over time. Create an interactive line plot using Plotly, which displays the temperature when hovering over the data points. Add appropriate labels and customize the plot's appearance.
7. Load a dataset with information about population density by country. Create a choropleth map using GeoPandas to visualize the population density. Customize the map's appearance and add a colors legend.
8. Design and implement an interactive dashboard using Dash to display various visualizations. Include at least two interactive controls (e.g., dropdowns, sliders) to update the visualizations dynamically.

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

Sample Activity Problem:

- Select a dataset related to a specific topic of interest (e.g., climate change, COVID-19). Design a series of visualizations that tell a compelling data story, highlighting key insights and trends. Present the visualizations with appropriate annotations and captions.
- Choose a dataset related to a real-world problem (e.g., retail sales, customer behavior). Explore the dataset, identify interesting patterns, and design a set of visualizations to present the findings effectively. Present the visualizations along with a brief explanation of the insights gained.

Part - B

1. Given a dataset containing multiple variables, determine the most appropriate visualization for each variable and justify the selection.
2. Create three different visual representations of the same dataset and compare how each representation influences interpretation.
3. Identify and redesign a misleading or poorly constructed chart using Python by correcting its scale, labels, colours, and visual structure.
4. Develop a visual story from a dataset using a sequence of charts that communicates one clear finding or conclusion.
5. Investigate how missing values, outliers, and duplicate records affect visualizations and propose suitable methods to handle them.
6. Compare the distributions of multiple groups using suitable plots and determine whether the groups exhibit similar or different patterns.
7. Explore relationships among three or more variables using multivariate visualizations and identify hidden patterns or clusters.
8. Analyse changes in time-series data, detect trends, seasonal behaviour, sudden variations, and unusual observations through visualization.
9. Design an accessible visualization for users with colour-vision deficiencies by applying suitable colour palettes, labels, annotations, and contrast.
10. Transform a complex dataset into a single-page visual report that presents the key findings without requiring detailed statistical explanations.

MOOC:

1. https://www.coursera.org/learn/python-for-data-visualization

2. https://www.edx.org/learn/data-visualization/ibm-visualizing-data-with-python

Course Articulation Matrix

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

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

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**VERSION CONTROLLER WITH GiT**		
Course Code	**25CB308D**	**L-T-P**	**(0-0-2)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**28**

Course Objective: To use GitLab/Git and utilize it for software development.
Course Outcomes(COs): Upon completion of the course ,students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Construct the repository using various Git commands.	3, 4, 5	1,2
2.	Demonstrate and document the work carried out	5, 9, 11	1, 2

List of Experiments:

1. Initializing a Repository: Initialize a new Git repository for a simple project. Add a few files to the repository and commit them.
2. Committing Changes: Make changes to the files in the repository and commit them. Practice creating meaningful commit messages
3. Creating and Switching Branches: Create a new branch in the repository, make changes in the branch, and switch between branches.
4. Merging Branches: Create a branch, make changes in both the main branch and the new branch, and merge the changes back into the main branch.
5. Resolving Merge Conflicts: Create a merge conflict by making conflicting changes in two different branches. Practice resolving the conflict using Git's conflict resolution tools.
6. Working with Remote Repositories: Clone a remote repository to your local machine. Make changes locally and push the changes back to the remote repository.
7. Collaborating with Others: Practice collaborating with others using Git. Clone a shared repository, make changes, push the changes, and pull changes made by others.
8. Reverting and Rolling Back Commits: Experiment with reverting commits and rolling back changes to a previous state in the repository using Git commands.
9. Tagging Releases: Tag a specific commit in the repository as a release version. Practice creating annotated tags and lightweight tags.
10. Ignoring Files: Create a .git ignore file to exclude certain files or directories from being tracked by Git.
11. Viewing Repository History: Use Git commands to view the commit history, explore differences between commits, and track changes made over time.

    Branch Management: Practice creating, deleting, and renaming branches in the repository using Git commands.

Part - B

1. A new software project has no version history. Establish a Git repository, organise the project files, and create an appropriate sequence of initial commits.
2. Examine a repository containing several poorly written commits and reorganise the changes using meaningful commit messages and logical checkpoints.
3. Simulate the development of two independent features using separate branches and demonstrate an effective branch creation, switching, renaming, and deletion strategy.
4. Two developers have completed different features in separate branches. Integrate their work into the main branch and verify that the combined project functions correctly.
5. Reproduce a merge-conflict situation in which two branches modify the same section of a file,

resolve the conflict, and document the decisions made.

6. Set up a local–remote repository workflow by cloning a project, making local changes, synchronising with the remote repository, and handling updates made by another contributor.
7. Conduct a collaborative development exercise in which team members divide tasks, work on separate branches, exchange changes, and maintain a consistent repository history.
8. A recently committed change introduces an error into a stable project. Identify the problematic commit and restore the project using suitable revert, reset, or checkout operations.
9. Prepare a repository for a software release by creating version tags, writing release-related commits, and distinguishing between lightweight and annotated tags.
10. Audit a project repository to identify unnecessary, sensitive, or generated files; create an appropriate .gitignore file and demonstrate useful commands for examining history and comparing versions.

MOOC:

1. https://www.coursera.org/learn/version-control-with-git
2. https://www.classcentral.com/course/microsoft-learn-introduction-to-version-control-with-git-2391

eBook:

https://www.oreilly.com/library/view/version-control-with/9781492091189/

Course Articulation Matrix

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

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**Community Project / Societal Project**		
Course Code	**25SCR**	**(L-T-P)C**	**(0-0-2)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
CIE + SEE	**50 marks + 50 Marks**	**Total Hours**	**30**

Course Objective: The Community Project / Societal Project is a practical, project-based learning course that builds students' awareness on Educational Social Responsibility (ESR). It focuses on real issues such as the adaptation of technology for rural and urban development, the application of tools for enhanced governance in civic societies, and sustainable technological solutions for better living. Students may work individually or in groups of up to four, including interdisciplinary topics, and assessment is based on the prescribed rubrics.

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	Identify and analyze societal problems through field interaction and technical assessment.	1,2,3,4,6,9	-
2	Develop skills in project planning, field survey, data collection, implementation, documentation and reporting.	1,2,3,4,5,8,9,10	-
3	Apply principles of social responsibility in engineering practice through community-oriented interventions	1,2,3,5,6,7,10	-
4	Formulate feasible societal problem statements and solutions considering practical constraints and sustainability aspects.	6, 7	-
5	Exhibit multidisciplinary learning and problem-solving ability based on collected data, user feedback and baseline conditions.	2,3,4,5,8,9,11	-
6	Demonstrate teamwork and communication skills while interacting with technical and non-technical stakeholders and reflect on project impact on society.	6,8,9,10,11	-

Restrictions and professional conduct:

Community / Societal Projects shall remain **academic, socially responsible, technically focused, and politically neutra**l. Students and faculty shall maintain professionalism, ethical conduct, public respect and institutional integrity while interacting with communities, public groups, organizations and stakeholders. Students and faculty shall avoid the following during project execution:

- Association with political party activities, campaigns or propaganda.
- Participation in activities that may disturb communal harmony, public order or institutional reputation.
- Use of the project platform for personal, political, ideological or commercial promotion.
- Disrespectful, discriminatory or unethical interaction with community members or stakeholders.

Projects must also recognize constraints related to cost, resources, environment and safety, and stakeholder behavior/cooperation/acceptance when planning and implementing activities.

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

SET OF PROJECT ACTIVITIES (TW/SL = 30 HOURS)

Students may identify the project topic using one or more of the following methods:

- Interaction with local rural or urban stakeholders such as local leaders, corporation/municipality personnel, NGOs, panchayat representatives, etc.
- Review of issues highlighted in print and electronic media, and social networks (WhatsApp, Facebook, X, Instagram, etc.).
- After selecting a broad topic, students shall collect data, conduct a feasibility survey, estimate timelines and resources, approximate expenditure, and then define the problem statement and objectives clearly.

List of Project Topics and Engineering Outcomes:

The following structured sequence of activities is to be carried out during the semester:

Methods for Project Identification:

Students may identify the project topic using one or more of the following methods:

- **Interaction with local rural or urban stakeholders such as local leaders, corporation/municipality personnel, NGOs, panchayat representatives, etc.**
- **Review of issues highlighted in print and electronic media, and social networks (WhatsApp, Facebook, X, Instagram, etc.).**
- **After selecting a broad topic, students shall collect data, conduct a feasibility survey, estimate timelines and resources, approximate expenditure, and then define the problem statement and objectives clearly.**

List of Project Topics and Engineering Outcomes:

The following structured sequence of activities is to be carried out during the semester:

Sl.No	Project Title	Measurable Engineering Outcome	Mapped POs	SDGs
1.	Computer-Based Learning Tool for Mentally Challenged Students	Design and develop a web/browser based learning tool as per the requirements of the special school.	5, 6	4
2.	Medication management system for an old age home	Design and develop a web-based application to monitor the administration of medicine to senior citizens residing at an old-age home.	6	3
3.	Virtual Labs for Learning Science	Design and Development of simulation environment to do the experimentation list in Physics/Chemistry/Biology for high school in a rural area	5, 6	4

4.	Local Skill Development and Employment Information Portal	Design and develop a web-based portal that provides information on local skill development programs, vocational training, internships, and employment opportunities for youth in the community.	6	4, 8
5.	Digital Complaint Portal for Gram Panchayat	Design and develop a web-based complaint portal (Specific nature) for Gram Panchayat	6	16
6.	Plant Care Reminder Application	Implement a reminder mechanism that generates timely notifications for watering, fertilizing, pruning, and other plant-care activities.	6	13, 15
7.	Basic Crop Recommendation System	Develop a basic crop recommendation system that recommends suitable crops based on user-provided parameters such as soil type, season, rainfall, and water availability	6	2, 13, 15
8.	Lost and Found Application	Develop a lost and found application that enables users to report, search, and manage lost and found items	6	11, 16
9.	Campus Navigation System	Develop a campus navigation system that enables users to locate important campus facilities and obtain directions between selected locations, which provides a simple digital map and location information for important facilities on campus.	6	15
10.	Public Waste Collection Monitoring System	Design and develop a web/mobile application that enables citizens to report uncollected garbage with geo tagged photos, track complaint status, and assist local municipal authorities in monitoring waste collection and sanitation services.	6	3, 11, 16
11.	Volunteer Management System for NGOs	Develop a web-based system to manage volunteer registration, event scheduling, attendance, and activity reporting for NGOs.	6	16
12.	Local Farmer Market Information System	Design and develop a digital platform that connects farmers directly with consumers by providing crop availability, prices, and contact information.	6	2, 8, 12

13.	Government scheme awareness for betterment of livelihood	Design a UI in the native language for people in rural areas to make best utilization of the government scheme.	6	11
14.	Community Renewable Energy Awareness and Management Portal	Design and develop a web/mobile portal to provide information on renewable energy resources and estimate energy savings within the community.	6	7, 11, 13
15.	Digital Learning Platform for Rural Government Schools	Design and develop a digital learning platform (Tool) that provides interactive learning content and activity-based learning materials in regional languages for rural and small village govt schools (primary govt. schools often lack interactive learning tools)	5, 6	4
16.	Digital Heritage Preservation and Cultural Information Portal	Develop a digital platform to document, preserve, and promote local heritage sites, cultural events, and historical information	6	11, 16
17.	Community Disaster Preparedness and Emergency Information System	Design and develop a web/mobile application for disaster preparedness and emergency alerts during natural disasters.	6	11, 13
18.	Pesticide Usage Advisory and Organic Farming Awareness System	Design and develop an application that provides recommendations on appropriate pesticide usage, promotes organic farming practices, and suggests suitable organic alternatives based on soil test reports and crop information.	6	2, 3, 15
19.	Cyber Security Awareness Platform for Phishing, Digital Arrest Scams, and Malicious Applications	Create a simple web app where users paste suspected text/links to get a risk score based on known phishing patterns, deceptive URLs, and high-risk keywords	5, 6	16
20.	Local Public Transportation Information and Route Assistance System	Design and develop a web or mobile application that provides location based information on available public transportation services, route maps, estimated travel options, and nearby transport facilities to improve accessibility and promote the use of public transportation.	6	11, 15
21.	Digital Inventory and Sales Management System	Design and develop a web-based inventory, billing, and sales analytics system for small businesses with dashboard reports and low-stock alerts.	6	8, 9

22.	Smart Financial Literacy and Budget Planner for public	Develop a mobile/web application that helps users manage household budgets, savings, government schemes, and financial planning through support.	6	1, 8
23.	Local Business Promotion and Market Analytics Portal	Design a digital platform that enables local vendors and small businesses to advertise products, analyze customer trends, and improve digital visibility.	6	8, 9
24.	Blood Donor and Emergency Blood Availability Portal	Develop a web/mobile platform to connect blood donors, hospitals, and patients with real-time blood availability information.	6	3
25.	Women Safety and Emergency Alert Application	Develop a mobile application with SOS alerts, live location sharing, emergency contacts, and nearby police station information.	6	5, 11, 16
26.	Public Grievance and Civic Issue Reporting System	Develop a web/mobile application that allows citizens to report civic issues such as potholes, streetlight failures, and drainage problems and monitor complaint resolution status.	6	11, 15, 16
27.	Digital Public Library and Book Exchange System	Design and develop a web-based platform that enables community members or schools to manage book donations, borrowing, returns, and book exchange activities	6	4
28.	Community Water Quality Reporting and Awareness Portal	Design and develop a web-based portal for citizens to report drinking water issues, record simple water quality observations, and provide awareness on safe water practices through educational resources.	6	3, 6
29.	Community Blood Donor Registry and Emergency Request System	Design and develop a web/mobile application that maintains a local blood donor database, enables emergency blood requests, and notifies eligible donors based on blood group and location.	6	3, 11
30.	Smart Community Health Camp Management System	Design and develop a web/mobile application to manage community health camps by facilitating online patient registration & doctor scheduling/digital health record maintenance/medicine inventory tracking.	6	3

31.	Food Waste Reduction and Food Donation Platform	Develop a platform connecting restaurants, hotels, and households with NGOs to donate surplus food before it is wasted.	6	2, 12
32.	Community Tree Plantation and Green Cover Monitoring Portal	Develop a web/mobile application to record tree plantation activities.	6	13, 15
33.	Career Guidance and Information Portal	Develop an app to get information on aptitude tests, Course/scholarship alerts/placement information	6	4, 8
34.	NGO Donation and Resource Management System	Develop a web application to manage donations, inventory, volunteers, and financial transparency for NGOs.	6	16
35.	Smart Local Tourism Business Portal	Develop a web platform promoting local tourism, homestays, guides, and cultural businesses with booking facilities.	6	8, 11, 15
36.	Local Artisan and Handicraft Marketplace	Design and develop a platform promoting local artisans and traditional handicraft products.	6	8, 11
37.	Waste Recycling Marketplace	Develop a digital platform connecting households, recyclers, and scrap collectors with pickup scheduling.	6	11, 12
38.	Digital Accessibility Evaluation and Improvement for Public Websites	Evaluate the accessibility of at least 10 government or public-service websites using WCAG guidelines, develop accessibility improvement recommendations, and implement a prototype demonstrating compliance improvements.	6	16
39.	Digital Library and Knowledge Sharing Platform for Government Schools	Develop a multilingual digital library with e-books, educational videos, and quizzes to improve access to learning resources.	6	4
40.	Community Renewable Energy Awareness and Management Portal	Design and develop a web/mobile portal to provide information on renewable energy resources and promote the adoption of sustainable energy practices within the community.	6	7, 11, 15
41.	Local Business Digital Marketplace	Web portal onboarding of at least 25 local vendors and product catalog.	6	8, 12
42.	Community Blood Donor and Emergency Volunteer Network	Web/mobile application connecting donors and volunteers.	6	3

43.	Mental Health Awareness and Helpline Directory App	Develop an application providing verified helpline contacts, self-help resources, and stigma-reducing content.	6	3
44.	Diet & Nutrition Awareness Tool for Anganwadi Children	Develop an application to track and suggest balanced meal plans for children under a nutrition scheme.	5, 6	2, 3
45.	Digital Literacy Portal for Elderly Citizens	Develop a simplified, accessible web application teaching basic smartphone and internet skills to senior citizens.	6	4, 11
46.	Scholarship & Government Scheme Eligibility Checker	Develop a Web tool matching students to eligible scholarships and welfare schemes based on entered criteria.	5, 6	4
47.	Digital Record keeping system for self help groups	Develop a ledger and record keeping application to help women's SHGs manage savings, loans and meeting records	6	5, 8
48.	Elderly Companion & Wellness Check-In App	Develop an application enabling family/volunteers to schedule and log wellness check-ins for the elderly living alone.	6	3
49.	Old-Age Home Volunteer Coordination Portal	Develop a platform matching volunteers with old-age homes for scheduled visits, events, and support activities.	6	3, 11
50.	Local Job & Skill Matching Portal for Daily-Wage Workers	Develop a Web application connecting unskilled and semi-skilled workers with nearby job opportunities.	6	8
51.	Street Vendor Digital Registry and Support Portal	Develop an application for the registry helping street vendors to access municipal registration information and gain customer visibility.	6	8
52.	Microloan and Repayment Tracker for Small Vendors	Develop an application helping small vendors track micro-loans, repayments, and daily sales.	6	8
53.	Rainwater Harvesting Feasibility & Awareness Tool	Develop a tool estimating rooftop rainwater harvesting potential based on roof area and local rainfall data.	5, 6	6, 13
54.	Water Quality Reporting System for a Village / Ward	Develop a Web/mobile application for citizens to report water contamination issues and track resolution status.	6	6
55.	Community Skill-Building Workshop Registration and Tracker App	Develop an application to register participants and track attendance for community skill-building workshops such as tailoring, computer usage, and first-aid.	6	4, 11

56.	Local Event & Festival Information Aggregator App	Develop an application aggregating community event and festival schedules for a town or ward.	6	11
57.	Community Sports Ground / Facility Booking App	Develop an application for local youth to check availability and book shared sports grounds or courts.	6	3, 11
58.	Talent Scouting Platform for Rural Sports Players	Develop a platform where local sports talent can register profiles and gain visibility to coaches and scouts.	6	3
59.	Youth Skill Development and Internship Finder App	Develop an application listing local internships, apprenticeships, and skill-training programs for youth.	6	4, 8
60.	Financial Literacy Awareness App for Rural Households	Develop an application teaching basic banking, savings, and fraud-avoidance concepts with local-language support.	6	4, 8
61.	Legal Aid & Rights Awareness Portal	Develop a portal listing free legal aid contacts with simplified explanations of common citizen legal rights.	6	16
62.	Digital Insurance / Pension Scheme Awareness Tool	Develop a tool helping unorganized-sector workers check eligibility and enroll in government insurance/pension schemes.	5, 6	8
63.	Livestock Health Record and Vaccination Tracker	Develop an application to record cattle and livestock health history and vaccination schedules for farmers.	6	15
64.	Soil Testing Appointment & Report Access Portal	Develop a portal letting farmers book soil-testing slots and access digital test reports.	6	15
65.	Power Outage Reporting and Tracking App for a Locality	Develop an application allowing residents to report and track power outages to the local utility board.	6	7, 11
66.	Community Borewell / Water Tanker Scheduling App	Develop an application to schedule and track water tanker deliveries for water-scarce localities.	6	6, 11
67.	Cyber Safety and Digital Fraud Awareness App	Develop an application educating students and senior citizens on common online scams and safe digital practices.	6	16
68.	Adult Literacy Program Registration and Progress Tracker	Develop an application to register learners and track attendance and progress in a community adult-literacy drive.	6	4
69.	Inclusive Learning Content Tool for Differently Abled Students	Develop a tool delivering audio/visual learning content adapted for students with visual or hearing impairments.	5, 6	4

70.	School Dropout Tracking and Follow-up System	Develop an application for teachers to record attendance trends and flag/follow up on students at risk of dropping out.	6	4
71.	Public Park / Garden Maintenance Complaint Tracker	Develop an application for citizens to report maintenance issues in public parks and gardens and track resolution.	6	11, 15
72.	Digital Suggestion Box for Local Governance	Develop an application allowing citizens to submit suggestions and feedback to local governing bodies on civic matters.	5, 6	16
73.	Community Health Screening Camp Scheduler	Develop an application to schedule and manage attendance for community blood-pressure/diabetes screening camps.	6	3
74.	Digital Queue Management System for Health Camps	Develop a token-based appointment and queue management system/application for health camps.	6	3
75.	Streetlight Fault Reporting System	Develop an application for citizens to report faulty streetlights using photographs and GPS location.	6	11
76.	Village Asset Mapping System	Develop a GIS-enabled or map-based application to document community assets such as schools, hospitals, water tanks, and roads.	6	11
77.	Food Waste Reduction & Expiry Management System	Design and develop a web/mobile application to record food items, monitor expiry dates, provide expiry reminders, and maintain food inventory to help reduce food wastage.	6	2, 12
78.	Community Hall Booking & Management System	Design and develop a web-based platform to manage community hall bookings, track hall availability, process booking requests, schedule maintenance, and maintain booking records.	6	11
79.	Public Infrastructure Asset Monitoring System	Design and develop a web-based platform to maintain records of public infrastructure assets, report maintenance issues, assign maintenance requests, and track their status.	6	9, 11

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher
1	Community Engagement and Social Innovation	Phadke, N. D.	1st	Oxford University Press, New Delhi.

2	Project-Based Learning in Engineering Education	Garg, N. R.	1st	Pearson India Education Services, Noida.
3	Service Learning and Community Projects.	Gupta, A. and P. Singh.	**1st**	McGraw-Hill Education (India), New Delhi.
4	Practical Guide to Community Development Projects	Wilson, G.	**2nd**	Routledge, London.

Reference Books:

1. NPTEL courses on Project-Based Learning and Social Innovation.
2. SWAYAM courses on community engagement and sustainability.
3. UN Sustainable Development Goals portal: https://sdgs.un.org
4. MyGov India and local civic body portals for community initiatives.
5. YouTube resources on design thinking, social innovation, and community service learning.
6. NGO and government field-action case studies related to sanitation, water, health, education, and environment.

Web links and Video Lectures (e-Resources):

1. NPTEL courses on Engineering Geology (IIT Roorkee, IIT Kharagpur).
2. NPTEL courses on Soil Mechanics and Foundation Engineering (IIT Delhi, IIT Bombay).
3. Virtual Labs – Geotechnical Engineering Virtual Lab (IIT Kanpur): https://vlab.co.in
4. Geological Survey of India (GSI) – Maps, reports, and publications: https://www.gsi.gov.in
5. YouTube channels: Civil Engineering Essentials, The Engineering Classroom (soil mechanics experiments).
6. American Society of Civil Engineers (ASCE) – Geotechnical resources and standards

Teaching-Learning Process:

Week / Phase	**Teaching-Learning Activity**	**Faculty Role**	**Student Activity**	**Output / Evidence**
1	Course introduction, objectives, ethics, conduct, and assessment briefing	Explain course scope, rules, rubrics, and expected deliverables	Understand course requirements and form teams	Team list, course plan

2	Community problem identification and topic selection	Guide topic framing and feasibility	Identify local issues through discussion and observation	Shortlisted project topic
3	Stakeholder interaction and preliminary survey	**Demonstrate survey methods and stakeholder engagement**	Collect initial data from community/users	**Survey notes, interview record**
4	Problem statement and objective formulation	**Review and refine problem statement**	Prepare problem statement, scope, and objectives	**Approved problem statement**
5	Literature/case study review and baseline analysis	**Suggest relevant references and examples**	Study existing solutions and compare approaches	**Baseline analysis summary**
6	Project planning and role assignment	**Help teams organize tasks, timeline, and responsibilities**	Plan activities, divide roles, and prepare schedule	**Work plan / Gantt chart**
7	Feasibility analysis and solution brainstorming	**Check technical feasibility and practicality**	Generate possible engineering solutions	**Solution alternatives sheet**
8	Selection of final solution and design approach	**Review final concept and design logic**	Finalize concept, methods, and expected outcome	**Concept note / design outline**
9	Data processing / calculations / sizing / mapping	**Support computations and technical review**	Analyze data, perform calculations, prepare maps/charts	**Technical analysis sheet**

10	Prototype / model / audit / DPR / app development	**Monitor progress and correct technical issues**	Develop the selected output	**Working model / draft DPR / map / app**
11	Testing, refinement, and implementation planning	**Evaluate technical correctness and improvements**	Test prototype or validate proposal with users	**Test results / revised output**
12	Field implementation / demonstration / awareness activity	**Facilitate community interaction and documentation**	Conduct implementation or demonstration	**Photos, attendance, implementation record**
13	Documentation of outcomes, feedback, and impact	**Review report structure and completeness**	Compile findings, stakeholder feedback, and observations	**Draft report**
14	Presentation preparation and viva practice	**Conduct mock presentation and feedback**	Prepare slides/poster and rehearse	**Presentation deck**
15	Final presentation, submission, and reflection	**Evaluate performance using rubrics**	Present project, submit report, reflect on learning	**Final report, presentation, viva**

Assessment structure:

A. Continuous Internal Evaluation (CIE) – 50 marks

• Students, in batches of 3–4, shall undertake at least one project (or a combination of two related activities) aiming, as far as possible, at a logical implemented or implementable outcome.

• CIE will be conducted by a departmental committee (HoD/nominee, guide and one senior faculty) using the following rubrics totaling 50 marks:

B. Semester End Examination (SEE) – 50 marks

• The SEE shall be conducted batch-wise by a committee of : one faculty from the same

department and one from a different department.

CIE and SEE Rubrics

Criterion	Weight (marks)	Excellent (Full marks)	Good	Fair	Needs Improvement
Problem identification & Relevance to society/industry/community	8	Problem is clearly identified with strong evidence of societal relevance and well-defined scope.	Problem is relevant and scope is clear with adequate supporting evidence.	Problem defined but justification or evidence is weak.	Problem unclear or not relevant; little/no supporting evidence.
Formation of problem statement; Engineering approach, innovation & feasibility	10	Problem statement is precise; approach is sound, innovative and clearly feasible.	Problem statement adequate; approach feasible with minor gaps.	Problem statement partial; approach feasibility is marginal.	Problem statement missing or approach not feasible.
Interaction with stakeholders; Data collection, analysis & interpretation	**8**	Thorough stakeholder engagement; data collection is comprehensive; analysis is well-interpreted.	Good engagement; data analysis adequate with minor gaps.	Limited engagement; data incomplete and analysis superficial.	Little/no stakeholder contact; insufficient or no data/analysis.
Project documentation; Clarity, organization & problem-solving demonstrated	**10**	Documentation is complete, well-organized, analytical, and shows strong problem-solving.	Documentation complete and clear with some analytical content.	Documentation on basic with omissions; problem-solving limited.	Documentation missing/poorly organized; no clear problem-solving.
Communication & Presentation skills	**6**	Presentation is confident, structured, and answers queries fully; visuals effective.	Presentation clear and satisfactory; responds to most queries.	Presentation acceptable but lacks clarity or confidence; weak responses.	Presentation poor or absent; unable to respond.

Contribution & Benefit to society (impact, sustainability)	**8**	Clear, demonstrable societal benefit and sustainability; realistic path to implementation	Benefit plausible; sustainability considered with minor gaps.	Limited or unclear societal benefit; sustainability not well addressed.	No evident benefit or sustainability; project not community-oriented.

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

Course Title	**NATIONAL SERVICE SCHEME (NSS)**		
Course Code	**25NYP1**	**L-T-P-C**	**(0-0-2)0**
Exam Hrs.		**Hours / Week**	**2**
		Total Hours	**28**

Course Objective: To use GitLab/Git and utilize it for software development.

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

#	Course Outcomes	Mapping to POs	Mapping to PSOs
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	-
5.	Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony in general.	11	-

Course Contents:

Module 1	**8 Hrs**
Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing	
Module 2	**8 Hrs**
Waste management– Public, Private and Govt. organization, 5 R's.	
Module 3	**8 Hrs**
Setting of the information imparting club for women leading to contribution in social and economic issues.	

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	NSS Course Manual	VTU Belagavi	1st	NSS Cell	
2.	Activities reports and its manual	Government of Karnataka	1st	NSS cell	
3.	Activities reports and its manual	Government of India	1st	NSS cell	

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1		
	CIE2		
	CIE3		
Activity Details			

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

Course Articulation matrix

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

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

Semester: III						
PHYSICAL EDUCATION (SPORTS & ATHLETICS)–I						
Course Code	**:**	25PE1		**CIE**	**:**	**100 Marks**
Credits: L:T:P	**:**	0:0:1				
Total Hours	**:**	15 P				

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

1. Understand the fundamental concepts and skills of Physical Education, Health, Nutrition and Fitness
2. Familiarization of health-related Exercises, Sports for overall growth and development
3. Create a foundation for the professionals in Physical Education and Sports
4. Participate in the competition at regional/state/national/international levels.
5. Create consciousness among the students on Health, Fitness and Wellness in developing and maintaining a healthy lifestyle.
6. Understand and practice of Traditional Games

Module I: Orientation **4 Hours**

A. Lifestyle
B. Health &Wellness
C. Pre-Fitness test.

Module II: General Fitness & Components of Fitness **4 Hours**

A. Warming up (Free Hand exercises)
B. Strength–Push-up/Pull-ups
C. Speed– 30Mtr Dash

Module III: Specific games (Any one to be selected by the student) **16 Hours**

1. Kabaddi–Handtouch,Toe Touch,Thigh Hold, Anklehold and Bonus.
2. Kho-Kho– Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.

Scheme and Assessment for auditing the course and Grades:

Sl.No.	**Activity**	**Marks**
1.	Participation of student in all the modules	20
2.	Quizzes/Assignment–2,eachof 20marks	40
3.	Final presentation/exhibition/Participation In competitions/practical on specific tasks assigned to the students	40
	Total	**100**

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

Semester III			
Yoga - I			
Course Code	25YOG1	**CIE**	100 Marks
Course Type	NCMC		
Total Hours	2 hrs/week		

Course Objectives

The objectives of this course are to:

1. Introduce students to the origin, history, philosophy, and fundamental concepts of Yoga.
2. Familiarize students with the different schools of Yoga, its aims, objectives, and the importance of prayer in Yogic practice.
3. Develop awareness of the rules, regulations, and safety precautions to be followed during Yogic practices.
4. Enable students to learn and practice Suryanamaskara and selected Yogasanas with proper techniques for improving physical and mental well-being.
5. Promote a healthy life style by encouraging regular Yogic practice, correcting misconceptions about Yoga, and fostering positive health, self-discipline, and overall wellness.

Introduction of Yoga: Yoga, its origin, history and development. Yoga, its meaning, definitions. Different schools of yoga, Aim and Objectives of yoga, **Prayer** : importance of prayer

Brief introduction of yogic practices for common man to promote positive health, **Rules and regulations**: Rules to be followed during yogic practices by practitioner

Suryanamaskara:Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar 12 count, 2rounds, Misconceptions of yoga: **Yoga its misconceptions**, Difference between yogic and non yogic practices

Different types of Asanas: Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionary measures and benefits of each asana, Sitting 1.Padmasana, 2.Vajrasana, Standing 1.Vrikshana, 2.Trikonasana, Proneline1.Bhujangasana, 2.Shalabhasana, Supineline
1.Utthitadvipadasana, 2.Ardhahalasana

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Explain the origin, history, philosophy, objectives, and different schools of Yoga, along with its role in promoting holistic health and well-being.
2. Understand and apply the rules, regulations, and ethical practices associated with Yogic exercises, including the significance of prayer and Suryanamaskara.
3. Demonstrate the correct techniques of selected Yogasanas, such as sitting, standing, prone, and supine postures, while observing appropriate precautions.
4. Analyze the physical, mental, and therapeutic benefits of Yogic practices and distinguish between authentic Yogic practices and common misconceptions about Yoga.
5. Adopt Yoga as a regular life style practice to enhance physical fitness, mental wellness, discipline, and overall quality of life.

Suggested Learning Resources: (TextBook/ReferenceBook/Manuals):

Text books:

1. George Feuerstein: the yoga Tradition (its history, literature, philosophy and practice)
2. Sri Ananda: The complete Book of yoga Harmony of Body and Mind (Orient paper Backs: Vision Books Pvt.Ltd..1982.
3. B.K.Slyenkar: Light on the Yoga sutras of Patanjali (Haper Collins Publications India Pvt.Ltd.New Delhi.)
4. Science of Divinity and Realization of Self Vethathiri Publication,(6-11)WCSC,Erode

Reference books/Manuals:

1. Principles and Practice of Yoga in Health Care,Publisher:Handspring Publishing Limited. ISBN:9781909141209,978190914209
2. BasavaraddiIV: Yoga in School Health, MDNIY NewDelhi. 2009
3. Dr.HR.Nagendra: Yoga Research and application (Vivekanda Kendra Yoga Prakashana Bengalore)
4. Dr.Shirley Telles: Glimpses of Human Body (Vivekanda KendraYoga Prakashana Bengalore).

Web links and Video Lectures (e-Resources):

Search by topics to get the videos

Assessment Structure:

This course is having only **Continuous Internal Assessment** (CIE) marks of 100.

Weightage	**Marks**
Attendance to all the sessions	20Marks
Practical sessions on Yoga and Its Benefits	40Marks
Two Assignments	40Marks
Total Marks	100

A student shall obtain a minimum of 40% marks or 40 marks out of 100 to qualify in the course.

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

Semester IV: Syllabus

Course Title	**ENTREPRENEURSHIP AND BUSINESS DEVELOPMENT**		
Course Code	**25CB401**	**L-T-P-C**	**(3-0-0) 3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Entrepreneurship and businesses are the basis for economic growth all over the world. They play an important role in employment, income and societal changes, particularly in transition economies.

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 structure of modern business enterprise, role of industries and government policies in developing business	6	-
2.	Classify the different types of entrepreneurs and identify the characteristics of a successful entrepreneur	6,8	-
3.	Motivate to take-up entrepreneurship	6	2
4.	Apply the stages involved in starting an enterprise, develop and implement a business plan	6	-

Course Contents:

Module 1	**10 Hours**

Modern Business Enterprises: Role of small scale industries, Concept and definitions of SSI, Government policy and Development of the small scale sector in India, Growth & Performance of small scale industries in India. Problems for small-scale industries, Prospects for small scale industries in a free economy.

Entrepreneurship: Importance of Entrepreneurship, concepts of Entrepreneurship, characteristics of a successful Entrepreneur, classification of Entrepreneurs, Myths of entrepreneurship, Entrepreneurial development models, Profiles of successful entrepreneurs.

Module 2	**10 Hours**

Women Entrepreneurs: Women Entrepreneurship defined, Women entrepreneurship environment, challenges in the path of women entrepreneurship, Strategies for the development of women entrepreneurs, Institutions supporting women entrepreneurs in India, women entrepreneurs in India, Any two case studies Institutions

Supporting Small Business Enterprises: Introduction, central level institutions, State level institutions. Other agencies, Industry associations

Module 3	**10 Hours**

Setting up a Small Business Enterprise: Identifying the business opportunity, Business opportunities in various sectors. Formalities for setting up a small business enterprise

Sickness in Small Business Enterprises: Definition of sickness and Present status of sickness of SSIs in India, Criteria for identifying sickness/incipient sickness, causes for sickness/incipient sickness in SSI, Symptoms of sickness, Cures for SSIs sickness, Any two case studies

Module 4	**10 Hours**

Strategic Management in Small Business: Organization life cycle, strategic management, the essence of business ethics, Financial management in small business: Importance of financial management, working capital management.

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

Family Business: Importance of family business, Various types of family business, History of the family business, Responsibility and rights of family shareholders of a family business, strategies for improving the capability of a family business, management development plan in family business,family reunion games promote family value, how to save the family business.

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Entrepreneurship Development-Small Business Enterprises	Poornima. M. Charantimat	3rd	Pearson Education	2017

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Dynamics of entrepreneurial development and Management	Vasant Desai	3rd	Himalayan Publishing House Entrepreneurship development, S.S. Khanka, S. Chand& Co, New Delhi.	2018

course Articulation Matrix

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

Teaching - Learning – Evaluation Scheme:

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

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

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (7 Hours)

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

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

Course Title	**DESIGN AND ANALYSIS OF ALGORITHMS**		
Course Code	**25CB402**	**(L-T-P)C**	**(3-0-3) 3**
Exam	**3Hrs**	**Hours/Week**	**5**
SEE	**50 Marks**	**Total Hours**	**40L +14P**

Course Objective: Students will be able to design algorithms using various strategies and analyze it mathematically.

Course outcomes: At the end of course, students will be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply various algorithm design techniques to solve the given problem.	2	-
2.	Analyse the time complexity of the algorithm using asymptotic notations.	2	-
3.	Differentiate tractable & intractable problems & apply techniques that help to cope up with limitation of algorithms power.	3	-
4.	Conduct experiments to implement the designed algorithms	3, 5	2

Course Contents:

Module 1	**10 Hours**

Introduction: Notion of Algorithm, Fundamentals of algorithmic problem solving. **Fundamentals of the Analysis of Algorithm Efficiency:** Analysis framework, Asymptotic notations and Basic efficiency classes, Mathematical analysis of Recursive and Non-recursive algorithms, Examples.

Brute Force: Selection Sort and Bubble Sort, Sequential Search and String Matching, Exhaustive search.

Module 2	**10 Hours**

Divide-and-Conquer: Binary Search, Merge Sort, Quick Sort, Binary tree traversals and related properties, Multiplication of large integers, Strassen's Matrix multiplication.

Decrease-and-Conquer: Insertion Sort, Depth First and Breadth First Search, Topological sorting, Algorithms for generating combinatorial objects.

Module 3	**10 Hours**

Transform-and-Conquer: Pre-sorting, Balanced Search Trees, Heaps and Heap Sort, Problem reduction.

Space and Time Trade-off: Sorting by counting, Input enhancement in string Matching (only Horspool), Hashing.

Dynamic Programming: Computing a Binomial coefficient, Warshall's Algorithm, Floyd's algorithms, The Knapsack problem.

Module 4	**10 Hours**

Greedy Technique: Prim's algorithm, Kruskal's algorithm, Dijkstra's algorithm, Huffman trees,

Limitations of Algorithm Power: Lower-bound arguments, Decision trees, P, NP and NP-Complete Problems, coping with the Limitations of Algorithm Power: Backtracking, Branch-and-bound. Assignment Problem, KnapSack Problem, Travelling Salesmen problem

Self-Study Components:

Real-World Applications of Greedy and Dynamic Programming, Case Studies on NP-Complete Problems, Algorithm Visualization Tools (e.g., Visualgo), Online Coding Practice on Sorting and Graph Algorithms, Reading on Algorithm Complexity and Big-O Analysis

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

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to the Design and Analysis of Algorithms	Anany Levitin	3rd Edition	Pearson Education	2017

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Algorithms	Thomas H. Coremen, Charles E. Leiserson, Ronald L Rivest	3rd Edition	PHI	2022
2	Computer Algorithms	Horowitz E., Sahani S., Rajasekharan S		Galgotia Publications	

eBooks and online course materials:

1. https://nptel.ac.in/courses/106/106/106106131

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**
CO1	-	3	-	-	-	-	-	-	-	-	-	-	-
CO2	-	3	-	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	2	-	-	-	-	-	-	-	2

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	**3**	**14**	**42**
2.	Integrated Lab Component	**-**	**14**	**30**
3.	Student Study Hours – Self Learning	**1**	**14**	**14**
4.	Evaluation of Learning Process	**-**	**-**	**07**
5.	Activity Based Learning (ABL1 & ABL2)	**-**	**-**	**15+12 = 27**
Total Learning Hours/Semester				**120**

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

Activity Based Learning (27 Hours)

ABL	Hours
ABL 1 – Algorithm Design, Implementation & Analysis (15 Hours) 1. Select a set of real-world problems (e.g., sorting a list, pathfinding, scheduling) and map them to appropriate algorithmic strategies – 2 hrs 2. Implement brute force and divide-and-conquer approaches (e.g., selection sort, binary search, merge sort) and compare performance – 5 hrs 3. Visualize and analyze recursive vs non-recursive approaches with time complexity evaluation – 3 hrs 4. Implement graph traversal algorithms (DFS, BFS) and topological sorting – 3 hrs 5. Submit documented source code and performance analysis report – 2 hrs	**15**
ABL 2 – Advanced Problem Solving Using Greedy, Dynamic Programming & NP Concepts (12 Hours) 1. Implement and analyze classic dynamic programming solutions (e.g., Knapsack, Floyd's algorithm) – 4 hrs 2. Develop greedy algorithm implementations (e.g., Prim's, Kruskal's, Dijkstra's, Huffman coding) – 4 hrs 3. Explore one NP-Complete problem and apply backtracking or branch-and-bound to a simplified version – 2 hrs 4. Final evaluation with viva or demo presentation – 2 hrs	**12**
Total Learning Hours/Semester	**27 hours**

Proposed Assessment Plan (for 50 marks of CIE)

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1 and 2)	3
Valuation of Codes and Presentation	1
Semester End Exam	3
Total	**7**

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

Course Title	**DATABASE MANAGEMENT SYSTEM**		
Course Code	**25CB403**	**L-T-P-C**	**(2-2-0) 3**
Exam Hrs.	**3**	**Hours / Week**	**4**
SEE	**50 Marks**	**Total Hours**	**28L+28T**

Course Objective: Students will acquire the concepts of databases, and application of SQL for solving problems.

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

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Explain the fundamental concepts and applications of Database Management Systems	1	-
2.	Design Entity-Relationship diagrams for real-world applications and construct appropriate SQL queries.	2, 3, 5	1, 2
3.	Apply normalization techniques and analyze transaction management concepts including concurrency and recovery mechanisms.	1,2,4	-
4.	Conduct experiments of databases using modern tools: Oracle, MongoDB, MySQL	3, 5	1, 2

Course Contents

Module 1	**8 Hours**

Introduction: Introduction; An example; Characteristics of Database approach; Data models, schemas and instances; Three- schema architecture and data independence; Database languages and interfaces; **Entity-Relationship Model:** Using High-Level Conceptual Data Models for Database Design; A sample Database Application; Entity Types, Entity Sets, Attributes and Keys.

Module 2	**8 Hours**

Relationship types, Relationship Sets, Roles and Structural Constraints; Weak Entity Types; ER Diagrams,. **Relational Model and Relational Algebra:** Relational Model Constraints and Relational Database Schemas; Update Operations, Transactions and dealing with constraint violations; Unary Relational Operations: SELECT and PROJECT

Module 3	**6 Hours**

Relational Algebra Operations from Set Theory; Binary Relational Operations: JOIN-variations of JOIN, OUTER JOIN operations. **SQL:** SQL Data Definition and Data Types; Specifying basic constraints in SQL; Basic Retrieval queries in SQL; Insert, Delete and Update statements in SQL; Additional features of SQL, more complex SQL Retrieval Queries; Views; Schema Change Statements in SQL.

Module 4	**6 Hours**

Database Design: Informal Design Guidelines for Relation Schemas; Functional Dependencies; Normal Forms Based on Primary Keys-1NF, 2NF, 3NF, Boyce-Codd Normal Form. Multi-valued Dependencies and Fourth Normal Form; **Transaction Management:** The ACID Properties, Lock based Concurrency control techniques: Two- Phase Locking Techniques for Concurrency control.

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

Self -Study Components:
Real-world applications of ER modeling and schema design, Differences between Relational Algebra and SQL, Exploring NoSQL vs Relational DBMS, Hands-on practice with online SQL platforms (e.g., SQLZoo, W3Schools SQL), ACID properties and isolation levels in DBMS

Tutorial Component

1. Design an Employee database and answer following queries:
   a) List all the employees who are above 40 years of age
   b) List the employees who work in a particular department
   c) List the female employees who are 30 years of age and drawing salary >8000
   d) List the employee number, employee name and his department name of all employees

2. Design a video parlour database and solve the following queries as outlined below using SQL.
   a) List only videos in the Children category with a daily rental rate of less than 100 and sorted according to video title.
   b) List the catalogNo, title and category of the Video table, ordered by video title
   c) List all videos with a certification of "U" or "B" in the Video table.

3. Consider the Insurance database. Create the tables by properly specifying the primary keys and the foreign keys, Enter at least five tuples for each relation.
   a) Demonstrate how you
   i. Update the damage amount for the car with a specific regno in accident with report number 12 to 25000
   ii. Add a new accident to the database
   b) Find the total number of people who owned cars that were involved in accidents in 2006.
   c) Find the number of accidents in which cars belonging to a specific model were involved.

4. Consider the database of student enrollment in courses and books adopted for each course.
   a) Demonstrate how you add a new text book to the database and make this book be adopted by some department.
   b) Produce a list of text books(include course # ,book_isbn, book-title) in the alphabetical order for courses offered by the cs department that use more than 2 books.
   c) List the department that has adopted books published by specific publisher.

5. Consider an order processing database application in a company. Create the tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.
   a) Produce a listing: CUSTNAME, NO_OF_ORDERS, and AVG_ORDER_AMT, where the middle column is the total number of orders by the customer and the last column is the average order amount for that customer.
   b) List the Order# for the orders that were shipped from all the warehouses that the company has in a specific city.
   c) Demonstrate how you delete a customer from the CUSTOMER table and make that field null in the ORDER table.

6. Design a relational database for a real estate agency. It should store information about houses for sale,seller information, Buyer information, agents information (who can act on behalf of either the buyer or the seller), and the sale of houses. Answer the following queries in SQL.

a) What are the ids, addresses, asking_price, and selling_price of all houses that sold for less than the asking price?

b) What are names of all of (prospective) buyers who have not bought a house? Each name should appear only once.

c) Find the addresses and asking prices of all houses that have at least 3 bedrooms and two bathrooms that have not sold. Each address, asking price pair should appear only once.

7. Consider the details maintained by a book dealer. Create the tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation.

a) Give the details of the authors who have 2 or more books in the catalog and the price of the books is greater than the average price of the books in the catalog and the year of publication is after 2000.

b) Find the author of the book which has maximum sales.

c) Demonstrate how you increase the price of books published by a specific publisher by 10%.

8. Consider the following schema:
Suppliers(sid: integer, sname: string, address: string)
Parts(pid: integer, pname: string, color: string)
Catalog(sid: integer, pid: integer, cost: real)
Design a database to the satisfy the above requirements and answer the following queries

a) Find the names of parts for which there is some supplier.

b) Find the names of suppliers who supply every part.

c) Find the id's of suppliers who supply red parts.

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Fundamentals of Database Systems	Elmasri and Navathe	7th	Addison-Wesley	2017
2	Database Management Systems	Raghu Ramakrishnan, Johannes Gehrke	3rd	McGraw-Hill	2017

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Database System Concepts	Silberschatz, Korth, Sudarshan	5th	McGraw-Hill	2016
2	An Introduction to Database Systems	C.J. Date, A. Kannan, S. Swamynathan	8th	Pearson Education	2016

eBooks and online course materials:

1. http://nptel.ac.in/courses/106106093
2. https://www.edx.org/course/database-systems-concepts-design-gtx-cs6400x

Course Articulation Matrix

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO 1**	**PSO 2**
CO1	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	-	2	3	-	2	-	-	-	-	-	-	2	2
CO3	2	3	-	2	-	-	-	-	-	-	-	-	-
CO4	-	-	3	-	2	-	-	-	-	-	-	2	2

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	**2**	**14**	**28**
2.	Tutorial Component	**2**	**14**	**28**
3.	Student Study Hours – Self Learning	**1**	**14**	**14**
4.	Evaluation of Learning Process	**-**	**-**	**08**
5.	Activity Based Learning (ABL1)	**-**	**-**	**12**
Total Learning Hours/Semester				**90**

Activity Based Learning (12 Hours)

ABL	Hours
ABL 1 – Conceptual and Relational Modeling (6 Hours) 1. Design an ER diagram for a real-world application (e.g., library, hospital, e-commerce system) – 2 hrs 2. Implement schema using SQL (DDL commands) – 1 hrs 3. Populate sample data and perform basic queries (SELECT, PROJECT, JOIN) – 2 hrs 4. Submit ER diagram, schema, and query output report – 1 hrs	**6**
ABL 2 – SQL Querying and Database Normalization (6 Hours) 1. Write SQL queries for advanced retrievals including aggregation functions, nested subqueries, and views – 2 hrs 2. Normalize an unnormalized relation through 1NF, 2NF, 3NF, and BCNF – 2 hrs 3. Apply multi-valued dependency concepts and convert a relation to 4NF – 2 hrs	**6**

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

Proposed Assessment Plan (for 50 marks of CIE):

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

Evaluation of Learning Process (8 Hours)

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

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

Course Title	**THEORETICAL FOUNDATIONS OF COMPUTATION**		
Course Code	**25CB404**	**L-T-P-C**	**(3-0-0) 3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: Students will learn computation theory fundamentals and design automata, formal languages, and grammars for advanced 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 fundamental concepts of formal languages and automata theory	1,11	-
2.	Analyze DFAs, NFAs, and their working Principles	2,3	-
3.	Design regular expressions, context free grammar, Push Down Automata and Turing machines for different levels of formal languages	3,4	1

Course Contents:

Module 1	**10 Hours**
Introduction to Finite Automata: Why Study Automata Theory? The Central Concepts of Automata Theory. Finite Automata: An Informal Picture of Finite Automata, Deterministic Finite Automata, on Deterministic Finite Automata, Finite Automata with Epsilon-Transitions.	
Module 2	**10 Hours**
Regular Expressions and Languages: Regular Expressions, Finite Automata and Regular Expressions, Applications of Regular Expressions. **Properties of Regular Languages**: Proving Languages Not to Be Regular – Pumping Lemma, Closure Properties of Regular Languages, Equivalence and Minimization of Automata	
Module 3	**10 Hours**
Context-Free Grammars and Languages: Context-Free Grammars, Parse Trees, Applications of Context-Free Grammars, Ambiguity in Grammars and Languages. **Pushdown Automata**: Definition of the Pushdown Automata, The languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata	
Module 4	**10 Hours**
Properties of Context-Free Languages: Normal Forms for Context-Free Grammars-Eliminating Useless symbols, eliminating epsilon productions, Eliminating Unit productions, Chomsky Normal Form (CNF), Griebach Normal Form (GNF). **Introduction to Turing Machines**: Problems that Computers cannot Solve, The Turing Machine Programming Techniques for Turing Machines.	

Prescribed Textbooks:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Automata Theory, Languages and Computation	J.P. Hopcroft, Rajeev Motwani, J.D. Ullman	3rd	Pearson Education	2017

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Introduction to Languages and Theory of Computation	John Martin	3rd	Tata McGraw-Hill	2007
2	An Introduction to Formal Languages and Automata	Peter Linz	4th	Narosa Publishing House	2011

eBooks and online course materials:

1. Theory of Computation - https://onlinecourses.nptel.ac.in/noc22_cs63

Course Articulation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	-	-	2	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	-
CO3	-	-	3	2	-	-	-	-	-	-	-	3	-

Teaching - Learning – Evaluation Scheme:

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

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

Activity Based Learning (27 Hours)

ABL	Hours
ABL 1 – Design and Simulation of Automata Models (15 Hours) 1. Select real-world pattern recognition or lexical analysis problems to model using Finite Automata – 2 hrs 2. Design and simulate Deterministic and Non-deterministic Finite Automata (DFA & NFA) for simple inputs – 5 hrs 3. Apply Epsilon-transitions and convert NFA to DFA – 3 hrs 4. Construct and test Regular Expressions for token validation (e.g., identifier, number, keyword) – 3 hrs 5. Document the automaton, transitions, and use cases with input/output validation – 2 hrs	**15**
ABL 2 – Grammar Construction and PDA/TM Simulation (12 Hours) 1. Construct Context-Free Grammars (CFGs) for arithmetic expressions and nested structures – 3 hrs 2. Design Parse Trees and test ambiguity in CFGs – 2 hrs 3. Implement Pushdown Automata (PDA) for balanced parentheses and palindromes – 3 hrs 4.Convert CFG to CNF and simulate PDA equivalence – 2 hrs 5. Demonstrate a basic Turing Machine operation using visual tools (e.g., TM simulator) – 2 hrs	**12**
Total Learning Hours/Semester	**27**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Two CIEs conducted for 50 marks each and reduced to 15 marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (7 Hours)

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

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

Course Title	**Machine Learning**		
Course Code	**25CB404**	**L-T-P-C**	**(3-0-0)3**
Exam Hrs.	**3**	**Hours / Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: Provide a comprehensive understanding of machine learning concepts, types, and algorithms, enabling students to apply appropriate techniques and evaluate models effectively in real-world problem-solving scenarios..

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

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Explain the machine learning techniques, their types and data analysis framework.	1	-
2.	Apply mathematical concepts for feature engineering and perform dimensionality reduction to enhance model performance.	2,3	-
3.	Develop similarity-based learning models and regression models for solving classification and prediction tasks.	4,5	-
4.	Develop probabilistic learning models and neural network models using perceptrons and multilayer architectures.	4,5	-

Course Contents:

Module 1	**10 Hours**

Introduction: Need for Machine Learning, Machine Learning Explained, Machine Learning in Relation to other Fields, Types of Machine Learning, Challenges of Machine Learning, Machine Learning Process, Machine Learning Applications.

Understanding Data – 1: Introduction, Big Data Analysis Framework, Descriptive Statistics, Univariate Data Analysis and Visualization.

Module 2	**10 Hours**

Understanding Data – 2: Bivariate Data and Multivariate Data, Multivariate Statistics, Essential Mathematics for Multivariate Data, Feature Engineering and Dimensionality Reduction Techniques.

Testing Machine Learning Algorithms: Overfitting , Training, Testing, and Validation Sets ,The Confusion Matrix , Accuracy Metrics , The Receiver Operator Characteristic (ROC) Curve , Unbalanced Datasets , Measurement Precision

Module 3	**10 Hours**

Similarity-based Learning: Nearest-Neighbor Learning, Weighted K-Nearest-Neighbor Algorithm, Nearest Centroid Classifier, Locally Weighted Regression (LWR).

Regression Analysis: Introduction to Regression, Introduction to Linear Regression, Multiple Linear Regression, Polynomial Regression, Logistic Regression.

Module 4	**10 Hours**

Decision Tree Learning: Introduction to Decision Tree Learning Model, Decision Tree Induction Algorithms. Validating and pruning of Decision trees.

Bayesian Learning: Introduction to Probability-based Learning, Fundamentals of Bayes Theorem, Classification Using Bayes Model, Naïve Bayes Algorithm for Continuous Attributes.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Machine Learning	S Sridhar, M Vijayalakshmi	First Edition	OXFORD University	2021
2	Machine Learning	Stephen Marsland	Second Edition	CRC Press - Taylor and Francis Group	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
2	Machine Learning	T. M. Mitchell	Second Edition	McGraw Hill	1997
2	Machine Learning	Murty, M. N., and V. S. Ananthanarayana	Second Edition	--	2024
3	Machine Learning	Burkov, Andriy	First Edition	Andriy Burkov	2019

Online Courses and Video Lectures:

1. **https://www.universitiespress.com/resources?id=9789393330697**
2. https://www.drssridhar.com/?page_id=1053
3. Machine Learning Tutorials: https://www.geeksforgeeks.org/machine-learning/
4. Machine Learning Tutorials: https://www.tutorialspoint.com/machine_learning/index.htm
5. Python for Machine Learning: https://www.w3schools.com/python/python_ml_getting_started.asp
6. Introduction to Machine Learning: https://onlinecourses.nptel.ac.in/noc22_cs29/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Two CIEs conducted for 50marks each and reduced to 15 marks	30
Activity Details	Project Based Activity	20
	Total	50

Activity Based Learning (27 Hours)

ABL	**Hours**

MLL 1 – Data Understanding, Preprocessing & Exploratory Data Analysis (15 Hours) 1. Explore real-world datasets **(**e.g., Iris, Titanic, Wine Quality, House Price) and identify data types, missing values, outliers, and target variables – **3 hrs** 2. Perform descriptive statistics and data visualization using histograms, box plots, scatter plots, correlation heatmaps, and pair plots for univariate, bivariate, and multivariate analysis – **4 hrs** 3. Implement data preprocessing techniques such as handling missing values, encoding categorical variables, feature scaling, normalization, and feature engineering – **4 hrs** 4. Apply dimensionality reduction techniques **(PCA)** and evaluate feature importance for improving model performance – **2 hrs** 5. Submit documented source code, visualization outputs, and EDA report – **2 hrs**	**15**
MLL 2 – Machine Learning Model Development & Performance Evaluation (15 Hours) 1. Implement similarity-based learning algorithms (K-Nearest Neighbors, Weighted KNN, Nearest Centroid) and compare classification performance – 4 hrs 2. Develop regression models (Linear Regression, Multiple Linear Regression, Polynomial Regression, Logistic Regression) and analyze prediction accuracy – 4 hrs 3. Implement classification algorithms (Decision Tree and Naïve Bayes), perform pruning, and compare model performance using different datasets – 3 hrs 4. Evaluate machine learning models using train-test split, cross-validation, confusion matrix, accuracy, precision, recall, F1-score, ROC curve, and analyze overfitting/underfitting – 2 hrs 5. Final evaluation through practical demonstration, viva, and project report submission – 2 hrs	**12**
Total Learning Hours/Semester	**27**

Course Articulation Matrix

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

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours

CIE (1 and 2)	3
Presentation and Viva	1
Semester End Exam	3
Total	**7**

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

Course Title	**WEB PROGRAMMING**		
Course Code	**25CB406**	**L-T-P**	**(1-2-0) 2**
Exam	**3 Hrs.**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**14L+28T**

Course Objective: Create web pages with client side and server-side scripting
Course Outcomes (COs): Upon completion of the course, students shall be able to

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply the knowledge of HTML/XHTML and CSS in designing webpage.	3	
2.	Develop client-side script to design webpage	3,5	
3.	Design server-side script to create webpage	2,3	
4.	Create web pages using JavaScript, xml, PHP and MySQL for the real world applications.	2,4	

Module 1 — **8 Hrs**

Fundamentals of Web, XHTML: Internet, WWW, Web Browsers, and Web Servers; URLs; MIME; HTTP;. XHTML: Basic syntax; Standard structure; basic text markup; Images; Hypertext Links; Lists; Tables; Forms; the audio element, the video element, time element

Module 2 — **6 Hrs**

CSS: Introduction; Levels of style sheets; Selector forms; Property value forms; Font properties. List properties; Color; Alignment of text; The box model; Background images; **JavaScript:** Overview of JavaScript; Syntactic characteristics; Primitives, operations, and expressions; Screen output and keyboard input;; Object creation, and modification; Arrays; Pattern matching using regular expressions.

Module 3 — **6Hrs**

JavaScript and HTML Documents: The JavaScript execution environment; Element access in JavaScript; Events and event handling; Handling events from the Body elements, Button elements, Text box and Password elements; The navigator object.
Dynamic Documents with JavaScript: Introduction to dynamic documents; Element positioning; Moving elements; Element visibility; Changing colors and fonts; Dynamic content; Stacking elements; Locating the mouse cursor

Module 4 — **6Hrs**

XML: Introduction; Syntax; Document structure; Namespaces, XML schemas, Displaying raw XML documents; Displaying XML documents with CSS; XSLT style sheets.
PHP: Origins and uses of PHP; Overview of PHP; General syntactic characteristics; Primitives, operations and expressions; Output; Control statements; Pattern matching; Form handling; Files; Cookies.

Tutorial Components:
Guided lab Experiments:

1.A. Write a HTML code to display message “HELLO WORLD”
B. Write an HTML code to display “WEB PROGRAMMING” using various heading tags .
2. Write a HTML code to display your educational details in tabular format.
3. Write an HTML code to display CV on the web page
4. Create a JavaScript that prompt the user for a number and their count from 1 to that number display only the add number using alert window.

5. Write a JavaScript to validate the following fields in a registration page: Name(should contain alphabets and length should be less than 6 characters),Password(should not less than 6 character), Email-Id(should not contain invalid address).
6. Develop and demonstrate using JavaScript a XHTML document that USN(the valid format is :A digit 1 to 4 followed by 2 upper cases characters followed by two digits followed by 2 upper case character followed by 3 digits: no embedded spaces allowed)of the user: event handlers must be included for the file validate the input. Messages in the alert windows must be produced when errors are detected.
7. Develop and demonstrate using Java Script a XHTML document
8.Write an HTML code to demonstrate the usage of inline CSS.
9.Write a PHP program to store current data time in a COOKIE and display the last visited on data-time on the web page upon reopening of the same page.

Open ended Experiment:

1. Design and develop a complete web application or website that incorporates concepts learned throughout the course, including HTML, CSS, JavaScript, PHP, and XML**.**

Text Book:

Robert W. Sebesta: Programming the World Wide Web, 8th Edition, Pearson Education

Reference Books:

1. Deitel H.M. and Deitel P.J., "Internet and World Wide Web How to program", Pearson International, 2012, 4th Edition.
2. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", Pearson, 2015.
3. ISRD Group: Internet Technology and Web Design, Tata McGraw Hill Publishing Ltd, 2011

MOOCs:

1. https://www.mooc-list.com/course/programming-and-web-beginners-coursera
2. http://nptel.ac.in/courses/117105080/3
3. https://www.coursera.org/specializations/web-design
4. http://www.w3c.org

Course Articulation Matrix:

Course Outcomes	Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO 2**
CO1	-	-	3	-	-	-	-	-	-	-	-	-	-
CO2	-	-	3	-	2	-	-	-	-	-	-	-	-
CO3	-	3	2	-	-	-	-	-	-	-	-	-	-
CO4	-	3	-	2	-	-	-	-	-	-	-	-	-

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

Teaching - Learning – Evaluation Scheme:

Sl. No.	Teaching Learning Method	No. of Hours/week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	**2**	**14**	**28**
2.	Integrated Lab Component	**-**	**-**	**-**
3.	Student Study Hours – Self Learning	**1**	**14**	**14**
4.	Evaluation of Learning Process	**-**	**-**	**07**
5.	Activity Based Learning (ABL1 & ABL2)	**-**	**-**	**11**
Total Learning Hours/Semester				**60**

Activity Based Learning (27 Hours)

ABL	**Hours**
1. Activity 1: Design a Responsive College Event Registration Portal	**11**
Total Learning Hours/Semester	**11hours**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	**Remarks**	**Marks**
CIE	Two CIEs conducted for 50 marks each and reduced to 15marks	30
Activity Details	Details of activities to be conducted 1) Details of activity 1 2) Details of activity 2	20
Total		**50**

Evaluation of Learning Process (7 Hours)

Type of Evaluation	**Hours**
CIE (1 and 2)	3
Report correction and Presentation	1
Semester End Exam	3
Total	**7**

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

Course Title	**DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY**		
Course Code	**25CB407**	**L-T-P-C**	**(0-0-2)1**
Exam Hrs.	**3**	**Hours / Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: To understand the design techniques and analysis of algorithms, evaluate their efficiency, and implement fundamental algorithms for sorting, graph problems, shortest paths, spanning trees, and string matching.

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

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Analyze and implement fundamental algorithms for graph traversal, sorting, and string matching to solve computational problems efficiently.	1,5,10	-
2.	Design and apply graph optimization algorithms, including shortest path and minimum spanning tree algorithms, to solve real-world optimization problems.	1,5,10	-

Course Contents:

PART A

1.	Students in a department need to be selected for a high jump competition based on their height (integer values only). Sort the heights of students using Quick sort and find the time required for the sorting..
2	Print all the nodes reachable from a given starting node in a graph using Depth First Search method and Breadth First Search. Also check whether a graph is connected.
3	Obtain the topological ordering of vertices in a given digraph.
4	Implement Horspool algorithm for String Matching.
5	Sort a given set of elements using the Heap sort method.
6	Implement Floyd's algorithm and Warshall's algorithm for a given graph.
7	There are n different routes from hostel to college. Each route incurs some cost. Find the minimum cost route to reach the college from the hostel using Prim's algorithm.
8	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm
9	Implement 0/1 Knapsack problem using dynamic programming.
10	Implement N Queen's problem using Backtracking.

PART B

1.	A college wants to rank students based on their performance in multiple subjects. Design a system to sort student records efficiently and analyze the time taken for different sorting techniques.
2.	Develop a system to explore all reachable locations (buildings/blocks) from a given starting point in a campus map. Also determine whether the entire campus is connected.

3.	A university wants to generate an order in which students should complete courses based on prerequisites. Design a solution to determine a valid course sequence.
4.	Design a simple tool to detect whether a given pattern (text snippet) exists in a large document. Optimize the search process.
5.	A company needs to sort a large dataset efficiently using limited memory. Design and analyze a suitable sorting approach.
6.	Given a network of cities, design a system to compute shortest paths between all pairs of cities and determine connectivity relationships.
7.	A campus wants to connect all its buildings with minimum wiring cost. Design a solution to determine the minimum cost required.
8.	A government project aims to connect villages with roads at minimum cost. Design a system to find the optimal connections.
9.	A company has limited resources (budget/weight capacity) and multiple projects/items with associated profits. Design a system to maximize profit under constraints.
10.	A security agency wants to place surveillance units in a grid such that no unit interferes with another. Design a placement strategy.

Course Articulation Matrix

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

Proposed Assessment Plan (for 50 marks of CIE):	
Remarks	**Marks**
Laboratory CIE	30
Laboratory Record Submission	10
Conduction of experiments	10
Total	50

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**JULIA**		
Course Code	**25CB408A**	**L-T-P**	**(0-0-2)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: To introduce the basics of Julia programming language To illustrate the data structures of Julia programming language To make use of built-in functions and packages

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

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply concepts of data-types, selection and looping constructs of Julia programming language.	1,2	-
2.	Demonstrate the use of strings, functions, arrays and matrix operations in solving problems.	2,5	-
3.	Develop programs involving data structures to handle multi-valued data items. Make use of packages to generate plots of mathematical functions and equations.	3,6	-

List of Experiments:

PART-A

1	a. Develop a Julia program to simulate a calculator (for integer and real numbers). b. Develop a Julia program to add, subtract, multiply and divide complex numbers.
2	Develop a Julia program for the following problem: A computer repair shop charges $100 per hour for labour plus the cost of any parts used in the repair. However, the minimum charge for any job is $150. Prompt for the number of hours worked and the cost of parts (which could be $0) and print the charge for the job.
3	Develop a Julia program which reads numbers from a file (input.txt) and finds the largest number, smallest number, count, sum and average of numbers.
4	a. Develop a Julia program and two separate functions to calculate GCD and LCM. b. Develop a Julia program and a recursive function to calculate factorial of a number.
5	Develop a Julia program which reads a string (word) and prints whether the word is palindrome.
6	Develop a Julia program to determine and print the frequency with which each letter of the alphabet is used in a given line of text.
7	Given a line of text as input, develop a Julia program to determine the frequency with which each letter of the alphabet is used (make use of dictionary)
8	Develop a Julia program to evaluate expressions consisting of rational, irrational number and floating- point numbers)
9	Develop a Julia program to determine addition and subtraction of two matrices (element -wise).
10	a. Develop a Julia program to generate a plot of (solid & dotted) a function: y=x2 (use suitable data pointsfor x). b. Develop a Julia program to generate a plot of mathematical equation: y = sin(x) + sin(2x).

PART-B

1. Develop a Julia program to evaluate expressions having mixed data types (integer, real, floating-point number and complex).
2. following: If hours worked is less than or equal to 40, regular pay is calculated by multiplying hours worked by rate of pay, and overtime pay is 0. If hours worked is greater than 40, regular pay is calculated by multiplying 40 by the rate of pay, and overtime pay is calculated by multiplying the hours in excess of 40 by the rate of pay by 1.5. Gross pay is calculated by adding regular pay and overtime pay.
3. An amount of money P (for principal) is put into an account which earns interest at r% per annum. So, at the end of one year, the amount becomes P + P×r/100. This becomes the principal for the next year. Develop a

Julia program to print the amount at the end of each year for the next 10 years. However, if the amount ever exceeds 2P, stop any further printing. Your program should prompt for the values of P and r.

4. Develop a Julia program and a recursive function to generate Fibonacci series.
5. Develop a Julia program which reads and prints the words present in a file (input.txt) having Random Data in which words are dispersed randomly (Assumption: a word is a contiguous sequence of letters. A word is delimited by any non-letter character or end-of-line).
6. A survey of 10 pop artists is made. Each person votes for an artist by specifying the number of the artist (a value from 1 to 10). Develop a Julia program to read the names of the artists, followed by the votes, and find out which artist is the most popular.
7. Develop a Julia program to fetch words from a file with arbitrary punctuation and keep track of all the different words found (make use of set and ignore the case of the letters: e.g. to and To are treated as the same word)
8. Develop a Julia program to determine the following properties of a matrix: determinant, inverse, rank, upper & lower triangular matrix, diagonal elements, Euclidean norm and Square Root of a Matrix.
9. Develop a Julia program to perform multiplication operation on matrices: scalar multiplication,element-wise multiplication, dot product, cross product.
10. Develop a Julia program to generate multiple plots of mathematical equations: y = sin(x) + sin(2x) and y = sin(2x) + sin(3x)

Course Articulation Matrix:

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

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**POWER BI**		
Course Code	**25CB408B**	**L-T-P**	**(0-0-2)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: To learn and practice programming techniques using Microsoft Power BI**.**
Course Outcomes (COs): Upon completion of the course, students shall be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Prepare the dataset in suitable format with required preprocessing using Power Query Editor.	1,2	-
2.	Apply suitable visualization techniques to generate reports for various problems.	3,5,9	-
3.	Implement, document and present data visualization projects for chosen problems.	5,10,12	2

Practice Programs / Self-Learning

1. Installation of Power BI
2. Building blocks and components of Power BI
3. Overview of GUI
4. Introduction to Power Query Editor

PART-A

1. Import an Excel dataset named SalesData.xlsx with Date, Product, Quantity, and Price columns; filter rows where Quantity is less than 10, remove duplicate rows, and add a new TotalSales column using Quantity × Price.
2. Use Power BI to transform and prepare data by assigning appropriate data types, replacing erroneous values, handling nulls and errors, performing pivoting and unpivoting operations, merging and appending queries, and importing data from folders.
3. Perform advanced data transformations in Power BI by creating custom columns, conditional columns, using Group By, managing queries, and optimizing report performance by enabling or disabling load and refresh options.
4. Establish and manage relationships between datasets containing sales transactions, product details, customer information, and category classifications for comprehensive data analysis and reporting.
5. Configure cross-filter directions and manage relationships between datasets to improve sales and customer data analysis.
6. Create visualizations in Power BI by understanding visualization types, using the Format tab, and creating tables and bar charts for insightful reporting.
7. Create and customize clustered column charts, matrix visuals, pie charts, and donut charts to present data and derive actionable insights.
8. Create clustered column charts, apply conditional formatting, and use different types of filters in Power BI for data visualization and analysis.
9. Use slicers, edit interactions, bookmarks, drill down, and drill through features to improve interactive data exploration and reporting.
10. Use tooltips, interactive buttons, KPI cards, waterfall charts, and custom visuals to create effective and actionable Power BI reports.

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

PART- B

1. A retail organisation has sales data stored across multiple Excel and CSV files. Import, combine, clean, and transform the data in Power BI to create a consolidated analytical dataset.
2. A company wants to understand its monthly business performance. Design a report that compares revenue, cost, profit, profit margin, and growth across products, regions, and time periods.
3. Examine a dataset containing missing values, duplicate records, inconsistent formats, and incorrect data types. Use Power Query to identify and resolve the data-quality issues.
4. A business maintains separate tables for customers, products, sales, employees, and locations. Develop an appropriate data model by defining relationships and organising the tables using a suitable schema.
5. Create calculated columns and DAX measures to analyse year-to-date sales, previous-year sales, percentage growth, average order value, rankings, and contribution to total revenue.
6. A sales manager requires different visual perspectives of the same dataset. Select appropriate charts, tables, maps, cards, and KPIs, and justify why each visual is suitable for the information presented.
7. Develop an interactive report that allows users to explore data using slicers, drill-down, drill-through, tooltips, bookmarks, buttons, and page navigation.
8. Analyse customer data to identify purchasing behaviour, high-value customers, inactive customers, regional preferences, and important customer segments.
9. A senior manager requires a single-page executive dashboard. Present the most important performance indicators, trends, exceptions, targets, and actionable findings without overcrowding the report.

Build and publish a complete Power BI solution using a real-world dataset, including data preparation, modelling, DAX calculations, visualisation, dashboard design, report sharing, and interpretation of findings.

Course Articulation Matrix:

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

Teaching - Learning – Evaluation Scheme:

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

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

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

Course Title	**COMPUTER & NETWORK CONFIGURATION**		
Course Code	**25CB408C**	**L-T-P**	**(0-0-2)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: The course aims to provide hands-on experience in assembling, configuring, and maintaining computer hardware.

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

No.	**Course Outcomes**	**Mapping to POs**	**Mapping to PSOs**
1.	Apply knowledge to assemble, configure, and test computer hardware systems.	2,5,10	-
2.	Analyse and troubleshoot hardware-related issues using appropriate tools.	2,5,10	-

List of Experiments:

PART - A

1. Identify internal and external components of a PC system
2. Assemble and disassemble a desktop computer
3. Configure BIOS/UEFI settings
4. Install and configure different operating systems (Windows/Linux)
5. Set up drivers for hardware components
6. Perform memory and storage configuration (RAM upgrade, disk partitioning)
7. Configure display settings for single and dual monitors
8. Set up input/output devices (keyboard, mouse, printer, scanner)
9. Troubleshoot hardware issues using diagnostic tools
10. Create and restore system backups
11. Perform hardware compatibility checks for upgrades
12. Configure power supply and UPS system
13. Update firmware and BIOS
14. Build a basic gaming or office PC within a budget

PART-B

1. A college purchases 20 new desktop computers. As a hardware technician, identify and prepare an inventory of all internal (CPU, RAM, motherboard, HDD/SSD, PSU, GPU) and external components (monitor, keyboard, mouse, speakers, printer).
2. A customer receives separate computer components and requests a fully assembled office PC. Disassemble an existing computer, identify all parts, and reassemble the system correctly.
3. A newly assembled computer cannot detect a bootable device. Access the BIOS/UEFI settings, configure the boot sequence, enable virtualization, and verify hardware detection.
4. A software development laboratory requires a dual-boot environment. Install Windows and Linux on the same computer and configure the boot manager.
5. After reinstalling the operating system, the network adapter, graphics card, and audio system are not functioning. Identify and install the required device drivers.
6. An office computer experiences slow performance because of insufficient memory and poor disk organization. Upgrade the RAM and create separate partitions for the operating system and user data.

7. A graphic designer requires an extended desktop across two monitors. Configure the display settings and adjust the resolution, orientation, and display mode.
8. A newly established computer laboratory requires all peripheral devices to be installed and configured. Connect and configure the keyboard, mouse, printer, and scanner and verify their operation.
9. A desktop computer frequently restarts and displays error messages. Use diagnostic tools to identify hardware faults related to memory, storage, temperature, or power supply.
10. Before upgrading the operating system in a computer laboratory, create a complete system backup and demonstrate system restoration after a simulated failure.

Course Articulation Matrix:

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

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**TECHNICAL WRITING USING LATEX**		
Course Code	**25CB408D**	**L-T-P**	**(0-0-2)1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: Students will gain hands-on skills in Latex for structured technical document preparation.

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

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	Apply Latex commands to create well-structured documents with text, equations, and images.	2,5,10	2
2.	Create technical reports and presentations using bibliographies, cross-references, and formatting tools in LaTeX.	2,5,10	-

List of Experiments:

PART-A

1. **Install and set up LaTeX editors**
   (Overleaf, TeXstudio, or MikTeX/TexLive installation and setup)
2. **Create a basic LaTeX document**
   (Use \documentclass, \begin{document}, \section, \textbf, \emph, etc.)
3. **Format text, paragraphs, and lists**
   (Alignment, indentation, bullets, and numbered lists)
4. **Work with titles, sections, and table of contents**
   (Use \title, \author, \maketitle, \tableofcontents, \section and \subsection)
5. **Insert and format mathematical equations**
   (Inline and displayed math using $...$, \[...\], and equation environment)
6. **Create and format tables and figures**
   (Use table, tabular, figure, includegraphics, captions and labels)
7. **Cross-referencing sections, tables, and figures**
   (Use \label, \ref, and \pageref)
8. **Use bibliographic citations and generate references using BibTeX**
   (Create .bib file and cite with \cite, \bibliographystyle, \bibliography)
9. **Use packages for layout and customization**
   (Import geometry, graphicx, amsmath, hyperref, etc.)
10. **Write a lab report or mini-project in LaTeX**
    (Include abstract, figures, equations, references – suitable for thesis formatting)
11. **Create a professional resume/CV using LaTeX**
    (Use a class like modern cv or custom document setup)
12. **Prepare a scientific presentation using LaTeX Beamer**
    (Design and present slides using \frame, \frame title, bullet lists, and overlays)

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

PART-B
1. A research laboratory is adopting LaTeX for preparing technical reports and publications. As a research assistant, install and configure a LaTeX environment using Overleaf, TeXstudio, or MiKTeX/TeX Live and verify the installation by compiling a sample document.
2. A faculty member asks you to prepare a simple document for a laboratory manual. Create a basic LaTeX document that includes a title, sections, bold text, italic text, and multiple paragraphs.
3. A department handbook requires consistent formatting. Format the document by applying text alignment, paragraph indentation, bullet lists, numbered lists, and spacing options.
4. A student is preparing a project report containing multiple chapters and subtopics. Create a document with a title page, author information, sections, subsections, and an automatically generated table of contents.
5. An engineering student needs to prepare a document containing mathematical derivations for an assignment. Create a document containing inline equations, displayed equations, and numbered equations using the appropriate LaTeX environments.
6. A researcher wants to include experimental results and graphical outputs in a journal paper. Insert tables and figures with appropriate formatting, captions, labels, and references.
7. A thesis document contains multiple chapters, figures, and tables. Implement cross-referencing to enable automatic referencing of sections, tables, figures, and page numbers.
8. A postgraduate student is preparing a literature review for a research paper. Create a bibliography database using a .bib file, cite references within the document, and automatically generate the reference list using BibTeX.
9. A journal publisher provides specific formatting guidelines for article submission. Customize the document using packages such as geometry, graphicx, amsmath, and hyperref to satisfy the formatting requirements.
10. An engineering laboratory requires students to submit reports in a standardized format. Prepare a complete laboratory report containing a title page, abstract, introduction, methodology, results, equations, figures, tables, and references.

Course Articulation Matrix:

Course Outcomes	**Program Outcomes**												
Cos	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	-	2	-	-	3	-	-	-	-	2	-	-	2
CO2	-	2	-	-	3	-	-	-	-	2	-	-	-

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

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**BIOLOGY FOR ENGINEERS**		
Course Code	**25CB409**	**(L-T-P)C**	**(0-1-0) 1**
Exam	**3 Hrs.**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30**

Course Objective: Realization of relation between Natural Engineering and man-made Engineering.
Course outcomes: At the end of course, student will be able to:

No.	Course Outcomes	Mapping to POs	Mapping to PSOs
1.	To familiarize engineering students with basic biological concepts	6	-
2.	Apply the interdisciplinary vision of biology to engineering	1,6,8	-
3.	Analyze how biological systems can be designed and engineered to substitute natural system	2,6	-
4.	To develop biological models using AI tools	2,6	-

Course Contents:

MODULE – 1	**7 Hrs.**
Introduction to Human Anatomy: Overview of human anatomy, Structural organization of the human body- cardiovascular system, endocrine system, digestive system, respiratory system, excretory system, lymphatic system, nervous system, muscular system and skeletal system.	
MODULE – 2	**8 Hrs.**
Bioinspired Engineering based on human physiology: Circulatory system (artificial heart, pacemaker, stents), Nervous system (Artificial neural network).	
MODULE -3	**8 Hrs.**
Bioinspired Algorithms and Applications: Genetic algorithm, Gene expression modelling. Parallel Genetic Programming: Methodology, History, and Application to Real-Life Problems. Dynamic Updating DNA Computing Algorithms. Beehive: New Ideas for Developing Routing Algorithms Inspired by Honey Bee Behaviour.	
MODULE -4	**7 Hrs.**
Artificial Intelligence and Biology: Applications of AI in medical imaging, neural engineering, systems biology, microbiome and data mining.	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Bioinspired Engineering	C.H. Jenkins	1st	Momentum Press	2012
2	A Practical Guide to Bio-inspired Design	Hashemi Farzaneh, Udo Lindemann	1st	Springer	2019

Reference Books:

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

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Human Physiology	Stuart Fox, Krista Rompolski	15th	McGraw-Hill eBook	2022
2	Biology for Engineers	Thyagarajan S., Selvamurugan N., Rajesh M.P., Nazeer R.A., Thilagaraj W., Barathi S., Jaganthan M.K.	1st	Tata McGraw-Hill	2012
3	Biology for Engineers	Sohini Singh, Tanu Allen	1st	Vayu Education of India	2014

Course Articulation Matrix:

Course Outcomes	Program Outcomes												
Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	-	-	-	-	-	3	-	-	-	-	-	-	-
CO2	3	-	-	-	-	3	-	3	-	-	-	-	-
CO3	-	2	-	-	-	3	-	-	-	-	-	-	-
CO4	-	2	-	-	-	3	-	-	-	-	-	-	-

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**ENVIRONMENTAL SCIENCE PROJECT**		
Course Code	**25EVS**	**L-T-P**	**(0-0-2)1**
Exam	**3 Hrs**	**Hours/Week**	**2**
SEE	**50 Marks**	**Total Hours**	**30 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

Course Contents:

MODULE-1

Environment: Definition, about the Earth, Earth's Structure i.e. Atmosphere and its parts, Hydrosphere, Lithosphere and Biosphere, Ecosystem, Balanced ecosystem, Effects of human activities on environment Agriculture Housing Industry Mining and Transportation.

MODULE-2

Natural Resources: Water resources, Availability and Quality, Water borne diseases, Water induced diseases, Fluoride Problem in drinking water. Mineral Resources-Forest Resources-Material Cycles-Carbon, Nitrogen and Sulphur Cycles.

MODULE-3

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

MODULE-4

Current Environmental issues of importance: Acid Rain, Ozone layer depletion - Population Growth, Climate change and Global warming. Environmental Impact Assessment and Sustainable Development Environmental Protection -Legal aspects. Water Act and Air Act.

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

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

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	-	-	-	-	-

Teaching - Learning – Evaluation Scheme:

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

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

Course Title	**NATIONAL SERVICE SCHEME (NSS)**		
Course Code	**25NYP1**	**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**	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	**3**	-	-	-

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

Semester:IV						
PHYSICAL EDUCATION (SPORTS & ATHLETICS)– II						
Course Code	**:**	25PE2		**CIE**	**:**	**100 Marks**
Course Type	**:**	NCMC				
Total Hours	**:**	15 P				

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

1. Understand the ethics and moral values in sports and athletics
2. Perform in the selected sports or athletics of student's choice.
3. Understand the roles and responsibilities of organization and administration of sports and games.

Module I: Ethics and Moral Values **4 Hours**

A. Ethics in Sports
B. Moral Values in Sports and Games

Module II : Specific Games (Any one to be selected by the student) **16 Hours**

A. Volleyball –Attack, Block, Service, Upper Hand Pass and Lowerhand Pass.
B. Athletics (Track Events) –Any event as per availability of Ground.

Module III : Role of organisation and administration **4 Hours**

Scheme and Assessment for auditing the course and Grades:

Sl.No.	Activity	Marks
1.	Participation of student in all the modules	20
2.	Quizzes/Assignment–2,eachof 20marks	40
3.	Final presentation/exhibition/Participation in competitions/ practical on specific tasks assigned to the students	40
	Total	**100**

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

Semester IV			
Yoga - II			
Course Code	25YOG2	**CIE**	100 Marks
Course Type	NCMC		
Total Hours	2 hrs/week		

Course Objectives

The objectives of this course are to:

1. Introduce students to the origin, history, philosophy, and fundamental concepts of Yoga.
2. Familiarize students with the different schools of Yoga, its aims, objectives, and the importance of prayer in Yogic practice.
3. Develop awareness of the rules, regulations, and safety precautions to be followed during Yogic practices.
4. Enable students to learn and practice Suryanamaskara and selected Yogasanas with proper techniques for improving physical and mental well-being.
5. Promote a healthy life style by encouraging regular Yogic practice, correcting misconceptions about Yoga, and fostering positive health, self-discipline, and overall wellness.

Patanjali's Ashtanga Yoga: Patanjali's Ashtanga Yoga, its need and importance. Yama: Ahimsa, satya, asteya, brahmacharya, aparigraha, Niyama : shoucha, santosh, tapa, svaadhyaya, Eshvarapranidhan, Suryanamaskar 12 count 4 rounds. Different types of Asanas: Sitting 1. Sukhasana, 2.Paschimottanasana, Standing1. Ardhakati Chakrasana, 2.ParshvaChakrasana, Prone line 1. Dhanurasana Supine line 1. Halasana, 2. Karna Peedasana

Kapalabhati: Meaning, importance and benefits of Kapalabhati. 40strokes/min3 rounds Pranayama– 1. Suryanuloma–Viloma, 2.Chandranuloma-Viloma, 3-Suryabhedana, 4-Chandra Bhedana, 2.Nadishodhana, 3-BhramariPranayama, Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Explain the origin, history, philosophy, objectives, and different schools of Yoga, along with its role in promoting holistic health and well-being.
2. Understand and apply the rules, regulations, and ethical practices associated with Yogic exercises, including the significance of prayer and Suryanamaskara.
3. Demonstrate the correct techniques of selected Yogasanas, such as sitting, standing, prone, and supine postures, while observing appropriate precautions.
4. Analyze the physical, mental, and therapeutic benefits of Yogic practices and distinguish between authentic Yogic practices and common misconceptions about Yoga.
5. Adopt Yoga as a regular life style practice to enhance physical fitness, mental wellness, discipline, and overall quality of life.

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

Suggested Learning Resources: (TextBook/ReferenceBook/Manuals):

Text books:

1. George Feuerstein: the yoga Tradition (its history, literature, philosophy and practice)
2. Sri Ananda: The complete Book of yoga Harmony of Body and Mind (Orient paper Backs: Vision Books Pvt.Ltd..1982.
3. B.K.Slyenkar: Light on the Yoga sutras of Patanjali (Haper Collins Publications India Pvt.Ltd.New Delhi.)
4. Science of Divinity and Realization of Self Vethathiri Publication,(6-11)WCSC,Erode

Reference books/Manuals:

1. Principles and Practice of Yoga in Health Care,Publisher:Handspring Publishing Limited. ISBN:9781909141209,978190914209
2. BasavaraddiIV: Yoga in School Health, MDNIY NewDelhi. 2009
3. Dr.HR.Nagendra: Yoga Research and application (Vivekanda Kendra Yoga Prakashana Bengalore)
4. Dr.Shirley Telles: Glimpses of Human Body (Vivekanda KendraYoga Prakashana Bengalore).

Web links and Video Lectures (e-Resources):

Search by topics to get the videos

Assessment Structure:

This course is having only **Continuous Internal Assessment** (CIE) marks of 100.

Weightage	**Marks**
Attendance to all the sessions	20Marks
s Practical sessions on Yoga and Its Benefits	40Marks
Two Assignments	40Marks
Total Marks	100

A student shall obtain a minimum of 40% marks or 40 marks out of 100 to qualify in the course.