

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



Autonomous Programme
Bachelor of Engineering



Department of
Computer Science and Engineering
(Artificial Intelligence and Machine Learning)

SCHEME and SYLLABUS
(2025 Admitted Batch)

Academic Year 2026-27



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

VISION OF THE INSTITUTE

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

MISSION OF THE INSTITUTE

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

VISION OF THE DEPARTMENT

To be a Center of Excellence for innovative teaching, learning and research to produce socially responsible professionals in the field of Artificial Intelligence and Machine Learning to address real-world problems.

MISSION OF THE DEPARTMENT

- Fostering innovation through cutting-edge teaching, transformative learning, and innovative research in field of artificial intelligence and machine learning with foundations of Computer Science and Engineering.
- Impart latest technology through industry-academia collaboration.
- Maintain high standards of ethical values involved in AI and ML applications with transparency of operations for moral concerns of the society.



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PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. **PEO1:** Acquire the fundamentals and expertise in basic science, Computer Science and Engineering, Artificial Intelligence and Machine Learning principles and excel as an IT professional or an entrepreneur.
2. **PEO2:** Pursue Higher Studies and Research.
3. **PEO3:** Adapt to the technological advancements by engaging in lifelong learning and exhibit professional ethics, teamwork and leadership qualities.

PROGRAM OUTCOMES (POs)

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



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PROGRAM OUTCOMES (POs)

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

- PSO1: Data Science and Analytics Expertise:** Apply advanced data science techniques and analytical methods to extract meaningful insights from complex datasets, leveraging modern tools and technologies to support data-driven decision-making and innovation across various domains.
- PSO2: AI & ML Competency:** Apply computational skills, innovative thinking, and practical expertise in artificial intelligence and machine learning to create efficient solutions in real-world scenarios.
- PSO3: Intelligent Systems Development:** Demonstrate Computational knowledge, practical competency and innovative ideas in Artificial Intelligence & Machine Learning to create intelligent systems.



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PBNo.21, HASSAN-573201, Karnataka, India

CIE and SEE Assessment Structure for 2025 batch onwards

Examination	Maximum Marks	Minimum marks to qualify
CIE	50	20 (12+8)
SEE	50	20
Total	100	40

Assessment Structure for Theory Courses

Assessment	Marks
CIE 1 – conducted for 50 marks and scaled down to 15 marks	15
CIE 2 – conducted for 50 marks and scaled down to 15 marks	15
Activities as decided by course faculty	20
SEE – conducted for 100 and scaled down to 50	50
Total	100

CIE Assessment Structure

Assessment	Marks	Syllabus
CIE 1 - Conducted for 50 marks and scaled down to 15 marks	15	Module-1 and Module-2
CIE 2 - Conducted for 50 marks and scaled down to 15 marks	15	Module-3 and Module-4
Activities as decided by course faculty	20	All Modules
Total	50	



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CIE 1 Question Paper Pattern

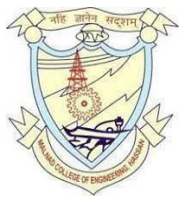
Question 1	Module-1	Mandatory	One question for 20 marks – maximum 4 sub divisions
Question 2	Module-2	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question – maximum 4 sub divisions
Question 3	Module-1 and Module-2	Mandatory	One question for 10 marks – maximum 5 sub divisions – short answer types

CIE 2 Question Paper Pattern

Question 1	Module-3	Mandatory	One question for 20 marks – maximum 4 sub divisions
Question 2	Module-4	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question – maximum 4 sub divisions
Question 3	Module-3 and Module-4	Mandatory	One question for 10 marks – maximum 5 sub divisions – short answer types

SEE Question Paper Pattern

Question 1	Module -1	Mandatory	One question for 20 marks – maximum 4 sub divisions
Question 2	Module -2	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question - maximum 4 sub divisions
Question 3	Module -3	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question - maximum 4 sub divisions
Question 4	Module -4	Internal choice	Two questions for 20 marks each, out of which, student has to answer one question - maximum 4 sub divisions
Question 5	Module – 1, 2, 3, 4	Mandatory	One question for 20 marks – maximum 5 sub divisions – short answer types



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Assessment Structure for Exclusive Laboratory Courses

Assessment	Marks	Minimum marks to qualify
Continuous Evaluation in every lab session by the Course Coordinator	30	12
Laboratory CIE - conducted for 50 marks and scaled down to 20	20	8
SEE	50	20
Total	100	40

1. The laboratory syllabus shall consist of PART-A and PART-B. PART-A shall have minimum of 10 fixed set of experiments. PART-B shall have minimum of 10 open-ended experiments.
2. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.
3. Both PART-A and PART-B are considered for CIE and SEE.
4. Students have to answer 1(one) question from PART-A and 1(one) question from PART-B.
5. The questions for CIE and SEE shall be included from among the experiments under PART-A and shall be evaluated for 25 marks out of the maximum 50 marks.
6. The open-ended question set for CIE and SEE shall be any other open-ended question not done in regular lab sessions under PART-B and shall be evaluated for 25 marks out of the maximum 50 marks.
7. The student shall be evaluated in every lab session for 30 marks and finally the average of all evaluations shall be considered as continuous evaluation for 30 marks.



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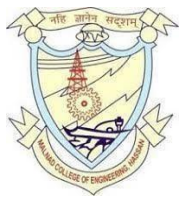
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Assessment Structure for Integrated Laboratory Courses (20 Marks)

Assessment	Marks	Minimum marks to qualify
Continuous Evaluation in every lab session by the Course Coordinator	30	12
Laboratory CIE - conducted for 50 marks and scaled down to 20	20	8
Total	50	20
*** Integrated Lab Course marks shall be scaled down to 20		

1. The laboratory syllabus shall consist of PART-A and PART-B. PART-A has shall have minimum of 10 fixed set experiments. PART-B shall have minimum of 10 open-ended experiments.
2. Open-ended experiments are a type of laboratory activity where the outcome is not predetermined and students are given the freedom to explore, design, and conduct the experiment based on the problem statements as per the concepts defined by the course coordinator. It encourages creativity, critical thinking, and inquiry-based learning.
3. Both PART-A and PART-B are considered for CIE.
4. Students have to answer 1(one) question from PART-A and 1(one) question from PART-B.
5. The questions for CIE shall be included from among the experiments under PART-A and shall be evaluated for 25 marks out of the maximum 50 marks.
6. The open-ended question set for CIE shall be any other open-ended question not done in regular lab sessions under PART-B and shall be evaluated for 25 marks out of the maximum 50 marks.
7. The student shall be evaluated in every lab session for 30 marks and finally the average of all evaluations shall be considered as continuous evaluation for 30 marks.



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Rubrics for Continuous Evaluation in Laboratory Courses **(30 marks)**

Performance Indicators	Excellent	Very Good	Good	Satisfactory
Fundamental Knowledge : Understanding the problem statement (4 Marks)	The student has in-depth knowledge of the topics related to the course (4)	Student has good knowledge of some of the topics related to course (3)	Student is capable of narrating the answer but not capable to show in depth knowledge (2)	Student has not understood the concepts clearly (1)
Design Of Experiment (5 Marks)	Student is capable of discussing more than one design for his/her problem statement and capable of proving the best suitable design with proper reason (5)	Student is capable of discussing few designs for his/her problem statement but not capable of selecting best (4)	Student is capable of discussing single design with its merits and demerits (2-3)	Student is capable of explaining the design (1)
Implementation (8 Marks)	Student is capable of implementing the design with best suitable algorithm considering optimal solution. (7-8)	Student is capable of implementing the design with best suitable algorithm and should be capable of explaining it (5-6)	Student is capable of implementing the design with proper explanation. (3-4)	Student is capable of implementing the design. (1-2)
Result & Analysis (5 Marks)	Student is able to run the program on various cases and compare the result with proper analysis. (5)	Student will be able to run the program for all the cases. (4)	Student will be able to run the code for few cases and analyze the output. (2-3)	Student will be able to run the program but not able to analyze the output. (1)
Demonstration and Documentation (8 Marks)	Demonstration is very good. The lab record is well organized, with clear sections (e.g., Introduction, Method, Results, and Conclusion). Transitions	Demonstration is good. The lab record is organized, with clear sections, but some sections are not well defined. (5-6)	Demonstration is not clear. The lab record lacks clear organization or structure. Some sections are unclear or incomplete. (3-4)	Demonstration is very poor. The lab record is poorly organized, with missing or unclear sections. (1-2)



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between sections
are smooth. (7-8)

Rubrics for CIE/SEE Test in Laboratory Courses

Performance Indicators	Superior(5)	Good(4)	Fair(3)	Needs Improvement(2)	Unacceptable(1)
Understanding of Experimental Principle	Excellent	Good	Satisfactory	Limited	Poor
Experimental Execution	Independent execution	Minor procedural errors	With guidance	Significant errors	Unable
Observation, Result & Interpretation	Accurate and scientific	Minor errors	Basic	Limited	Incorrect
Open-ended Problem Solving	Independent design	Good approach	Basic solution	Limited	Unable
Viva Voce & Scientific Communication	Excellent	Good	Satisfactory	Limited	Unable



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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



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THIRD SEMESTER												
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1	ASC	25MAAI301	Mathematics for AI&ML	42	0	0	48	90	50	50	100	3
2	IPCC	25AI302	Digital Systems for AI	42	0	28	50	120	50	50	100	4
3	IPCC	25AI303	Operating Systems	42	0	28	50	120	50	50	100	4
4	PCC	25AI304	Data Structures and Applications	42	0	0	48	90	50	50	100	3
5	PCC	25AI305	Introduction to Artificial Intelligence	42	0	0	48	90	50	50	100	3
6	PCCL	25AIL306	Data Structures Lab	0	0	28	2	30	50	50	100	1
7	PCCL	25AIL307	Web Application development	0	0	28	2	30	50	50	100	1
8	AEC	25AI308X	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	50	50	100	A
11	NCMC	25NYP1	NSS, YOGA, PE	0	0	0	28	28	100	-	100	A
12	NCMC	25BCM301	Bridge Mathematics-I (Non-Credit Mandatory Audit Course for Diploma entry students)	14	0	0	14	28	100	-	100	A
Total												21

13		25SKL1	Skill Lab	0	0	0	30	30	100	-	100	1
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Ability Enhancement Course (Laboratory)			
25AI308A	GO Programming	25AI308B	UI/UX
25AI308C	Technical writing using Latex	25AI308D	2D and 3D Game development



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FOURTH SEMESTER

Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week					Exam Marks			Credits
				L	T	P	TW & SL	TH/S	CIE	SEE	Total	
1	IPCC	25AI401	Design and Analysis of Algorithms	42	0	28	50	120	50	50	100	4
2	IPCC	25AI402	Database Management Systems	42	0	28	50	120	50	50	100	4
3	PCC	25AI403	Machine Learning	42	0	0	48	90	50	50	100	3
4	PCC	25AI404	Python for Data Science	42	0	28	50	120	50	50	100	4
5	PCC	25AI405	Object Oriented Programming with JAVA	42	0	0	48	90	50	50	100	3
6	PCCL	25AIL406	Machine Learning Lab	0	0	28	2	30	50	50	100	1
7	AEC	25AI407X	Ability Enhancement Course Laboratory	0	0	28	2	30	50	50	100	1
8	BSC	25AI408	Biology for Engineers	14	0	0	16	30	50	50	100	1
9	SDC	25EVS	Environmental Science Project	0	0	0	30	30	50	50	100	1
10	AEC	25PT2	Placement Training II	14	0	0	16	30	50	50	100	A
11	NCMC	25NYP2	NSS, YOGA, PE	0	0	0	28	28	100	-	100	A
12	NCMC	25BCM301	Bridge Mathematics-I (Non-Credit Mandatory Audit Course for Diploma entry students)	14	0	0	14	28	100	-	100	A
Total												22

13		25SKL1	Skill Lab	0	0	0	30	30	100	-	100	1
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Ability Enhancement Course (Laboratory)

25AI407A	Project Management with Git	25AI407B	NOSQL
25AI407C	Unix shell programming	25AI407D	iOS App Development with Swift



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Course Title	Mathematics for AI & ML		
Course Code	25MAAI301	(L-T-P) C	(3-0-0) 3
Exam	3 hours	Hours/Week	03
SEE	50 marks	Total Hours	42L + 48ABL = 90

Course Objective: To equip students with a strong foundation in linear algebra and computational statistics, enabling them to model and solve real-world problems in artificial intelligence, machine learning, and engineering, analyze and interpret data, make informed decisions based on statistical evidence, and effectively communicate analytical 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 linear algebra, vector spaces, descriptive statistics, probability distributions, sampling theory, and statistical inference to formulate and solve mathematical, statistical, and engineering problems.	1	-
2.	Analyze mathematical models and datasets using linear algebra, vector space techniques, probability distributions, statistical inference, hypothesis testing, and data analysis methods to support effective problem-solving and decision-making.	2	-
3.	Develop mathematical and statistical models for real-life engineering and analytical problems.	2, 3	-

MODULE - 1	10 Hrs.
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Linear Algebra: Importance of Matrices. Rank of a matrix. Nullity of matrix. Consistency of homogeneous and non-homogeneous system of equations, Computation of Eigen value and Eigen vectors, Diagonalization and powers of 3X3 matrices when Eigen values are already given.

Applications: Traffic - flow problem. Applications to web page ranking.

Self-Study- Application of Eigen value Eigen vectors in Signature testing, Jordan canonical matrices

MODULE - 2	10 Hrs.
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Vector Space: Basics of- Vector space, subspace, basis and dimension. Linearly dependent and independent vectors. Orthogonal sets, Orthogonal projections, Gram-Schmidt process, QR-factorization, least-square problems, Singular value decomposition.

Applications of Principal component analysis- to data compression and image processing.

Self-Study- Face recognition. Bases for Null space and Column space. Change of basis.

MODULE - 3	10 Hrs.
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Descriptive Statistics: Mean, variance and standard deviation.

Probability distributions: Continuous Probability distribution, Exponential distribution, Normal distribution, Uniform distribution.

Applications: AI-based traffic systems, face-recognition system

Self-study: Data visualization techniques (histograms, boxplots, QQ- plots).



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MODULE – 4	12 Hrs.
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	

Note – Theorems and properties without proof. Applicable to all the modules.

Self-study is not included in SEE

Prescribed Text Books:

Sl. No.	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Statistics	S C Gupta	7	Himalaya Publishing House	
2.	Statistics for Business: Decision Making and Analysis	Robert Stine	2	Pearson	2017
3.	Probability, Statistics and Random Process	T Veerarajan	3	Tata McGraw Hill Co.	2008
4.	Linear Algebra and its Applications	David C. Lay, Steven R. Lay and J.J. Mc Donald	5 ISBN-10:9350517698	Pearson Education Ltd	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Advanced Engineering Mathematics	E. Kreyszig	10	Wiley	2015
2.	Linear Algebra and its Applications	Gilbert Strang	4	Cenage publications	2014
3.	Probability and Statistics	Murray R. Spiegel, John J. Schiller & R. Alu Srinivasan	4	McGraw-Hill	2012

E Books and online course materials:

1. <https://www.coursera.org/learn/the-power-of-statistics>
2. <https://nptel.ac.in/courses/110107114>
3. https://www.geneseo.edu/~aguilar/public/assets/courses/233/main_notes.pdf



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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
4. <https://www.coursera.org/learn/introduction-to-linear-algebra>
5. <https://www.coursera.org/learn/linear-algebra-machine-learning>
6. <https://archive.nptel.ac.in/courses/111/106/111106135/>

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
3	Activity Based Learning (ABL1 & ABL2)	-	-	27
4	Evaluation of Learning Process	-	-	07
Total Learning Hours / Semester				90

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		

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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 (7 Hours)

Type of Evaluation	Hours
Test (1, 2)	3
Activity (1 and 2)	1
Semester End Exam	3
Total	7

Course Articulation Matrix

[illegible]



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Course Title	DIGITAL SYSTEMS FOR AI		
Course Code	25AI302	(L-T-P) C	(3-0-2) 4
Exam	3	Hours/Week	5
SEE	50 Marks	Total Hours	42L + 28P + 50ABL = 120
Objective: To provide foundational knowledge of digital systems, embedded system architecture, and Internet of Things (IoT) technologies, enabling students to analyze, design, and develop intelligent IoT-based systems for real-world applications. Course Outcomes: Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply the principles of digital logic circuits, data processing circuits, sequential circuits in the design of basic digital systems, IoT architectures, communication technologies, and protocols.	1	2
2	Analyze the architecture and working principles of embedded systems, microcontrollers, sensors, actuators, data flow and connectivity in IoT system and embedded platforms used in IoT applications.	1,2	2
3	Design and develop digital systems, embedded system architectures, and IoT-based intelligent solutions for various applications.	1,2,3	2
4	Collaborate Effectively in teams, demonstrate the working of different neural networks and document the results systematically.	1,2,3,5,8,9	1, 2, 3
MODULE-1			11 Hours
Digital Logic: The Basic Gates, NOT, OR, AND, Universal Logic Gates, NOR, NAND. Data Processing Circuits: Multiplexers, Demultiplexers, Encoder, Decoder, Magnitude Comparator, Exclusive OR Gates, Parity Generators and Checkers. Introduction to Sequential Circuits – Flip Flops: RS Flip Flop, D Flip Flop, T Flip Flop, JK Flip Flop, JK Master Slave Flip Flop			
MODULE-2			10 Hours
Introduction to Embedded Systems: Definition, Characteristics and Classification of Embedded Systems, Real-Time Embedded Systems. Embedded System Architecture: Basic Components of Embedded Systems, Processor, Memory, Input/Output Interfaces, Buses and Communication Interfaces. Microprocessors and Microcontrollers: Introduction, Comparison between Microprocessors and Microcontrollers, Overview of Embedded Processors and Controllers. Embedded System Programming Concepts: GPIO, Interrupts, Timers and Basic Interfacing Concepts. Embedded Platforms: Introduction to Arduino and Raspberry Pi, Features and Applications. Sensors and Actuators: Introduction, Types of Sensors and Actuators, Interfacing Concepts and Applications in Smart Systems.			
MODULE-3			11 Hours
Introduction to Internet of Things (IoT): Definition, Characteristics, IoT Ecosystem and Applications. IoT Architecture: Physical Design and Logical Design of IoT, IoT Functional Blocks, IoT Communication Models and IoT Levels. IoT Components: Sensors, Actuators, Embedded Devices, Gateways and Cloud Connectivity. IoT Communication Technologies: Wi-Fi, Bluetooth, ZigBee, RFID and NFC. IoT Communication Protocols: MQTT, HTTP and CoAP – Basic Concepts and Applications. IoT System Design: Basic IoT System Architecture and Data Flow in IoT Systems.			



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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

MODULE-4	10 Hours
Data Acquisition and Processing in IoT: Data Collection, Data Transmission and Data Storage Concepts. Cloud and Edge Computing: Introduction, Edge Devices and Cloud-Based IoT Systems. Introduction to AI in IoT (AIoT): Intelligent IoT Systems, Smart Devices and Automation Concepts. IoT Analytics and Visualization: Basic Concepts of Data Analytics and Visualization in IoT Systems. IoT Applications: Smart Home, Smart Healthcare, Smart Agriculture, Smart Cities and Industrial IoT. Security and Privacy in IoT: Basic Security Challenges, Privacy Issues and Safe IoT Practices.	

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	Lab Program Execution – 10 Marks Activity Based Learning – 10 Marks	20
Total		50

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Digital Principles and Applications	Donald P Leach, Albert Paul Malvino, Goutam Saha	3 rd	McGrawHill Education	2015
2.	Embedded Systems: Architecture, Programming and Design	Raj Kamal	3 rd	McGraw Hill Education	2012
3.	Internet of Things: A Hands-on Approach	Arshdeep Bahga and Vijay Madisetti	1 st	VPT	2016

Reference Books:

1.	Internet of Things and its Applications	Satish, Singh, Shashi Jain	1 st	BPB	2020
2.	Digital design	R. Anantha Natarajan	1 st	VPT	2015
	IoT based Projects Realization with RaspberryPi, Node MCU and Arduino	Dr. Rajesh Singh, Dr. Anita Gehlot, et.al.	1 st	BPB	2020

eBooks and online course materials:

1. <https://www.arduino.cc/reference/en>
2. <https://create.arduino.cc/projecthub>
3. <https://maker.pro/raspberry-pi/tutorial>
4. <https://projects.raspberrypi.org/en/projects>
5. <https://www.digikey.com/en/maker/blogs/2019/how-to-use-mqtt-with-the-raspberry-pi>

Online Courses and Video Lectures:

1. <https://www.coursera.org/specializations/iot>
2. https://onlinecourses.nptel.ac.in/noc22_cs53/preview
3. <https://www.udemy.com/topic/internet-of-things/?srsltid=AfmBOookiX60lxygYruGgFT4k9PLzonugxExqJFfvzt3CdE7ALO1djfb>



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

#	List of Experiments
PART-A	
1.	Push Button and RGB LED Control GPIO input/output configurations; internal pull-up/pull-down resistors; digital state management; LED colour blending using PWM duty cycle on RGB module.
2.	Servo Motor Control and Motor Driver Control Generate PWM signals to position a metal gear servo motor at precise angular positions; operate the RICK 4-channel H-Bridge motor driver to control DC motor speed and direction.
3.	MPU6050 IMU and OLED Display Integration Interface MPU6050 accelerometer and gyroscope over I2C; read raw sensor registers; apply scaling to obtain g-force and °/s values; display live data on SSD1306 OLED.
4.	Ultrasonic, PIR, IR Sensor Data Logging to SD Card Interface HC-SR04 ultrasonic sensor (timing-based), PIR motion sensor, and IR proximity sensor; log timestamped multimodal sensor data as CSV to SD card via SPI.
5.	Speech-to-Text and Text-to-Speech via Cloud API Capture audio using the RICK onboard INMP441 microphone via I2S; stream to a cloud STT API; process text response through LLM; convert reply to speech via TTS API and play on speaker.
6.	Soil Moisture, DS18B20, and Water Pump – Automated Irrigation System Read soil moisture level via ADC; measure temperature via DS18B20 1-Wire sensor; trigger relay to activate 12V water pump when threshold conditions are met – closed-loop control.
7.	RFID Access Control with Solenoid Lock and Speaker Read RFID tag UID via SPI (RC522); implement state machine for authentication (grant/deny/timeout); activate solenoid lock and play corresponding audio tones on speaker.
8.	Microphone and Speaker Integrated with AI (LLM Voice Assistant) Capture user voice via I2S mic on RICK; transmit audio to LLM API (Claude/OpenAI) over WebSocket/REST; parse JSON response; play TTS audio reply on speaker – full AI voice assistant.
9.	Camera, Speaker, and Microphone Integrated with AI (Multimodal Edge AI) Capture JPEG frames via ESP32-CAM module; bundle with audio input; send to multimodal LLM API; synchronize visual analysis response with TTS voice output.
10.	Sending DHT22 Sensor Data to the Cloud (IoT Telemetry) Interface DHT22 temperature and humidity sensor; connect RICK to WiFi; publish telemetry to ThingSpeak or Firebase using MQTT or HTTP POST; create live dashboard.
PART-B	
Open Ended Experiments	
1.	Smart LED Lighting System using LDR Sensor
2.	Automatic Room Temperature Monitoring using DHT22 Sensor
3.	Smart Water Level Indicator and Alarm
4.	Automatic Plant Watering System using Soil Moisture Sensor
5.	Motion Detection and Security Alarm using PIR Sensor
6.	RFID-Based Student Attendance System
7.	Smart Doorbell with Push Button and Buzzer
8.	Distance Measurement and Obstacle Detection using Ultrasonic Sensor
9.	Home Appliance Control using Bluetooth/Wi-Fi
10.	IoT-Based Weather Monitoring System (Temperature & Humidity Display)



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Activity Based Learning (41 Hours)

ABL: Analyze, design and present a neural network solution to a real-world problem		Hours
1.	Problem Identification	4
2.	Simulation of the design	30
3.	Report	5
4.	Presentation	1
Total		41

Evaluation of Learning Process (9 Hours)

Type of Evaluation	Hours
CIE (1,2)	3
Lab Program Execution	2
ABL Presentation	1
SEE	3
Total	9

Course Articulation Matrix

Course Outcomes	Program Outcomes											Program Specific Outcomes		
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO3
CO1	3												2	
CO2	2	3											2	
CO3	2	2	3										2	
CO4	2	2	2		3			2	1			2	3	3



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	OPERATING SYSTEMS		
Course Code	25AI303	(L-T-P) C	(3-0-2)4
Exam	3	Hours/Week	5
SEE	50 Marks	Total Hours	42L + 28P + 50ABL =120
Course Objective: Students will be able to understand the working of operating system and its components. Course Outcomes: Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply the process scheduling, disk Scheduling and memory management algorithms for processes, disk and memory management	1	-
2.	Analyze the given scenario and identify the appropriate algorithm and solve the problems	1,2	2
3.	Design solutions for process synchronization and deadlock prevention using synchronization techniques and apply concepts of memory management strategies in various scenarios	1,2,3	3
4.	Work collaboratively and demonstrate the operating system concepts and algorithms and its applications through clear documentation and presentation	1,2,3, 5, 8, 9	-
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			11 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			11 Hours
Virtual Memory Management: Background; Demand Paging; Page Replacement. Storage Management: Secondary Storage Structures, Protection: Mass Storage Structures; Disk Structure; Disk Scheduling; File System Interface. Protection: Goals of Protection, Principles of Protection, Domain of Protection- Domain Structure, Access Matrix, Implementation of Access Matrix.			



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Operating System Concepts	Abraham Silberschatz, Peter Baer Galvin, Greg Gagne	10 th Edition	John Wiley	2023

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Modern Operating Systems - A Concept Based Approach	Andrew.S. Tanenbaum	4th Edition	Addison Wesley	2015
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

E-Books and online course materials:

1. <https://www.geeksforgeeks.org/different-approaches-or-structures-of-operating-systems/>
2. <https://www.javatpoint.com/system-calls-in-operating-system>

Online Courses and Video Lectures:

1. <https://nptel.ac.in/courses/106/105/106105214/>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and 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	Open-Ended Experiments	-	-	41
4	Evaluation of Learning Process	-	-	9
Total Learning Hours / Semester				120

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
Integrated Lab	Lab Program Execution – 20 Marks	20
Total		50



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Integrated Lab Component (28 Hours)

Program Details

PART A

1. Achieve the following using basic UNIX commands and vi editor:

- a. create a file, identify its attributes
- b. edit the file contents using vi editor: insert-lines, words, copy-lines, words, delete-lines words, cut-lines words, append, search, navigating across the file
- c. change the permissions of the files – both octal and symbolic notations
- d. create a new user and change the ownership of the file
- e. record your login session
- f. change any 3 terminal characteristics
- g. create a directory structure, remove the current working directory and navigate across the file system – absolute and relative paths
- h. create hard link and symbolic link for a file and identify the same in the file system
- i. Identify no. of processes and explore any three options

2. Create a database file using space as a delimiter. How do you achieve the following?

- a. Display first 6 lines of the file
- b. Display last 6 lines of the file
- c. Display lines from 5 to 8 of the file
- d. Display specified columns from a file
- e. Combine two files vertically
- f. Sort the file based on field attributes
- g. Search a given file
- h. Count the number of characters, words and lines in a file
- i. demonstrate to zip and unzip the files.

3. Given a file, achieve the following operations:

- a. Redirect the file contents to both terminal and a new file
- b. Enter a wrong command and redirect the error to a error file
- c. Rectify the command and append the output to the same error file
- d. Execute, cat file1.c nofile , Redirect the output of successful command to a file and error to error file
- e. Given two files, compare them using different filters
- f. Redirect the output of a command to /dev/null . What is your observation?
- g. Search a file based on a criteria
- h. Identify suitable command for input redirection
- i. Use system control command and run the job in background.
- j. Illustrate ps, sig, kill, system commands



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

4. Create a text file, How do you achieve the following using GREP:

- a. Remove the blank lines from the file
- b. List the 5 character palindromes
- c. Select lines that have exactly 5 characters
- d. Select the lines with leading or trailing zeros
- e. Number the above lines of text
- f. Select lines that do not start with A to K.
- g. List the dates available in mon/dd/yyyy
- h. Select lines that contain floating point nos.
- i. Select the lines that contain only one hex number
- j. Simulate wc -l, cat f1 f2.

5. Create a text file, how do you achieve the following using sed :

- a. Replace all Read with Retrieve
- b. Delete the blank line that follows the line that starts with an alphabet.
- c. Double space the file
- d. Extract the first word of each line
- e. Extract the year from the date in mm/dd/yyyy format
- f. Print the line following a pattern match
- g. Merge the odd numbered line and even numbered line. Eg. Merge 1st and 2nd line, 3rd and 4th line ,
- h. Delete any integer in each line.
- i. Insert header info “Summary sheet” available in the file new.txt
- j. Simulate copy, head and tail

6. Develop a Menu driven shell script that accepts two real numbers from the user to simulate a simple calculator. Display the result with suitable messages. Also, the program must take care of handling divide by zero error and the precision of the result must be 4.

[Hint : To perform modulo operation, typecast the values].



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

7. Develop a shell script that computes the Gross Salary and Net Salary of 'n' employees according to the following:

- a. if basic salary is < 1500 then HRA 10% of the basic, DA = 90% of the basic and PF = 12% of the basic.
- b. if basic salary is ≥ 1500 then HRA 500, DA = 98% of the basic and PF = 15% of the basic.

The basic salary and no of employees 'n' must be entered interactively through the keyboard. The salary details (Sl. No, Employee name, Basic Salary, HRA, DA, PF, Gross Salary and Net Salary) must be displayed in tabular format with suitable message.

8. Develop a shell script that accepts a list of filename as its arguments and perform the following:

- a. counts and reports the occurrence of each word that is present in the first argument file on other argument files.
- b. Checks every argument specified is a file or a directory and report accordingly. Whenever the argument is a file, the number of lines on it is also reported

9. Develop a shell scripts using functions to perform the following :

- a. To check the given string is palindrome or not. Display the input string, reversed string and the result with suitable messages.
- b. To find the substring in a given string.

Input to the shell script must be accepted from the user and display the resultant string(s) along with input string(s) with suitable messages

10. Develop a shell script to check the permission of a file, print file line contents along with line numbers and copy the contents of files to another file.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

PART B Open-Ended Experiments:

1. Write programs using the I/O system calls of UNIX/LINUX operating system.
2. Write a C program simulate the following CPU scheduling algorithms:
a) FCFS b) SJF
3. Write a C program simulate the following CPU scheduling algorithms
a) Round Robin b) Priority
4. Write a C program which demonstrates interprocess communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.
5. Write a C program to simulate producer - consumer problem using semaphores.
6. Write a C program to simulate Bankers algorithm for Deadlock Avoidance and Prevention.
7. Write a C program to simulate FIFO page replacement algorithms
8. Write a C program to simulate LRU page replacement algorithms
9. Write a C program to simulate the following memory segment techniques
a) Paging b) Segmentation
10. Write a C program to simulate SCAN disk scheduling algorithms.

Assessment Structure for Integrated Laboratory Courses (20 Marks) :

Assessment	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
*** Integrated Lab Course marks shall be scaled down to 20	

Evaluation of Learning Process (9 Hours)

Type of Evaluation	Hours
CIE (1,2)	3
Lab Program Execution	2
Open-Ended Experiments	1
SEE	3
Total	9

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2	PSO3
CO1	2													
CO2	2	2											1	2
CO3	2	2	2										1	2
CO4	2	2	2		3			3	3					



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	DATA STRUCTURES AND APPLICATIONS		
Course Code	25AI304	(L-T-P) C	(3-0-0)3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	42 L + 40 ABL + 8 ELP = 90
Course Objective: Students will be able to use appropriate data structures for solving problems. Course Outcomes: Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply principles of Data Structures for solving problems	1	-
2.	Analyze and develop operations on linear and non-linear data structures	1,2	-
3.	Design various methodology for organizing data and solving basic programming challenges using Linear Data Structures.	1,2,3	-
4.	Work collaboratively and demonstrate the applications of Data Structures in solving the real time problems.	1,2,3,5, 8, 9	1
MODULE-1			11 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 and examples: 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 postfix expression, converting an expression from infix to postfix, Program to convert an expression from infix to postfix.			
MODULE-2			10 Hours
Recursion - finding GCD, Fibonacci Series, Recursion Types, Tower of Hanoi, and Recursion versus iteration. Queues and lists: The queue and its sequential representation: C implementation of queues, Insert operation, Priority queue, Array implementation of a priority queue. Linked lists: Inserting and removing nodes from a list, Linked implementation of stacks. Getnode and freenode operations.			
MODULE-3			11 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.			



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

MODULE-4	10 Hours
Trees -Binary trees: Operations on binary trees, Applications of binary trees. Binary tree representation: Node representation of binary tree, Internal and external node, Implicit array representation of binary trees, choosing a binary tree representation, Binary tree traversals in C, Threaded binary trees.	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data structures using C and C++	Reema Thereja	2nd	Oxford Press	2017
2.	Data structures using C and C++	Yedidyah Langsam and Moshe J. Augenstein and Aaron M.Tenanbaum	1 st edition	PHI	2008

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures: A Pseudo-code approach	C –Gilberg and Forouzan	2 nd edition	Cengage Learning	2014
2.	An Introduction to Data Structures with Applications	Jean-Paul Tremblay & Paul G. Sorenson	2 nd Edition	McGraw Hill	2013

EBooks and online course materials:

1. <https://www.geeksforgeeks.org/dynamic-memory-allocation-in-c-using-malloc-calloc-free-and-realloc/>
2. <https://www.javatpoint.com/dynamic-memory-allocation-in-data-structure>

Online Courses and Video Lectures:

1. <https://nptel.ac.in/courses/106/102/106102064/>

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	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1 & ABL2)	-	-	40
6	Evaluation of Learning Process	-	-	8
Total Learning Hours / Semester				90



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

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) Project based Learning (15 M) 2) Competitive Coding Platform/ MOOC course (5 M)	20
Total		50

Activity Based Learning (40 Hours)

ABL1 (30 Hours): Students will apply the key data structure concepts such as Stacks, Queues, Linked List and Trees to solve the real-time problems reflecting their practical applications.		Hours
1	Problem Statement: Choose a domain (e.g., Library Management, Booking System, Event Management etc.).	3
2	Create different modules to solve the given problem	9
3	Implement the different modules of the program	9
5	Test the modulus and final workflow	9
Total		30
ABL2 (10 Hours): Applied Problems solving through Competitive Coding Platforms		Hours
1	Students practice and solve various problems on any online programming platforms	10
Total		10
Total Learning Hours/ Semester		40

Evaluation of Learning Process (8 Hours)

Type of Evaluation	Hours
CIE (1,2)	3
Activity Presentation and Evaluation	2
SEE	3
Total	8

Course Articulation Matrix

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



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	INTRODUCTION TO ARTIFICIAL INTELLIGENCE		
Course Code	25AI305	(L-T-P) C	(3-0-0)3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	42 L + 41 ABL + 7ELP = 90

Course Objective:

- To equip students with the fundamental concepts and techniques of Artificial Intelligence, including search strategies, logic, and knowledge representation.
- To enable students to analyze, design, and develop intelligent systems and apply AI methods to solve complex real-world engineering problems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the foundational principles of Artificial Intelligence, including agent architectures, search strategies, logic, and adversarial techniques, and Apply them to formulate and solve engineering problems.	1	1,2
2.	Apply appropriate AI techniques including search algorithms, knowledge representation, logical inference, and adversarial strategies to analyze and solve complex, real-world engineering problems.	1,2	1,2
3.	Design and develop intelligent AI solutions by integrating knowledge representation, inference, search, and optimization methods to address complex engineering challenges .	1,2,3,4	2,3
4.	Create AI-based applications by applying knowledge of agents, search, logic, and optimization, analyse and document results through technical reports and presentations.	1,2,3,4,5	2,3

MODULE-1	11 Hours
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Introduction: What is AI? **Intelligent Agents:** Agents and environment; Good behavior: The Concept of Rationality; the nature of environment; the structure of agents.

Solving Problems by Searching: Problem-solving agents, Example problems; Search Algorithms; Uninformed search strategies: Breadth-first search, Uniform-cost search, Depth-first search, Depth-limited search, Iterative deepening depth-first search, Bidirectional search.

MODULE-2	11 Hours
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Informed (Heuristic) Search Strategies: Greedy best-first search, A* search, Optimality of A*, Memory-bounded search.

Local Search Algorithms and Optimization Problems: Hill-climbing search, Simulated annealing, Local beam search, Genetic algorithms.

Logical Agents: Knowledge-based agents; The Wumpus world, Logic, propositional logic.

MODULE-3	10 Hours
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First-Order Logic: Representation revisited; Syntax and semantics of first-order logic; Using first-order logic, Knowledge engineering in first-order logic.

Inference in first-order logic: propositional versus first-order inference, uniform and lifting, forward chaining, and backward chaining.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

MODULE-4	10 Hours
Adversarial Search & Games: Game theory optimal decision in games, heuristic alpha beta tree search. Ethics and Safety of AI: The Limits of AI, The Ethics of AI: autonomous weapons, Surveillance, security, and privacy, Fairness and bias, Trust and transparency, The future of work, Robot rights, AI Safety.	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Artificial Intelligence - A Modern Approach	Stuart Russell and Peter Norvig	4 th edition	Pearson	2022
2.	Artificial Intelligence	Elaine Rich, Kevin Knight, Shivashankar B Nair	3rd Edition	Mc Graw Hill Education	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Artificial Intelligence and Expert Systems	Dan W Patterson	1st Edition	Pearson	2015
2.	Introduction to Expert Systems	Peter Jackson	3rd Edition	Pearson Education	2007

E-Books and online course materials:

1. <https://www.javatpoint.com/agents-in-ai>
2. <https://www.geeksforgeeks.org/agents-artificial-intelligence/>

Online Courses and Video Lectures:

1. <https://www.edx.org/course/artificial-intelligence-uc-berkeleyx-cs188-1x>
2. <https://www.udacity.com/course/intro-to-artificial-intelligence--cs271>
3. <https://www.class-central.com/subject/ai>

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	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1 & ABL2)	-	-	41
6	Evaluation of Learning Process	-	-	7
Total Learning Hours / Semester				90



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

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) Design and Development of an AI-Based Chatbot. (15 marks) 2) Building a Real-Time AI System using Teachable Machine (5 marks)	20
Total		50

Activity Based Learning (41 Hours)

ABL1 (30 Hours): Students will design and build an AI-powered Chatbot using any AI workflow tool (such as n8n, Flowise, Botpress, or equivalent), applying AI concepts like intent recognition, natural language understanding, and conversational agent design.		Hours
1	Problem Statement: Choose a domain for the chatbot (e.g., College Helpdesk, Library Assistant, Hospital Query Bot, Travel Guide).	3
2	Select an AI workflow tool, set up the environment, and design the chatbot flow with intents, entities, and response logic.	9
3	Build and integrate the chatbot using the chosen AI workflow, incorporating NLP capabilities and conversational logic.	9
4	Test the chatbot interactions, refine responses, and validate against the problem statement.	5
5	Document the design, workflow used, AI concepts applied, test results, and observations in a structured report.	4
Total		30
ABL2 (11 Hours): Students will build a real-time image or audio classifier without coding Using Teachable Machine. They'll explore supervised learning and model training through live examples.		Hours
1	Problem Statement: Choose a classification task (e.g., hand gesture recognition, emotion detection, object classification).	2
2	Collect and label training data using a webcam or uploaded images. (min 30 samples)	2
3	Train an AI model using Teachable Machine's user-friendly interface.	2
4	Test the trained model in real time using their webcam or microphone.	1
6	Prepare a report including screenshots, observations, and explanation of AI concepts used.	4
Total		11
Total Learning Hours/ Semester		41



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1,2)	3
Activity Presentation	1
SEE	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	-	-	-	-	-	-	-	-	-	-	2	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	2	3	-
CO3	3	3	2	2	-	-	-	-	-	-	-	-	2	3
CO4	3	3	2	2	2	-	-	2	2	2	2	-	2	3



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	DATA STRUCTURES LAB		
Course Code	25AIL306	(L-T-P) C	(0-0-2)1
Exam	3	Hours/Week	2
SEE	50 Marks	Total Hours	28P+2E=30

Course Objective: Students will be able to use appropriate data structures to solve the given problem.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply fundamental programming concepts to design and implement algorithms for solving problems related to data structures such as arrays, stacks, queues, linked lists, and trees.	1	-
2	Develop menu-driven programs to simulate and solve real-world computational problems using appropriate data structures and algorithms.	3	-

Part - A	
Sl. No	Program details
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 1. Searching an element in a given list of integers using the Binary search method. 2. Solving the Towers of Hanoi problem.
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



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

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.	A shopping mall maintains the IDs of vehicles parked in its parking area. As vehicles enter and leave throughout the day, the parking records need to be updated efficiently. Design and implement a Smart Parking Management System using an arrays.	
2.	Design and implement a Library Book Return Management System in C using a Stack.	
3.	An organization maintains employee records using unique Employee IDs. To efficiently organize and retrieve employee information. Design an Employee Management System. using a Binary Search Tree.	
4.	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.	
5.	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.	
6.	Hospital Patient Token Management Using Queue.	
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.	A phonebook stores contact information in ascending alphabetical order based on the contact names to enable efficient organization and retrieval. Each contact consists of a Name and a Phone Number. Design and implement a C program using a Singly Linked List to develop a Phonebook Management System.	
9.	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	
10.	A college stores student records using Student IDs as unique keys. To facilitate quick searching and ordered retrieval, the records are maintained using a Binary Search Tree.	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data structures using C and C++	YedidyahLangsam and Moshe J. Augenstein and Aaron M.Tenanbaum	1 st edition	PHI	2008

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Data Structures: A Pseudo-code approach with C	Gilberg and Forouzan	2nd edition	Cengage Learning	2014
2.	An Introduction to Data Structures with Applications	Jean-Paul Tremblay & Paul G. Sorenson	2ndEdition	McGraw Hill	2013



1. <https://www.geeksforgeeks.org/dynamic-memory-allocation-in-c-using-malloc-calloc-free-and-realloc/>
2. <https://www.javatpoint.com/dynamic-memory-allocation-in-data-structure>

1. <https://nptel.ac.in/courses/106/102/106102064/>

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Lab Conduction	2	14	28
2	Evaluation	-	-	2
Total Learning Hours / Semester				30

Assessment	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

Tool	Remarks	Marks
Internals Assessment Plan	Record – 10 Marks Continuous Evaluation – 15 Marks Viva – 5 Marks Lab CIE – 20 Marks	50
Total		50

[illegible]



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	WEB APPLICATION DEVELOPMENT		
Course Code	25AIL307	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28P + 2E = 30

Course Objective: Equip students with the skills to develop dynamic web applications using comprehensive range of web technologies.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply the basic web development constructs to build the web pages	1	-
2	Analyze the given scenario and build the webpage using suitable web development techniques	1,2	-
3	Design and develop interactive web pages	1,2,3	1
4	Create an end-to-end web pages connected to database using modern tools and present the results	1,2,3,4,5,8,9,11	1

Course Contents

Part A

Lab 1:Setting Up Environment

- Install and configure a local server environment (e.g., XAMPP, WAMP).
- Set up PHP, MySQL, Apache, and a text editor for coding.
- Verify functionality by running a simple HTML page.

Lab 2:HTML Basics

- Learn HTML syntax, elements, and attributes.
- Create a webpage structure using HTML tags, including headings, paragraphs, lists, and links.
- Understand semantic HTML and its importance for accessibility and SEO.

Lab 3: Additional HTML Techniques

Design a static web page using basic HTML that fulfills the following requirements:

1. Timetable Table:

- Create a weekly class timetable using the <table> tag.
- Use appropriate rows and columns for days (Mon–Sat) and lecture slots (Periods 1 to 6).

- Apply:

- Row span/Col span to merge cells for lunch break or labs.
- Cell padding and Cell spacing attributes to improve table readability.
- Appropriate borders, background colours, and alignment.

To design a weekly class timetable using HTML with proper table formatting techniques



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Lab 4: Additional HTML Techniques

Write an HTML program to create a simple Google Form-like registration form. The form should include the following fields:

- Headline – A title for the form (e.g., "Student Registration Form")
- Name – Text input
- Age – Number input
- Date of Birth – Date input
- Sex/Gender – Radio buttons (Male / Female / Other)
- Email – Email input
- Phone Number – Text or number input
- Submit Button

Lab 5: CSS Basics

- Understand the basics of CSS, including selectors, properties, and values.
- Style HTML elements using CSS to control layout, typography, colors, and backgrounds.

Lab 6: More CSS Basics

- Explore CSS box model and positioning techniques.

Lab 7: More CSS Basics

Design and develop a web-based feedback form using HTML and internal CSS that simulates the appearance and behavior of a Google Form. Your form should include the following fields:

- Full Name (Text input)
- Email Address (Email input)
- How did you hear about us? (Dropdown menu with 4+ options)
- Would you recommend us to others? (Radio buttons: Yes / No)
- Your Comments (Text area box)
- Submit Button (Styled appropriately)

Lab 8: More CSS Techniques

- Dive deeper into CSS with advanced styling techniques such as CSS Flex box and CSS Grid for layout design.
- Implement responsive design principles using media queries to create websites that adapt to different screen sizes.

Lab 9: Basic JavaScript

- Introduce JavaScript syntax, variables, data types, and operators.
- Write simple scripts to manipulate the DOM, such as changing text content, modifying styles, and handling events.

Lab 10: DOM Manipulation with JavaScript

- Explore the Document Object Model (DOM) and its relationship with HTML elements.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

- Use JavaScript to select DOM elements and manipulate their properties and attributes.
- Implement basic interactivity in a web page by responding to user actions using JavaScript event listeners and handlers. Design a form with a USN input field and validate whether the entered USN is valid or not.

Part B

Experiment 1: Personal Portfolio Webpage

Objective: Design a personal portfolio webpage using HTML.

Requirements:

- Display your name as the main heading.
- Add a profile image.
- **Include sections:**
 - About Me
 - Education
 - Skills
 - Projects
 - Contact Information
- Use lists, hyperlinks, images, and semantic HTML tags.
- Add links to social media or GitHub.

Learning Outcome:

Understand the use of semantic HTML tags and webpage structuring.

Experiment 2: College Department Webpage

Objective: Create a webpage representing a college department.

Requirements:

- Department name and logo.
- Vision and Mission.
- Faculty list using tables.
- Courses offered using unordered or ordered lists.
- Laboratory facilities.
- Contact details with hyperlinks.

Learning Outcome:

Learn webpage organization using headings, tables, images, and hyperlinks.

Experiment 3: Tourist Place Information Page

Objective: Design an informative webpage about a famous tourist destination.

Requirements:

- Destination name.
- Images of the place.
- History and importance.
- Best time to visit.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

- Places to explore.
- Travel tips.
- Link to the official tourism website.

Learning Outcome:

Practice combining different HTML elements into a structured information page.

Experiment 4: Restaurant Menu Website

Objective: Create a restaurant menu webpage.

Requirements:

- Restaurant name and logo.
- Categories:
 - Starters
 - Main Course
 - Desserts
 - Beverages
- Menu displayed using tables.
- Prices.
- Contact information.
- Online order hyperlink.

Learning Outcome:

Understand the use of tables, lists, images, and hyperlinks in webpage design.

CSS - Open-Ended Experiments)

Experiment 5: Responsive Product Card Design

Objective: Design attractive product cards using CSS.

Requirements:

- Product image.
- Product title.
- Description.
- Price.
- Buy Now button.
- Hover effects.
- Responsive layout using Flexbox.

Learning Outcome:

Learn Flexbox, shadows, transitions, and responsive design.

Experiment 6: College Event Poster Webpage

Objective: Create a colorful event poster using HTML and CSS.

Requirements:

- Event title.
- Date and venue.
- Attractive typography.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

- Background image or gradient.
- Register button.
- Responsive design.

Learning Outcome:

Apply typography, colors, backgrounds, and positioning.

Experiment 7: Responsive Photo Gallery

Objective: Design a responsive image gallery.

Requirements:

- Display at least 12 images.
- Use CSS Grid.
- Hover zoom effect.
- Rounded corners.
- Responsive layout for mobile, tablet, and desktop.

Learning Outcome:

Practice CSS Grid, transitions, and media queries.

Experiment 8: Student Dashboard Interface

Objective: Create a student dashboard homepage.

Requirements:

- Header.
- Navigation menu.
- Student profile card.
- Attendance card.
- Marks card.
- Timetable section.
- Footer.
- Responsive layout using Flexbox/Grid.

Learning Outcome:

Develop complete webpage layouts using modern CSS techniques.

JavaScript - Open-Ended Experiments

Experiment 9: Student Grade Calculator

Objective: Develop a web application to calculate student grades.

Requirements:

- Input marks for five subjects.
- Calculate:
 - Total
 - Average
 - Percentage
 - Grade



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

- Display results dynamically without reloading the page.
- Validate user input.

Learning Outcome:

Understand variables, operators, conditional statements, functions, and DOM manipulation.

Experiment 10: Digital Stopwatch

Objective: Develop a digital stopwatch using JavaScript.

Requirements:

- Display elapsed time.
- Start button.
- Stop button.
- Reset button.
- Update timer every second.
- Use JavaScript timing functions.

Learning Outcome:

Learn JavaScript event handling, timers (setInterval/clearInterval), and dynamic DOM updates.

Practical Components

Guided Experiments:

1. Write a program to set up a local server environment using XAMPP or WAMP for PHP development. Include instructions for configuring PHP, MySQL, and Apache.
2. Write a program to create a simple webpage structure using HTML tags. Include headings, paragraphs, lists, and links in your webpage.
3. Design a static HTML web page to display a weekly class timetable using the <table> tag with proper rows, columns, borders, background colors, and alignment. Include merged cells using row span/col span, and apply cell padding and cell spacing for better formatting.
4. Write an HTML program to create a Google Form-like registration form with the following fields: Headline, Name, Age, Date of Birth, Gender (Male/Female/Other), and Email using appropriate HTML input types.
5. Write a program to style HTML elements using CSS to control layout, typography, colors, and backgrounds. Apply CSS styles to headings, paragraphs, and lists.
6. Explore the CSS box model and positioning techniques by styling HTML elements. Use CSS selectors, properties, and values to control layout, typography, colors, and backgrounds.
7. Design a Google Form-like feedback form using HTML and internal CSS with fields for Full Name, Email, Source (dropdown), Recommendation (radio), Comments, and a styled Submit button.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

8. Write a program to implement CSS Flex box for layout design. Create a webpage layout with flexible boxes that adjust based on screen size.
9. Write simple JavaScript scripts to manipulate the DOM by dynamically changing text content, modifying styles, and handling events on HTML elements. Implement basic interactivity in a web page by responding to user actions using JavaScript event listeners and handlers.
10. Implement basic interactivity in a web page by responding to user actions using JavaScript event listeners and handlers. Design a form with a USN input field and validate whether the entered USN is valid or not.

11. Open-Ended Experiments:

Design and develop a complete web application or website that incorporates concepts learned throughout the course, including HTML, CSS, JavaScript, (it may include PHP, MySQL) for web development.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Learning PHP, MySQL, JavaScript, CSS & HTML5	Robin Nixon	3 rd Edition	Oreilly	2016.

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Programming the World Wide Web	Robert W Sebesta	8th Edition	Pearson Edition	2014
2.	Web Programming Building Internet Applications	Chris Bates	3 rd Edition	Wiley India	2014
3.	Open Source Web Development with LAMP	James Lee, Brent Ware	3 rd Edition	Pearson Education	2013.

Online Courses and Video Lectures:

1. <https://www.youtube.com/watch?v=7nX6tbcEw6k&feature=youtu.be>
2. <https://www.youtube.com/watch?v=7nX6tbcEw6k>
3. <https://www.youtube.com/watch?v=zRBnIqLThBU>

MOOCS:

1. https://online-degree.swayam2.ac.in/mri22_01_d03_s1_el10/preview



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Lab Conduction	2	14	28
2	Evaluation	-	-	2
Total Learning Hours / Semester				30

Assessment structure for Exclusive Laboratory Courses:

Assessment	Marks	Min Marks To qualify
Continuous Evaluation in every lab session by the Course Coordinator	30	12
Laboratory CIE-conducted for 50 marks and scaled down to 20	20	8
Total	50	20

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals Assessment Plan	Record – 10 Marks Continuous Evaluation – 15 Marks Viva – 5 Marks Lab CIE – 20 Marks	50
Total		50

Course Articulation Matrix:

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO1	2													
CO2	2	2												
CO3	2	2	2									3		
CO4	2	2	2	2	3			3	3		2	3		



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	GO PROGRAMMING LANGUAGE LABORATORY		
Course Code	25AI308A	L-T-P-C	(0-0-2)1
Exam Hrs.	3	Hours / Week	2
CIE	50 Marks	SEE	50 Marks
Total Hours	28L+2EV = 30		

Course Objective: Design and learn Go programming concepts by building a real-world CLI application, covering Go syntax, data structures, concurrency, and package organisation.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Set up the Go development environment and write, compile, and execute basic Go programs demonstrating variables, constants, data types, and formatted output.	1,3,5,9,10	-
2	Apply control flow structures (loops, conditionals, switch), functions, and scope rules to solve programming problems in Go.	1,3,5,9,10	-
3	Use Go data structures — arrays, slices, maps, and structs — to model and manipulate data effectively.	1,3,5,9,10	-
4	Implement concurrent programs using Goroutines, organize code with packages, and apply Go's pointer semantics in real-world CLI applications.	1,3,5,9,10	-

Course Contents:

PART A

1. Install Go, configure the GOPATH/GOROOT environment variables, and set up VS Code with the Go extension. Write and run a 'Hello, World!' program from the terminal using go run and go build. Explore the go.mod file and understand module initialisation with go mod init.
2. a) Write a Go program to demonstrate the use of variables and constants. Declare variables using var and the short declaration operator :=. Use multiple assignment and swap two values without a temporary variable.
 - a) b) Write a Go program to demonstrate all basic data types (int, float64, string, bool). Use the fmt.Printf function with format verbs (%v, %T, %d, %f, %s, %t) to display the type and value of each variable.
3. a) Write a Go program that accepts user input using fmt.Scan / fmt.Println and performs formatted output using fmt.Sprintf and fmt.Printf.
 - b) b) Write a Go program to illustrate the use of pointers: declare a pointer, dereference it, pass a pointer to a function, and demonstrate how in-place modification differs from pass-by-value.
4. Write a Go program to implement arrays and slices:
 - c) a) Declare a fixed-size array and iterate over it.
 - d) b) Create a slice, append elements, use slice expressions, and demonstrate that slices reference the underlying array.
 - e) c) Write a function that removes a duplicate element from a slice and returns the modified slice.
5. a) Write a Go program to demonstrate all loop constructs in Go (traditional for, for as while, for-range over a slice, infinite loop with break).
 - f) b) Write a Go program that uses nested loops and the continue statement to print a pattern.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

6. a) Write a Go program using if/else and boolean expressions to validate user input (e.g., ticket booking: check remaining seats, valid name length, valid email format using strings.Contains).
- g) b) Write a Go program using a switch statement to implement a simple menu-driven calculator (addition, subtraction, multiplication, division) and handle the default case.
7. Write a Go program with the following functions:
 - h) a) A function that accepts multiple parameters and returns multiple values (e.g., a function that splits a full name into first and last name).
 - i) b) A variadic function that computes the sum of any number of integers.
 - j) c) A function that returns another function (closure) to demonstrate first-class functions in Go.
8. Write a Go program to organise code across multiple packages:
 - k) a) Create a helper package (e.g., helper) with exported functions and import it into the main package.
 - l) b) Demonstrate the difference between exported (capitalised) and unexported (lowercase) identifiers.
 - m) c) Explain and demonstrate the three scope levels in Go: block scope, package scope, and file scope.
9. Write a Go program to demonstrate the use of maps:
 - n) a) Create a map, add, update, delete, and look up key-value pairs.
 - o) b) Iterate over a map using for-range and print all key-value pairs in sorted order.
 - p) c) Use a map to count the frequency of words in a given string.
10. Write a Go program to model a real-world entity using structs:
 - q) a) Define a struct with multiple fields and create instances of it.
 - r) b) Define methods on the struct (both value receiver and pointer receiver).
 - s) c) Create a slice of structs and sort it by a field using sort.Slice.

PART B

Open Ended Experiments

1. Simple Calculator

Design a menu-driven calculator supporting basic arithmetic operations. Students can extend it with scientific operations or history.

2. Library Book Management

Create a program to add, search, and display book details. Students may add issue/return functionality.

3. Shopping Bill Generator

Develop a billing system that accepts product details and generates a bill. Students may include discounts or GST calculation.

4. Number Analysis Tool

Develop a program to check whether a number is prime, palindrome, Armstrong, or perfect. Students can add more mathematical operations.

5. Create a Hospital Appointment System for patient registration, doctor scheduling, and appointment booking.

Structs, Slices, Control Statements



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

6. Develop a Quiz Application with multiple-choice questions, score calculation, and result analysis. Loops, Arrays, Maps, Functions
7. Create a Mini Online Shopping Cart allowing users to add/remove products, calculate discounts, and generate bills. Structs, Maps, Functions
8. Develop a Personal Expense Tracker to categorize expenses, generate monthly reports, and calculate savings. Structs, Maps, Functions
9. Write a Go program to demonstrate Goroutines and concurrency:
 - a) Launch multiple Goroutines using the go keyword and use a WaitGroup to wait for all of them to finish.
 - b) Demonstrate a data race scenario and fix it using a Mutex.
 - c) Use an unbuffered channel to communicate between two Goroutines and a buffered channel to avoid blocking.
10. Capstone – Conference Ticket Booking CLI Application: Build a complete command-line Go application that:
 - a) Greets users and displays remaining tickets.
 - b) Accepts user inputs (first name, last name, email, ticket count) and validates them.
 - c) Books tickets and updates remaining count.
 - d) Stores booked users in a slice of maps or structs.
 - e) Sends confirmation emails concurrently using a Goroutine.
 - f) Is organised across at least two packages (main and helper).

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE Laboratory	CIE	30
Record	Laboratory Record Submission	10
Continuous Evaluation	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	Class Room Teaching	2	14	28
2	Evaluation of Learning Process	-	-	2
	Total Learning Hours / Semester			30



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

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



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	UI/UX Design		
Course Code	25AI308B	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28P + 2E = 30

Course Objective: Students will be able to build UI and UX based systems.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply Figma tools and UI/UX principles to create basic prototypes that address user requirements.	1	1
2	Analyze existing websites and mobile applications to evaluate UI components, user interactions, and areas for improvement.	2	1
3	Design interactive UI/UX prototypes by translating user requirements into effective layouts and workflows.	3	1
4	Implement activity and project-based learning to develop real-time UI/UX solutions for web and mobile applications.	5,6,7,8,9,10,11,12	1

Part - A

Practical Components:

1. Chat App Redesign: Create a Wireframe and redesign any popular chat app.
2. Food App: Create a wireframe, Design and Prototype the UI Pages for the food application.
3. Social Media App: Create a wireframe, Design and Prototype social media photo sharing app.
4. Product Website: Design and prototype a product website page. Create web pages and rollovers for the web pages
5. Travel Agency Website: Create a wireframe, Design and prototype the UI for the website including design for Home Page with search bar, Activities page, Client Testimonial Page, Image Gallery
6. UI/UX Designer Portfolio Design: Create a wireframe, Design and prototype a UI for a portfolio including design for About page, Work showcase page, Blog page, contact page
7. Dashboard Design: Create a wireframe, Design and Prototype Dashboard UI page, add some Dashboard details, statistics and graphs, Add dropdown options for some dashboard details
8. E-Commerce Website: Create a wireframe, Design and prototype Web pages including product category pages (example: mobiles, gaming consoles, Speakers), product pages in each category, buy now page, add to cart page
9. Educational Website: Create a wireframe, Design and Prototype the UI for an educational website – Include a Homepage with footer, About Us Page, Programs page, Instructors page, pricing page, and Payments page with radial buttons. Design dropdowns for programs button



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

10. Music Player App: Create a wireframe, Design and prototype the pages with a background and a Rollover button, and Song selection Page with a Home Rollover button. The third page may include animated play and pause button, play music animation, timer animation.

PART B: Open Ended Experiments

1. Campus Utility App – design an app solving a real campus problem of your choice
2. Redesign Challenge – find, evaluate, and redesign a poorly designed existing website/app
3. Accessibility-First Interface – design an accessible UI for elderly/visually impaired users
4. Cross-Platform Consistency Study – design one app consistently across mobile and web
5. Data Dashboard for a Real Dataset – design a dashboard UI for any open dataset
6. Micro-Interaction Design – design 3 alternative micro-interactions for one user action
7. Dark Mode / Theme System – build a complete alternate theme/design system for an existing design
8. Onboarding Flow Design – design a 3–5 screen onboarding flow to reduce user drop-off
9. Community/Social Problem App – design an app/website addressing a real civic/social issue
10. Design System / Component Library – build a reusable UI component library (buttons, forms, cards, navigation, typography, color tokens) for an app of your choice, ensuring consistency and scalability across screens

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Sketching User Experiences: Getting the Design Right and the Right Design	Buxton, B, Morgan Kaufmann	1 st edition	Morgan Kaufmann Publishers Inc.	2007
2.	The Elements of User Experience: User-centered Design for the Web	Jesse James Garrett, New Riders	2 nd edition	New Riders	2010

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	A Project Guide to UX Design: For User Experience Designers in the Field or in the Making	Russ Unger, Carolyn Chandler, New Riders	2nd edition	O'Reilly	2012
2.	The Design of Everyday Things, Basic Books	Don Norman	2 ND edition	MIT Press	2013
3.	UI is Communication: How to Design Intuitive, User Centered Interfaces by Focusing on Effective Communication	Everett N. McKay, Morgan Kaufmann	Illustrated edition	Morgan Kaufmann Pub	2013



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

4.	Design Patterns: Elements of Reusable Object - Oriented Software	Dr. Erich Gamma, Ralph Johnson, Richard Helm and John Vlissides	1 st edition	Pearson	2008
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Online Courses and Video Lectures:

1. <https://www.figma.com/>
2. <https://www.udemy.com/course/learn-figma-web-design>
3. <https://www.udemy.com/course/figma-2023-master-class-realtime-uiux-web-projects>

MOOCS:

1. https://onlinecourses.nptel.ac.in/noc21_ar05/preview
2. https://onlinecourses.swayam2.ac.in/aic19_de04/preview

Teaching–Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Lab Conduction	2	14	28
2	Evaluation	-	-	2
Total Learning Hours / Semester				30

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Record – 5 Marks Continuous Evaluation – 15 Marks Lab CIE1 – 10 Marks Lab CIE2 – 10 Marks Activity(PBL)– 10 Marks	50
Total		50

Course Articulation Matrix

Course Outcomes	Program Outcomes														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
CO1	1												3		
CO2		2											3		
CO3			2										3		
CO4					3	1	1	1	3	3	2	3	3		



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	Technical Writing using LaTeX		
Course Code	25AI308C	(L-T-P) C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28P+2ELP=30

Course Objective:

- To introduce the basic syntax and semantics of the LaTeX scripting language
- To understand the presentation of tables and figures in the document
- To illustrate the LaTeX syntax to represent the theorems and mathematical equations
- To make use of the libraries (Tikz, algorithm) to design the diagram and algorithms in the document

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply basic LaTeX commands to create structured documents with appropriate formatting, sections, and text elements.	1,5	-
2	Develop LaTeX scripts to incorporate tables, figures, mathematical equations, and theorems using appropriate environments and packages.	1,2,5	-
3	Construct well-formatted academic or technical reports in LaTeX, including citations, cross-references, and bibliographies.	1,2,5	-
4	Design and integrate advanced elements in LaTeX documents such as diagrams using TikZ and pseudocode using algorithmic environments.	1,2,5	-

Part - A

1. Develop a LaTeX script to create a simple document that consists of 2 sections [Section1, Section2], and a paragraph with dummy text in each section. And also include header [title of document] and footer [institute name, page number] in the document.
2. Develop a LaTeX script to create a document that displays the sample Abstract/Summary
3. Develop a LaTeX script to create a simple title page of the VTU project Report [Use suitable Logos and text formatting]
4. Develop a LaTeX script to create the Certificate Page of the Report [Use suitable commands to leave the blank spaces for user entry]
5. Develop a LaTeX script to create a document that contains the following table with proper labels.
6. Develop a LaTeX script to include the side-by-side graphics/pictures/figures in the document by using the subgraph concept
7. Develop a LaTeX script to create a document that consists of the following two mathematical equations

S.No	USN	Student Name	Marks		
			Subject1	Subject2	Subject3
1	4XX22XX001	Name 1	89	60	90
2	4XX22XX002	Name 2	78	45	98
3	4XX22XX003	Name 3	67	55	59



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

$$\begin{aligned}
 x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} \\
 &= \frac{-2 \pm \sqrt{2^2 - 4 \cdot (1) \cdot (-8)}}{2 \cdot 1} \varphi_{\sigma}^{\lambda} A_t = \sum_{\pi \in C_t} \text{sgn}(\pi) \varphi_{\sigma}^{\lambda} \varphi_{\pi}^{\lambda} \\
 &= \frac{-2 \pm \sqrt{4 + 32}}{2} = \sum_{\tau \in C_{\sigma t}} \text{sgn}(\sigma^{-1} \tau \sigma) \varphi_{\sigma}^{\lambda} \varphi_{\sigma^{-1} \tau \sigma}^{\lambda} \\
 &= A_{\sigma t} \varphi_{\sigma}^{\lambda}
 \end{aligned}$$

8. Develop a LaTeX script to demonstrate the presentation of Numbered theorems, definitions, corollaries, and lemmas in the document.
9. Develop a LaTeX script to create a document that consists of two paragraphs with a minimum of 10 citations in it and display the reference in the section
10. Develop a LaTeX script to design a simple tree diagram or hierarchical structure in the document with appropriate labels using the Tikz library
11. Develop a LaTeX script to present an algorithm in the document using algorithm/algorithmic/algorithm2e library
12. Develop a LaTeX script to create a simple report and article by using suitable commands and formats of user choice.

PART B: Open Ended Experiments

1. Personal Resume/CV in LaTeX – design a multi-section resume with custom formatting, no template given
2. Research Paper Draft – typeset a 2-column IEEE/ACM-style paper on a topic of your choice with abstract, sections, references
3. Mathematics Booklet – compile a set of theorems, proofs, and equations from any subject of your choice using proper math environments
4. Data Table Report – choose any real dataset and present it as a well-formatted multi-table LaTeX report with captions and cross-references
5. Technical Diagram Design – use TikZ to recreate any technical diagram (flowchart, circuit, network topology) of your choice
6. Algorithm Documentation – pick any algorithm you know and typeset its pseudocode formally using the algorithmic/algorithm2e package
7. Thesis/Project Report Template – build a complete VTU-style project report template with title page, certificate, TOC, chapters, and bibliography
8. Beamer Presentation – create a LaTeX Beamer slide deck on a technical topic of your choice
9. Bibliography Management – write a report that cites at least 8 sources using BibTeX/BibLaTeX with a properly generated reference list
10. Custom Class/Style File – design your own LaTeX document class or style file defining custom headers, footers, and section formatting for reuse



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	A Short Introduction to LaTeX	FIRUZA KARMALI (AIBARA)	First Edition	Create space Independent Publishing Platform	2019

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	A Beginner's Introduction to Typesetting with LaTeX	PETER FLYNN	First Edition	Silmaril Consultants	2005

EBooks and online course materials:

1. LaTeX TUTORIAL: <https://latex-tutorial.com/tutorials/>
2. LaTeX TUTORIAL: <https://www.javatpoint.com/latex/>

Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Lab Conduction	2	14	28
2	Student Study Hours – Self Learning	-	-	-
3	Tutorial Component	-	-	-
4	Activity Based Learning (ABL1 & ABL2)	-	-	-
5	Evaluation of Learning Process	-	-	2
Total Learning Hours / Semester				30



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	2D and 3D Game Development		
Course Code	25AI308D	(L-T-P) C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28P+2ELP=30

Course Objective: To equip students with foundational knowledge and practical skills in game development using industry-standard tools and libraries. The course aims to enable students to design, prototype, and implement 2D and 3D game environments, user interfaces, animations, and physics simulations.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the fundamentals of game development.	1,5	-
2	Explore into the features of 2D game development.	1,2,5	1
3	Implement appropriate UI design elements for 3D game development.	1,2,5	1
4	Analyze the physics and animations within simulation tools by interpreting the effects and backgrounds	1,2,5	1

Part - A

1. Install Unity and get familiar with the interface; Create a new Unity project; Explore the different windows & panels in Unity Editor.
2. Create a simple 2D or 3D scene with Unity.
3. Add objects like cubes, spheres, or sprites to your scene.
4. Manipulate Position, rotate, and scale these objects using the Unity Editor
5. Create simple UI elements like buttons, text fields, and images in the Unity Editor. Adjust their properties such as size, position, and color.
6. Create in-game UI elements, such as a health bar, score display, and timer; Implement interactivity for buttons (e.g., "Start Game" button starts the game).
7. Create a Simple 3D Scene
8. Perform basic 3D Model Manipulation
9. Implement a real-time shadow
10. Add advanced 3D visual effects
11. Perform realistic movement and physics simulation
12. Add character animation and sound effects



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

PART B: Open Ended Experiments

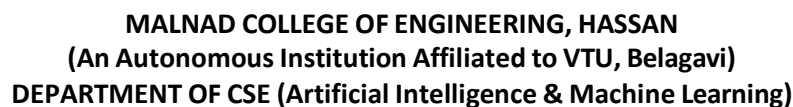
1. Mini 2D Platformer – design and build a simple playable 2D platformer level of your choice with player movement, obstacles, and a win condition
2. 3D Environment Walkthrough – build a 3D scene (any theme: room, outdoor terrain, dungeon) that a player can explore with first/third-person controls
3. Custom UI/HUD Design – design a complete in-game UI/HUD (health, score, timer, menus) for a game concept of your own choice
4. Physics-Based Puzzle – create a small puzzle or mini-game that relies on Unity's physics engine (e.g., rolling, stacking, launching objects)
5. Character Animation Showcase – rig/animate a character (2D or 3D) performing a sequence of your choice (idle, walk, jump, attack) using Unity's Animator
6. Dynamic Lighting Scene – design a scene demonstrating real-time lighting and shadow effects to create a specific mood (e.g., horror, daytime, sci-fi)
7. Particle & Visual Effects Demo – create a scene showcasing custom particle effects (fire, smoke, magic, explosions) of your choice
8. Simple AI-Controlled Enemy – implement an enemy/NPC with basic AI behavior (patrol, chase, avoid) in a scene of your choice
9. Sound-Integrated Game Scene – build a short interactive scene that uses background music, sound effects, and audio triggers tied to player actions
10. Mini Game Prototype (Capstone) – design and build a complete small playable game (2D or 3D) combining UI, physics, animation, and sound, based on a concept of your choice.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Unity in Action: Multiplatform Game Development in C#	Joe Hocking	2 nd Edition	Manning Publications	2018

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Learning C# by Developing Games with Unity	Harrison Ferrone	2 nd edition	Packt publications	2018



- <https://github.com/Kavex/GameDev-Resources#readme>
- <http://graphicburger.com/mobile-game-gui/>
- <http://7soul1.deviantart.com/art/420-Pixel-Art-Icons-for-RPG-129892453>
- <http://www.gameartguppy.com/shop/>

Sl.No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Lab Conduction	2	14	28
2	Student Study Hours – Self Learning	-	-	-
3	Tutorial Component	-	-	-
4	Activity Based Learning (ABL1 & ABL2)	-	-	-
5	Evaluation of Learning Process	-	-	2
Total Learning Hours / Semester				30

Tool	Remarks	Marks
Continuous Evaluation	Weekly Conduction of Experiment + Record + Viva	10
CIE	Conduction of CIE	20
Activity Details	Details of activities to be conducted 3) Project based learning	20
Total		50

Type of Evaluation	Hours
SEE	2
Total	2

[illegible]

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 neutral**. 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.

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

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	Develop a mobile application with SOS alerts, live location sharing, emergency	6	5, 11, 16

	Application	contacts, and nearby police station information.		
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	Develop a ledger and record keeping	6	5, 8

	system for self help groups	application to help women's SHGs manage savings, loans and meeting records		
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:

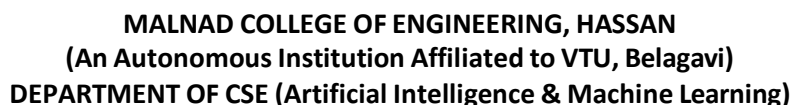
B. Semester End Examination (SEE) – 50 marks

- 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.

[illegible]

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, 2 rounds, 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, Prone 1. Bhujangasana, 2. Shalabhasana, Supine 1. Utthitadvipadasana, 2. Ardhamahalasana			
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 Bangalore)
4. Dr.Shirley Telles: Glimpses of Human Body (Vivekanda KendraYoga Prakashana Bangalore).

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.

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 A. Lifestyle B. Health & Wellness C. Pre-Fitness test.						4 Hours
Module II: General Fitness & Components of Fitness A. Warming up (Free Hand exercises) B. Strength–Push-up/Pull-ups C. Speed– 30Mtr Dash						4 Hours
Module III: Specific games (Any one to be selected by the student) 1. Kabaddi–Handtouch, Toe Touch, Thigh Hold, Anklehold and Bonus. 2. Kho-Kho– Giving Kho, Single Chain, Pole dive, Pole turning, 3-6 Up.						16 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, each of 20 marks	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 CSE (Artificial Intelligence & Machine Learning)

Course Title	Bridge Mathematics-I (Mandate Audit Course for Diploma entry students)		
Course Code	25BCM301	L-T-P	(3-0-0)
Exam	3 Hrs.	Hours/Week	3
CIE	50 Marks	Total Hours	42
Course Objective: Students will be able to use appropriate data structures for solving problems. Course Outcomes: At the end of course, student will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Solve simple problems on determinants, matrix multiplication, partial differentiation, and integration.	1	-
2	Compute the roots of transcendental equations and interpolate when the experimental data is given.	1	-
3	Expand the given function in terms of Taylor/ Macluarin's series	1	-
MODULE-1			10 Hrs.
Basic Formulas: Partial fractions. Matrices and determinants: matrix multiplication, evaluation of determinants, finding inverse. Differentiation-I: Review of limit and Continuity, differentiation- Basic formulas, Sum rule, product rule, quotient rule, chain rule and problems. Differentiation-II: Taylor's series, and Macluarin's series of simple functions for single variable, simple problems.			
MODULE-2			10 Hrs.
Partial Differentiation: Definition, Illustrative examples on Partial differentiation, Total differentiation, chain rule, Differentiation of composite and implicit functions, Jacobians, illustrative examples and problems, simple problems.			
MODULE-3			10 Hrs.
Integration: Basic formulas, Illustrative examples, evaluation of definite integrals, Integration by parts, Bernoulli's rule of Integration. Integral calculus: Reduction formula for functions $\sin^n x$, (without proof), Simple problems, Double & triple integration, simple problems with standard limits.			
MODULE-4			12 Hrs.
Numerical Methods - Numerical Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method, Regular Falsi method. Numerical Interpolation -Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula.			



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
01	Higher Engineering Mathematics	Dr.B.S.Grewal	40 th edition	Khanna Publications	2007
02	Advanced Engineering Mathematics	Erwin Kreyszig	8 th edition	TataMcGrawHill, Publications	2007

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
01	Calculus	Thomas Finney	9 th edition	Pearson education	2002
02	A text book of Engineering Mathematics	N.P. Baliand Manish Goyal	Reprint	Laxmi Publications	2010

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	12	36
2	Integrated Lab Component	0	0	00
3	Student Study Hours - Self Learning	2	1	2
3	Activity Based Learning (ABL1 & ABL2)	-	-	-
4	Evaluation of Learning Process	-	-	04
Total Learning Hours/Semester				42

Proposed Assessment Plan(for 50marks of CIE):

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

Evaluation of Learning Process (4 Hours)

Type of Evaluation	Hours
CIE (1 and 2)	4
Lab component	0
Semester End Exam	0
Total	4

[illegible]



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	DESIGN AND ANALYSIS OF ALGORITHMS		
Course Code	25AI401	(L-T-P) C	(3-0-2) 4
Exam	3Hrs	Hours/Week	5
SEE	50 Marks	Total Hours	42L + 28P + 50ABL = 120

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

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply various algorithm techniques to solve the given problem.	1, 2	-
2	Analyse the time and space complexity of different algorithms	1, 2	-
3	Design efficient algorithms using appropriate algorithm techniques.	1, 2, 3	1
4	Conduct experiments to implement the algorithms and provide valid conclusions	1, 4, 5, 8, 9	1

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

11 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

11 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.

Prescribed Text Books:

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



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Introduction to Algorithms	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest	3rd Edition	PHI	2009
2.	Computer Algorithms	Horowitz E., Sahani S., Rajasekharan S		Galgotia Publications	2001

E-Books and online course materials:

1. <https://ocw.mit.edu/courses/6-046j-design-and-analysis-of-algorithms-spring-2015/pages/syllabus/>

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc26_cs67/preview

Teaching -Learning– Evaluation Scheme:

Sl.No	Teaching and 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	Activity Based Learning	-	-	41
4	Evaluation of Learning Process	-	-	9
Total Learning Hours / Semester				120

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	Lab Program Execution – 10 Marks Activity Based Learning – 10 Marks	20
Total		50

Integrated Lab Component (28Hours)

Lab Program	Program Details
Guided Experiments Implement the following using C/Python.	
1	Employees in an organization need to be grouped for a tournament based on their ages. Sort the ages using Merge sort and find the time required to perform the sorting.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

2	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.
3	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.
4	Obtain the topological ordering of vertices in a given digraph.
5	Implement Horspool algorithm for String Matching.
6	Sort a given set of elements using the Heap sort method.
7	Implement Floyd's algorithm and Warshall's algorithm for a given graph.
8	There are 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.
9	Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm
10	Implement 0/1 Knapsack problem using dynamic programming.
11	Implement N Queen's problem using Backtracking.
Open ended Experiments Students have to solve a given problem using any suitable design technique and demonstrate its efficiency. Sample list of problems (but not limited to this) that can be considered are 1. Josephus problem 2. Travelling salesman problem 3. Job assignment problem 4. Boyre Moore string matching algorithm 5. Searching problem like - Given a string, find all possible palindromic substrings in it, Given a sequence of numbers between 2 and 9, print all possible combinations of words formed from the mobile keypad which has English alphabets associated with each key. 6. Sorting problem like - Given two integer arrays, reorder elements of the first array by the order of elements defined by the second array.	

Activity Based Learning (41 Hours)

ABL (41 Hours): Visual Journey Through an Algorithm		Hours
Students will create a visual animation or presentation that demonstrates how a selected algorithm works step by step. The activity aims to help students understand and communicate algorithm concepts clearly through visual representation.		
1	Algorithm Selection and Planning: Choose one algorithm from the syllabus (e.g., Merge Sort, Quick Sort, Dijkstra's Algorithm, or 0/1 Knapsack). Plan the animation steps and decide how to illustrate each phase.	6
2	Content Preparation: Create slides, flowcharts, or storyboards that depict each step of the algorithm visually.	10
3	Animation Development: Build the animation using PowerPoint, any video tool, or a coding-based visualization (if comfortable).	15



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

4	Testing and Refinement: Review the animation to ensure clarity and correctness. Make improvements based on peer or faculty feedback.	7
5	Documentation: Prepare a short explanatory note describing the algorithm, steps of animation, and observations.	3
Total		41

Evaluation of Learning Process (9 Hours)

Type of Evaluation	Hours
CIE (1,2,3)	3
Lab Program Execution	2
ABL Presentation	1
SEE	3
Total	9

Course Articulation Matrix

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PSO1	PSO2	PSO 3
CO1	3	2												
CO2	2	3												
CO3	1	2	3									1		
CO4	1			3	3			2	2			1		



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	DATABASE MANAGEMENT SYSTEM		
Course Code	25AI402	(L-T-P) C	(3-0-2) 4
Exam	3	Hours/Week	5
SEE	50 Marks	Total Hours	42L + 28P + 30 ABL + 12SL + 8ELP = 120

Course Objective:

- To enable students to clear understanding of database concepts and enable students to **design and manage databases** using SQL and appropriate data models.
- To equip students with the skills to **analyze, implement, and optimize database solutions** for real-world applications using modern database technologies.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the fundamental concepts of database systems, data models, and architecture and the role of databases in real-world applications.	1,2,12	1
2	Apply SQL queries for data definition, retrieval, and manipulation operations, and apply appropriate constraints to maintain data accuracy and consistency	1,2,3,5	1,2
3	Analyze requirements and design ER diagrams for database systems and convert them into normalized relational schemas.	1,2,3,4,5	1,2
4	Design and Implement database solutions using modern tools and technologies through practical exercises and real-world mini-projects.	1,2,3,4,5, 8, 9,10,11,12	1,2

MODULE-1	11 Hours
Database and Database Users: Introduction, an example, Characteristics of Database approach, Actors on the Screen, Workers Behind the Scene, Advantages of Using DBMS Approach. Database System Concepts and Architecture: Data Models, Schemas and Instances, Three-schema Architecture and Data Independence, Database Languages and Interfaces, The Database System Environment. Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design, a Sample Database Application, Entity Types, Entity Sets, Attributes and Keys, Relationship Types, Relationship Sets, Roles and Structural Constraints, Weak Entity Types, Refining the ER Design, ER Diagrams, Naming Conventions and Design Issues, Relationship Types of Degree Higher Than Two.	
MODULE-2	11 Hours
The Relational Data Model and Relational Database Constraints: Relational Model Concepts, Relational Model Constraints and Relational Database Schemas, Update Operations, Transactions and Dealing with Constraint, Violations. Basic SQL: SQL Data Definition and Data Types, Specifying Basic Constraints in SQL, Basic Queries in SQL. Insert, Delete and Update statements in SQL. More SQL: More Complex SQL Queries, Insert Delete and Update Statements in SQL, Specifying Constraints as Assertion and Trigger, Views (Virtual Tables) in SQL, Schema Change Statements in SQL.	



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

MODULE-3	10 Hours
Relational Algebra: Unary Relational Operations: SELECT and PROJECT, Relational Algebra Operations from Set Theory, Binary Relational Operations: JOIN and DIVISION, Additional Relational Operations, Examples of Queries in Relational Algebra. Basics of Functional Dependencies and Normalization or Relational Databases: Informal Design Guidelines for Relation Schemas, Functional Dependencies, Normal Forms Based on Primary Keys, General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form, Join Dependencies and Fifth Normal Form.	
MODULE-4	10 Hours
Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing, Transaction and System Concepts, Desirable Properties of Transactions, Characterizing Schedules Based on Recoverability, Characterizing Schedules Based on Serializability, Transaction Support in SQL, Two- Phase Locking Techniques for Concurrency Control. NoSQL Databases: Introduction to NOSQL Systems, The CAP Theorem, Document-Based NOSQL Systems and MongoDB, NOSQL Key-Value Stores.	

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Fundamentals of Database Systems	Elmasri and Navathe	7th Edition	Addison-Wesley	2015

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Database System Concepts	Silberschatz, Korth and Sudharshan	7th Edition	Mc-Graw Hill	2019
2.	An Introduction to Database Systems	C J Date	8 th Edition	Pearson education	2006
3.	Professional NOSQL	Shashank Tiwari	1 st Edition	John Wiley & Sons, Inc	2017

EBooks and online course materials:

1. <https://www.javatpoint.com/dbms-three-schema-architecture>
2. <https://www.geeksforgeeks.org/characteristics-of-the-database-approach/>

Online Courses and Video Lectures:

1. https://onlinecourses.swayam2.ac.in/cec19_cs05/preview
2. https://onlinecourses.nptel.ac.in/noc19_cs46/preview



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Laboratory Plan (if integrated course):

Lab Program	Program Details
Guided Experiments	
1	Consider the following schema: EMPLOYEE (Ename, Ssn, Bdate, Sex, Address, salary, Mgrssn, Dno) DEPARTMENT (Dname, Dnumber, Mgrssn, Mgr_start_date) PROJECT (Pname, Pnumber, Plocation, Dnum) WORKS_ON (Essn, Pno, Hours) DEPENDENT (Essn, Dependent_name, Sex) Create above tables by specifying primary key, foreign key and other suitable constraints. Insert atleast 5 tuples to each created table. i. Retrieve the name and address of all employees who work for the "specified" department. ii. For each employee, retrieve the employee's name and the name of his or her immediate supervisor iii. Find the sum of all salaries of all employees iv. For each department, retrieve the department number, the number of employees in the department and their average salary.
2	Consider the following relation schema: SAILORS (Sid: integer, Sname: string, Rating: integer, Age: real) BOATS (Bid: integer, Bname: string, Color: string) RESERVES (sid: integer, bid: integer, Day: date) Create above tables by specifying primary key, foreign key and other suitable constraints. Insert atleast 5 tuples to each created table. Design a database to satisfy the above requirements and answer following queries i. Find all sailors with a rating above 7 ii. Find the names of sailors who have reserved boat number 103 iii. Find the names of sailors who have reserved a red boat iv. Find the names of sailors who have reserved a red or a green boat
3	Consider the following relation schema: STUDENT (Snum: integer, Sname: string, Major: string, Level: string, Age: integer) CLASS (Cname: string, meets at: string, Room: string, Fid: integer) ENROLLED (Snum: integer, Cname: string) FACULTY (Fid: integer, Fname: string, Deptid: integer) The meaning of these relations is straightforward; for example, enrolled has one record per student-class pair such that the student is enrolled in the class. Level is a two-character code with 4 different values (example: Junior: JR etc) Write the following queries in SQL. No duplicates should be printed in any of the answers. i. Find the names of all Juniors (level = JR) who are enrolled in a class taught by Prof. Harshith ii. Find the names of all classes that either meet in room R128 or have five or more Students enrolled. iii. Find the names of all students who are enrolled in two classes that meet at the same time. iv. Find the names of faculty members who teach in every room in which some class is taught.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

4	Consider the relation schema for book dealer database: AUTHOR (Author-id:int, Name: string, City: string, Country: string) PUBLISHER (Publisher-id:int, Name: string, City: string, Country: string) CATALOG (Book-id: int, Title: string, Author-id: int, Publisher-id: int, Category-id: int, Year: int, Price: int) CATEGORY (Category-id: int, Description: string) ORDER-DETAILS (Order-no: int, Book-id: int, Quantity: int) Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation. i. 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. ii. Find the author of the book which has maximum sales. iii. Demonstrate how you increase the price of books published by a specific publisher by 10% iv. List any department that has all its adopted books published by a specific publisher
5	Consider the schema for Movie Database: ACTOR (Act_id, Act_Name, Act_Gender) DIRECTOR (Dir_id, Dir_Name, Dir_Phone) MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id) MOVIE_CAST (Act_id, Mov_id, Role) RATING (Mov_id, Rev_Stars) Write SQL queries to Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation. i. List the titles of all movies directed by 'Hitchcock'. ii. Find the movie names where one or more actors acted in two or more movies. iii. List all actors who acted in a movie before 2000 and also in a movie after 2015. iv. Update rating of all movies directed by 'Steven Spielberg' to
6	Consider the following database for a banking enterprise BRANCH (branch-name: String, branch-city: String, assets: real) ACCOUNTS (accno: int, branch-name: String, balance: real) DEPOSITOR (customer-name: String, customer-street: String, customer-city: String) LOAN (loan-number: int, branch-name: String, amount: real) BORROWER (customer-name: String, loan-number: int) Create the above tables by properly specifying the primary keys and the foreign keys. Enter at least five tuples for each relation. i. Find all the customers who have at least two accounts at the Main branch. ii. Find all the customers who have an account at all the branches located in a specific city. iii. Demonstrate how you delete all account tuples at every branch located in a specific city.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Open Ended Experiments	
7	The production company is organized into different studios. We store each studio's name branch and location; every studio must own at least one movie. We store each movie's title, sensor number and year of production. Star may act in any number of movies and we store each actors name and address. 2. Establish the database by normalizing up to 3NF and considering all schema level constraints 3. Write SQL insertion query to insert few tuples to all the relations 4. List all the studios of the movie "xyz"; 5. List all the actors , acted in a movie 'xyz' 6. Write a procedure to list all movies produced during the specific year. 7. Write a deletion trigger, does not allow to deleting current year movies.
8	The production company is organized into different studios. We store each studio's name branch and location; a studio own any number of Cartoon-serials. We store each CartoonSerial's title, sensor number and year of production. Star may do voices in any number of Cartoon-Serials and we store each actors name and address. i) Establish the database by normalizing up to 3NF and considering all schema level constraints ii) Write SQL insertion query to insert few tuples to all the relations iii) Find total no of actors, do voiced in a Cartoon-Serials 'xyz' iv) Retrieve name of studio, location and Cartoon-Serials title in which star "abc" is voiced. v) Write a procedure to list all Cartoon-Serials produced during the specific year. vi) Write a deletion trigger, does not allow to deleting current year Cartoon Serials.
9	Car marketing company wants keep track of marketed cars and their owner. Each car must be associated with a single owner and owner may have any number of cars. We store car's registration number, model & color and owner's name, address & SSN. We also store date of purchase of each car. i) Establish the database by normalizing up to 3NF and considering all schema level constraints ii) Write SQL insertion query to insert few tuples to all the relations iii) Find a person who owns highest number of cars iv) Retrieve persons and cars information purchased on the day 11-11-11 v) Write a insertion trigger to check date of purchase must be less than current date (must use systemdate) vi) Write a procedure to list all cars and owner information purchased during the specific year.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

10	Puppy pet shop wants to keep track of dogs and their owners. The person can buy maximum three pet dogs. We store person's name, SSN and address and dog's name, date of purchase and sex. The owner of the pet dogs will be identified by SSN since the dog's names are not distinct. i) Establish the database by normalizing up to 3NF and considering all schema level constraints ii) Write SQL insertion query to insert few tuples to all the relations iii) List all pets owned by a person 'Abhiman'. iv) List all persons who are not owned a single pet v) Write a trigger to check the constraint that the person can buy maximum three pet dogs vi) Write a procedure to list all dogs and owner details purchased on the specific date.
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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	2	14	28
3	Student Study Hours – Self Learning	-	-	12
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL)	-	-	30
6	Evaluation of Learning Process	-	-	8
Total Learning Hours / Semester				120

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) Lab Conduction (10 marks) 2) ABL: NoSQL Mini Project: Recommendation System using MongoDB Atlas (10 marks)	20
Total		50



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Self-Learning

Sl.No	Topics	Hours
1	Self-practice in MongoDB Atlas (Cloud): Create a basic document database using sample movie or user data. Practice CRUD operations. Explore: https://www.mongodb.com/try	6
2	Introductory Video Tutorial on draw.io (ER diagram basics, using shapes, relationships) Explore: YouTube tutorials or Help section at https://drawio-app.com	6

Activity Based Learning (30 Hours)

ABL1 (30 Hours): To enable students to design and develop a database system for a real-world application (such as Library Management, Hospital System, E-commerce, Student Management), applying DBMS concepts like ER modeling, normalization, SQL, and transactions. MongoDB Atlas and Compass, with extended features.		Hours
1.	Problem Identification & Requirement Analysis (5 Hours) Students will choose a real-world application (Library, Hospital, E-commerce, Student System). They will identify entities, attributes, relationships, and prepare a clear problem statement.	5
2.	Schema Design and ER Diagram Design (5 Hours) Students will design an ER diagram using AI tools like (Draw.io or MySQL Workbench). Convert the ER model into relational schema. They will define entities, relationships, keys, and constraints properly.	5
3.	Data Integrity using Assertions, Triggers, Views & Constraint Handling Students will create tables with constraints and test constraint violations to ensure data integrity. They will implement views, triggers, and assertions to manage and enforce database operations and rules.	
4.	SQL Implementation (5 Hours) Students will create tables and apply constraints (Primary Key, Foreign Key). They will perform SQL operations such as INSERT, UPDATE, DELETE, and SELECT.	5
5.	Advanced SQL & Query Optimization (5 Hours) Students will write complex queries using joins, subqueries, and aggregate functions. They will analyze and improve query performance using basic optimization techniques.	5
6.	Normalization of Database Students will be given an unnormalized table (UNF) based on a real-world scenario (e.g., Student Enrollment, Order System). They will identify dependencies and progressively convert the table into 1NF, 2NF, and 3NF (or BCNF) if necessary 4NF and 5NF.	5
Total		30



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1,2,3)	3
Lab + Activity Presentation	2
SEE	3
Total	8

Course Articulation Matrix

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



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	MACHINE LEARNING		
Course Code	25AI403	(L-T-P) C	(3-0-0) 3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	42 L+ 30 ABL+ 10SL+ 8 EV= 90
Course Objective: To utilize the machine learning algorithms to solve real time problems. Course Outcomes: Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply data preprocessing, data modeling, supervised and unsupervised machine learning algorithms to the given scenario	1	2
2	Analyze the given problem and identify the appropriate data modeling and machine learning method to solve the same	1, 2	2
3	Design and develop a solution using appropriate machine learning algorithm.	1,2, 3	2
4	Investigate the real world problem and develop a machine learning system to provide a solution for the same and communicate the results through report and presentation	1,2,3,5,9	1, 2, 3
MODULE-1			11 Hours
Introduction to Machine learning: Introduction, What is Human Learning, Types of Human Learning, what is Machine Learning, Types of Machine Learning, Problems not be solved using Machine Learning, Applications of Machine Learning, State of the art languages/tools in Machine Learning, Issues in Machine Learning. Preparing to Model: Machine Learning Activities, Basic Types of Data in Machine Learning. Exploring Structure of Data, Data Quality and Remediation, Data Pre-Processing. Modeling and Evaluation: Introduction, selecting a Model, Training a Model, Model Representation and Interpretability.			
MODULE-2			10 Hours
Modeling and Evaluation: Evaluating Performance of a Model, Improving Performance of a Model. Basics of Feature Engineering: Introduction, Feature Transformation, Feature Subset Selection. Learning Problems and Concept Learning: Find-S, Version Space and Candidate Elimination Algorithm. Bayesian Concept Learning: Why Bayesian Methods are Important, Bayes' Theorem, Bayes' Theorem and Concept Learning. Applications of Naïve Bayes Classifier.			
MODULE-3			11 Hours
Supervised Learning-Classification: Example of Supervised Learning, Classification Model, Classification Learning Steps, Common Classification Algorithms- KNN, decision tree, Random forest model, Support vector machines. Supervised Learning- Regression: Introduction, Example of Regression, Common Regression Algorithms- Simple Linear Regression, Multiple Linear Regression, Polynomial Regression Model, Logistic Regression, Maximum Likelihood Estimation.			



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

MODULE-4	10 Hours
Unsupervised Learning: Unsupervised VS Supervised Learning, Application of Unsupervised Learning, Clustering, Finding Patterns using Association Rules. Other Types of Learning: Introduction, Representation Learning, Active Learning, Instance-based Learning, Association Rule Learning Algorithm, Ensemble Learning Algorithm. Regularization Algorithm	

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Machine Learning	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das	1st	Pearson	2023
2.	Machine Learning	Tom M. Mitchell	1st	McGraw-Hill Education (INDIAN EDITION)	2013

Reference Books:

1.	Hands-on machine learning with scikit-learn and tensorflow, Concepts, Tools, and Techniques to Build Intelligent Systems	Aurélien Géron	2nd	O'REILLY	2013
2.	Introduction to Machine Learning	Ethem Alpaydin	2nd	PHI Learning Pvt. Ltd.	2013
3.	The Elements of Statistical Learning	T. Hastie, R. Tibshirani, J. H. Friedman	1st	Springer	2001

eBooks and online course materials:

1. <https://www.geeksforgeeks.org/ml-machine-learning/>
2. <https://www.javatpoint.com/machine-learning>

Online Courses and Video Lectures:

1. https://swayam.gov.in/nd1_noc19_cs52/preview
2. <https://www.coursera.org/learn/machine-learning>

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Classroom Teaching & Learning	3	14	42
2.	Integrated Lab Component	-	-	-
3.	Self-Study Hours-Self Learning	-	10	10
4.	Evaluation of Learning Process	-	-	08
5.	Activity Based Learning	-	-	30
Total Learning Hours/Semester				90



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
CIE	CIE1	Conducted for 20 marks & reduced to 10 marks	10
	CIE2	Conducted for 20 marks & reduced to 10 marks	10
	CIE3	Conducted for 20 marks & reduced to 10 marks	10
Activity Details	Activity 1	Activity Based Learning	10
	Activity 2	Activity Based Learning	10
Total			50

Self Study Component (10 Hours)

1.	History and Evolution of Machine Learning
2.	Difference Between Traditional Programming and Machine Learning
3.	Types of Data in the Real World: Recognize structured, semi-structured, unstructured data in real applications.
4.	Difference Between AI, ML, Deep Learning, and Data Science: Clarify misconceptions between overlapping fields.
5.	How Recommendation Systems Work (Intro Level): Explore the ML idea behind YouTube, Amazon, or Netflix recommendations.
6.	Popular Datasets and Their Real-World Uses: Introduce famous datasets (Titanic, MNIST, Iris, etc.) and why they're useful.
7.	Introduction to Data Visualization: Understand the role of visualization in understanding data before modeling.
8.	Machine Learning in Popular Applications: Explore ML in various areas such as Healthcare, Agriculture, etc.,.
9.	Gamified Learning: Intro to ML via Tools like Teachable Machine or Machine Learning for Kids: Engage students using interactive ML tools.
10.	Basic Concept of Labels and Features: Understand the supervised learning idea — what is input and what is output.

Activity Based Learning (30 Hours)

DeldSim Simulator		Hours
1.	Python Libraries for Machine Learning-Pandas, Sklearn, numpy, Matplotlib, Exploratory Data Analysis and Data Visualization	4
2.	i. Problem Statement: Choose a dataset and define the problem. ii. Data Preprocessing: Handle missing values, encode categorical data, normalize features. iii. Model Building: Select and implement at least two ML models to solve the problem iv. Model Evaluation and Interpretation: Use metrics like accuracy, precision, recall, RMSE, confusion matrix, and visualizations to evaluate and compare models.	20



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

3.	Documentation & Reporting: Prepare a mini-project report containing: problem statement, dataset summary, preprocessing steps, model performance, and conclusions.	06
Total		30

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
Test (1, 2 and 3)	3
Activity 1 and 2 Evaluation (1 hour per activity)	2
Semester End Exam	3
Total	8

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO3
CO1	3											3		
CO2	2	3											3	
CO3	2	2	3										2	
CO4	2	2	2		3				2			2	3	3



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	PYTHON FOR DATA SCIENCE		
Course Code	25AI404	(L-T-P) C	(2-0-2)3
Exam	3 Hrs.	Hours/Week	4
SEE	50 Marks	Total Hours	30L+28L+ 25 ABL + 7ELP = 90

Course Objective:

- To develop a foundation in Python, data science libraries, database connectivity, and statistical techniques for data processing and analysis.
- To build practical skills in implementing data-driven and AI-oriented solutions through visualization and hands-on activities.
- Equip students with the knowledge and skills to effectively visualize data using Tableau and Power BI, covering basic to advanced visualization techniques, data preparation, dashboard creation, and integration with external tools

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand and interpret core concepts of Python programming, NumPy arrays, Pandas data structures, data visualization techniques, and fundamental statistical methods for data science.	1,2,5,12	1,2
2.	Apply Python libraries and database connectivity techniques to perform efficient data acquisition, preprocessing, transformation, and management of structured datasets.	1,2,4,5,12	1,2,3
3.	Analyze complex datasets using statistical methods, correlation techniques, and visualization tools to extract meaningful patterns, trends, and insights.	1,2,4,5,12	1,2,3
4.	Implement and demonstrate end-to-end data science workflows through hands-on activities and mini-projects by integrating preprocessing, visualization, statistics, and database operations to solve real-world and AI-oriented problems. Design interactive dashboards, reports, and visual stories using Tableau and Power BI for business and decision-making applications.	1,2,3,4,5,9,10,11,12	1,2,3

Course Contents:

MODULE-1	8 Hours
Introduction to NumPy: Understanding data types in python, NumPy array attributes, array indexing, array slicing, reshaping array, array concatenation and splitting, and computations on NumPy Arrays. Introduction to UFuncs: advanced UFuncs features, Aggregation: Min, Max and in between, computation on arrays, rules of broadcasting, comparisons, masks and Boolean logics, indexing, sorting arrays, NumPy's structured arrays. Self-Learning: Basics of NumPy arrays, Broadcasting in Practice	



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

MODULE-2	8 Hours
Data Manipulation with Pandas: Introduction to pandas objects – Series object, DataFrame object, Index object, Data Indexing and selection for series and DataFrame, Operating on Data in Pandas, Handling missing data, Operating on Null values, hierarchical Indexing, combining datasets using Concat and Append. Aggregation and Grouping, Pivot tables, Vectorized string operations, working with Time series- Dates and Times in python, indexing by Time, time series data structures, frequencies and offsets, resampling, shifting and windowing.	
Self-Learning: Merge and Join, High-performance Pandas – eval() and query()	
MODULE-3	8 Hours
Visualization using Python: Importing matplotlib, setting styles, simple line plots, simple scatter plots, visualizing errors, density and contour plots, visualizing a three dimensional function, Histograms, binning and density, customizing plot legends, customizing ticks. Three-Dimensional Plotting: Three-dimensional points and lines, three dimensional contour plots, surface triangulation, geographic data with basemap, visualization with Seaborn.	
MODULE-4	6 Hours
Statistics : Measures of Central Tendency, Statistics with Python, Measuring Variance, Normal Distribution, Binomial Distribution, Poisson Discrete Distribution, Bernoulli Distribution, P-value, Exploring Correlation in Python, Create a correlation Matrix using Python, Pearson's Chi-Square Test Python Relational Database : Connect MySQL database using MySQL-Connector Python, Python: MySQL Create Table, Python MySQL – Insert into Table, Python MySQL – Select Query, Python MySQL – Update Query, Python MySQL – Delete Q	

Laboratory Plan (if integrated course):

Lab Program	Program Details
Guided Experiments	
1.	a) Write a Python program to perform arithmetic, logical, and conditional operations using user input. b) Develop a Python program to generate student grade analysis using functions and lists.
2.	a) Write a Python program to create NumPy arrays and perform indexing, slicing, reshaping, and broadcasting. b) Develop a Python program to perform matrix and statistical operations using NumPy.
3.	a) Write a Python program to create Pandas Series and DataFrames using CSV and Excel datasets. b) Develop a Python program for handling missing values, removing duplicates, and preprocessing datasets.
4.	a) Write a Python program to perform sorting, filtering, grouping, and aggregation operations using Pandas. b) Develop a Python program to merge, concatenate, and join multiple datasets using Pandas.
5.	a) Write a Python program to create line charts, bar charts, and pie charts using Matplotlib. b) Develop a Python program to generate histograms, scatter plots, and box plots using Matplotlib.
6.	a) Write a Python program to visualize heatmaps and correlation matrices using Seaborn. b) Develop a Python program to create pair plots, violin plots, and count plots using Seaborn.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

7.	a) Create basic visualizations such as bar charts, line charts, and pie charts using Tableau. b) Develop Tableau worksheets using filters, parameters, and calculated fields.
8.	a) Create interactive dashboards and stories in Tableau for business analysis. b) Perform data blending, joins, and dashboard customization in Tableau.
9.	a) Create basic reports and dashboards in Power BI using imported datasets. b) Perform data transformation using Power Query Editor in Power BI.
Open Ended Experiments	
10.	a) Develop interactive dashboards using slicers, filters, and drill-throughs in Power BI. b) Create DAX measures and calculated columns for business analytics in Power BI.
11.	a) Write a Python program to create interactive visualizations using Plotly. b) Develop a Python program to generate 3D plots and time-series visualizations using Plotly.
12.	a) Analyze a real-world dataset using Python libraries and generate visual analytical reports. b) Design and develop an end-to-end dashboard project using Tableau or Power BI.
13.	a) Perform comparative visualization analysis using Python, Tableau, and Power BI. b) Present a comprehensive data science project integrating data preprocessing, visualization, dashboards, and business insights.

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Python for Data Analysis	Wes McKinney	2nd edition	O'Reilly Media	2018
2.	Practical Statistics for Data Scientists	Peter Bruce, Andrew Bruce	2nd Edition	O'Reilly Media	2020

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Python Data Science Handbook: Essential Tools for working with Data	Jake VanderPlas	2 nd Edition	O'reilly	2016
2.	Python Programming and SQL	Mark Reed	1 st Edition	Independently published	2023
3.	Introduction to Data Science: Practical Approach with R and Python	B Uma Maheshwari , R. Sujatha	1 st Edition	Wiley	2023
4.	Introduction to Python for Data Science	Paul J. Deitel, Harvey M. Deitel, Harvey Deite	1 st Edition	Pearson Education	2022
5	Hands-On Data Visualization	Jack Dougherty, Ilya Ilyankou	1st Edition	O'Reilly Media	2021
6	Tableau for Beginners	Dr. Madhulika Bhatia	1st Edition	BPB Publications	2019



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

E-Books and online course materials:

1. <https://www.geeksforgeeks.org/basics-of-numpy-arrays/>
2. https://www.w3schools.com/python/numpy/numpy_intro.asp

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc23_cs99/preview
2. <https://www.coursera.org/learn/python-for-applied-data-science-ai>
3. <https://www.coursera.org/learn/python-data-analysis>
4. <https://learn.microsoft.com/en-us/training/powerplatform/power-bi/>
5. <https://www.tableau.com/learn/training>

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	30
2	Integrated Lab Component	2	14	28
3	Student Study Hours – Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Activity Based Learning (ABL1/ABL2)	-	-	25
6	Evaluation of Learning Process	-	-	7
Total Learning Hours / Semester				90

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) Tutorial practical Test 2) Activity-Based Learning: Students actively participated in tasks such as implementing real-time applications, building mini-projects using Python for Data Science concepts, and demonstrating their solutions. These activities enhanced their practical coding skills and problem-solving abilities.	20
Total		50



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Activity Based Learning (25 Hours)

ABL1: Exploring NumPy Arrays for Efficient Data Computation Students will work with NumPy arrays to perform operations such as array creation, indexing, slicing, reshaping, and broadcasting. They will also generate random datasets and perform vectorized computations to understand efficiency in data processing.	5 Hrs
ABL2 : Data Cleaning and Transformation using Pandas Students will load real-world datasets and perform preprocessing tasks such as handling missing values, filtering, sorting, grouping, and transforming data. Basic feature engineering techniques will also be introduced.	5 Hrs
ABL3: Visualizing Data for Insightful Analysis Students will create various visualizations such as line plots, bar charts, histograms, and scatter plots using Matplotlib and Seaborn. They will interpret trends and relationships from the visual outputs.	5 Hrs
ABL4: Applying Statistical Techniques for Data Analysis Students will perform statistical computations such as mean, median, variance, and correlation. They will also explore data distributions and basic hypothesis testing to understand data behavior.	5 Hrs
ABL5: Implementing a Data Science Solution for Real-World Problems Students will work individually or in groups to complete a mini project involving dataset selection, preprocessing, visualization, and analysis. They will present their findings based on insights derived.	5 Hrs
Total Learning Hours/ Semester	25 Hrs

Evaluation of Learning Process (7 Hours)

Type of Evaluation	Hours
CIE (1,2,3)	3
Activity Presentation	1
SEE	3
Total	7

Course Articulation Matrix

Course Outcomes	Program Outcomes														
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 1 1	PO 1 2	PSO 1	PSO 2	PSO 3
CO1	3	1			2							1	2	1	
CO2	3	2		1	3							1	3	3	1
CO3	3	3		2	3							2	3	3	2
CO4	3	3	2	3	3				2	2	1	3	3	3	3



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	Object Oriented Programming with JAVA		
Course Code	25AI405	(L-T-P) C	(3-0-0)3
Exam	3	Hours/Week	3
SEE	50 Marks	Total Hours	42 I+ 41 ABL+ 7 EV = 90 Hrs

Course Objective: This course enables students to understand and apply object-oriented programming concepts using Java. Students will learn to design, analyze, and develop Java programs involving classes, inheritance, packages, interfaces, exception handling, generics, file handling, applets, and servlets. The course also helps students build modular and collaborative Java applications for solving real-world problems using object-oriented techniques.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply the Object Oriented Programming concepts to design programs	1	1
2.	Analyse the given java program and write output	1,2	1
3.	Design and implement object oriented solutions involving multiple objects, packages & Interfaces	1,2,3	1
4.	Implement a collaborative Java mini project using object-oriented concepts, multiple objects, packages, interfaces, and modular programming for real-world problem solving.	1,2,3,4,5, 8,9,11	1

MODULE-1		11 Hours
An Overview Of Java: Object-Oriented Programming, A First Simple Program, A Second Short Program Classes, Objects and Methods; Inheritance Classes, Objects and Methods-Introduction, Defining a Class, Fields Declaration, Methods Declaration, Creating Objects, Accessing Class Members, Constructors, Methods Overloading, Static Members. Inheritance: Inheritance, Using super, Creating a Multilevel Hierarchy, When Constructors Are Called, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with Inheritance.		
MODULE-2		10 Hours
Packages: Defining a Package, Finding Packages and CLASSPATH, A Short Package Example, Access protection: An Access Example, Importing Packages. Interfaces: Defining an Interface, Implementing Interfaces, Nested Interfaces, Applying Interfaces, Variables in Interfaces, Default Interface Methods: A More Practical Example, Multiple Inheritance Issues, and Use Static Methods in an Interface.		
MODULE-3		10 Hours
Exception Handling and Generics: Exception Handling Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch: Displaying a Description of an Exception, Multiple Catch Clauses, throw, throws, finally. What Are Generics? A Simple Generics Example, The General Form of a Generic Class, Creating a Generic Method, Generic Constructors, Some Generic Restrictions.		



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

MODULE-4					11 Hours
Programming with I/O, Applets: I/O Basics, Streams, Byte Streams and Character Streams, The Predefined Streams, Reading Console Read the values, Reading Characters, Reading Strings, Writing Console Output, Automatically Closing a File. Applet Fundamentals: The Applet Class: - Two Types of Applets, Applet Basics, The Applet Class, An Applet Skeleton, Requesting Repainting, Using the Status Window, The HTML APPLET Tag. Servlets: A Simple Servlet, The Servlet API, javax.servlet Packages, Reading Servlet Parameters. The javax.servlet.http Package, Handling HTTP Request and Responses, Using Cooking, Session Tracking.					
Text Books:					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2009	Herbert Schildt	9 th Edition	Tata McGrawhil	2009
Reference Books:					
Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Object-Oriented Programming With JAVA Essentials and Applications	RajKumar Buyya	3 rd Edition	McGraw Hill	2009
E-Books and online course materials:					
1. http://www.mhhe.com/buyya/oopj					
Online Courses and Video Lectures:					
1. https://onlinecourses.nptel.ac.in/noc22_cs47/preview					
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	-	-	-	
4	Tutorial Component	-	-	-	
5	Activity Based Learning (ABL)	-	14	41	
6	Evaluation of Learning Process	-	-	7	
Total Learning Hours / Semester					90



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

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: Developing a Mini Java Application Suite	20
Total		50

Activity Based Learning (41 Hours): prefer latest frameworks like spring / eclipse

ABL (41 Hours): Students will design and develop a Java-based application by identifying a suitable problem scenario, performing planning, and applying appropriate programming concepts. They will implement the solution using modular design, interfaces, and essential features, followed by testing and documentation.		Hours
1	Problem Definition & Planning: Identify real-life applications (e.g., Library Management, College Info System, Task Tracker). Define modules and class relationships.	3
2	Class Design: Create UML diagrams and design Java classes using inheritance, interfaces, and abstract classes.	8
3	Coding Core Modules: Implement key modules including constructors, method overloading, static members.	10
4	Package & Interface Integration: Organize modules using packages and implement custom interfaces.	6
5	Exception Handling: Incorporate error handling using try, catch, throw, finally, and custom exceptions. File Handling: Add file input/output features to save and retrieve application data.	7
6	AWT GUI Integration: Develop a simple GUI for the application using AWT (e.g., form input, button action, color/font usage).	5
7	Testing & Documentation: Test the application, handle edge cases, and prepare a report detailing design, features, and screenshots.	2
Total		41

Course Articulation Matrix:

Course Outcomes	Program Outcomes[POs]													
COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO3
CO1	2				3							2		
CO2	2	2			3							2		
CO3	2	2	2		3							2		
CO4	2	2	2	3	3			2	2		3	2		



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	MACHINE LEARNING LAB		
Course Code	25AIL406	(L-T-P) C	(0-0-2) 1
Exam	3	Hours/Week	2
SEE	50 Marks	Total Hours	14 L+ 2 EV= 30

Course Objective: To understand the basic circuit design and basic structure of a computer.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply data preprocessing, data modeling, supervised and unsupervised machine learning algorithms to the given scenario	1	1
2	Analyze the given problem and identify the appropriate data modeling and machine learning method to solve the same	1, 2	2
3	Design and develop a solution using appropriate machine learning algorithm.	1,2, 3	2
4	Conduct experiments individually and in teams for given tasks and document the results systematically.	1,2, 3, 5, 9	1,2,3

Course Content

Guided Experiments

1. Demonstration of Python Libraries for Machine Learning-Pandas, Sklearn, numpy, Matplotlib.
2. Demonstration of Exploratory Data Analysis and Data Visualization
3. Implement the Concept learning algorithms: Find-S and Candidate Elimination Algorithms
4. Implement the KNN classification algorithm for the given dataset
5. Implement a classification problem using Decision Tree for the given dataset
6. Implement a classification problem using Random Forest for the given dataset
7. Implement a classification problem using Support vector machines
8. Implement a Simple Linear Regression for the given dataset
9. Implement Multiple Linear Regression for the given dataset
10. Implement Polynomial Regression for the given dataset
11. Implement Logistic Regression for the given dataset
12. Implement a clustering algorithm using K-means clustering for the given dataset

Open Ended Experiments

1. Student Academic Performance Prediction
2. House Price Prediction
3. Heart Disease Prediction
4. Customer Purchase Prediction
5. Email Spam Detection
6. Iris Flower Classification
7. Wine Quality Classification
8. Mall Customer Segmentation
9. Loan Approval Prediction
10. Employee Salary Prediction



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Machine Learning	Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das	1 st	Pearson	2023
2.	Machine Learning	Tom M. Mitchell	1 st	McGraw-Hill Education (INDIAN EDITION)	2013
Reference Books:					
1.	Hands-on machine learning with scikit-learn and tensorflow, Concepts, Tools, and Techniques to Build Intelligent Systems	Aurélien Géron	2 nd	O'REILLY	2013
2.	Introduction to Machine Learning	EthemAlpaydin	2 nd	PHI Learning Pvt. Ltd.	2013
3.	The Elements of Statistical Learning	T. Hastie, R. Tibshirani, J. H. Friedman	1 st	Springer	2001
eBooks and online course materials: https://www.geeksforgeeks.org/ml-machine-learning/ https://www.javatpoint.com/machine-learning Online Courses and Video Lectures: https://swayam.gov.in/nd1_noc19_cs52/preview https://www.coursera.org/learn/machine-learning					

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1.	Lab Conduction	2	14	28
2.	Integrated Lab Component	-	-	-
3.	Self-Study Hours-Self Learning	-	-	-
4.	Evaluation of Learning Process	-	-	02
5.	Activity Based Learning	-	-	-
Total Learning Hours/Semester				30



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Proposed Assessment Plan (for 50 marks of CIE):

Tool		Remarks	Marks
Continuous Evaluation	Conduction	Execution of programs, conduction of experiments in the lab	20
	Record	Record writing	10
CIE		Conducted for 20 marks & reduced to 10 marks	10

Evaluation of Learning Process (6 Hours)

Type of Evaluation	Hours
CIE 1 and 2	2
Semester End Exam	2
Total	4

Course Articulation Matrix

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



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	Project Management with Git		
Course Code	25AI407A	(L-T-P) C	(0-0-2)1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28P+2ELP=30

Course Objective: Provide students with advanced knowledge and practical skills in prompt engineering for AI systems, covering text completion, zero-shot classification, text summarization, question answering, multimodal prompt engineering, prompt optimization, transfer learning, adversarial attacks, and ethical considerations.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply commands related to Collaboration and Remote Repositories	1	-
2	Analyse and change the git history	3	-
3	Create and manage the branches	3,5	1
4	Collaborate using Git and GitHub for effective version control and project documentation.	3,5	1

Part - A

Week 1: Setting Up and Basic Commands

Initialize a new Git repository in a directory. Create a new file and add it to the staging area and commit the changes with an appropriate commit message.

Week 2: Creating and Managing Branches

Create a new branch named "feature-branch." Switch to the "master" branch. Merge the "feature-branch" into "master."

Week 3: Creating and Managing Branches

Write the commands to stash your changes, switch branches, and then apply the stashed changes.

Week 4: Collaboration and Remote Repositories

Clone a remote Git repository to your local machine.

Week 5: Collaboration and Remote Repositories

Fetch the latest changes from a remote repository and rebase your local branch onto the updated remote branch.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Week 6: Collaboration and Remote Repositories

Write the command to merge "feature-branch" into "master" while providing a custom commit message for the merge.

Week 7: Git Tags and Releases

Write the command to create a lightweight Git tag named "v1.0" for a commit in your local repository.

Week 8: Advanced Git Operations

Write the command to cherry-pick a range of commits from "source-branch" to the current branch

Week 9: Analysing and Changing Git History

Given a commit ID, how would you use Git to view the details of that specific commit, including the author, date, and commit message?

Week 10: Analysing and Changing Git History

Write the command to list all commits made by the author "JohnDoe" between "2023-01-01" and "2023-12-31."

Week 11: Analysing and Changing Git History

Write the command to display the last five commits in the repository's history

Week 12: Analysing and Changing Git History

Write the command to undo the changes introduced by the commit with the ID "abc123".



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

PART B: Open Ended Experiments

- Personal Project Version Control Setup – initialize and structure a Git repository for a project of your choice, including branching strategy and commit conventions
- Team Collaboration Simulation – set up a shared repository (GitHub) and simulate a multi-contributor workflow with pull requests, code reviews, and merge conflict resolution
- Feature Branch Workflow Design – design and implement a complete Git branching workflow (e.g., Gitflow, trunk-based) for a project of your choice
- History Investigation Challenge – given/created a messy repository, use Git tools to trace, diagnose, and fix an introduced bug using history analysis commands
- Release Management – design a tagging and release strategy for a project, including versioning conventions and changelog generation
- Open Source Contribution – fork a public repository of your choice, make a meaningful change, and submit a pull request following that project's contribution guidelines
- Conflict Resolution Scenario – deliberately create and resolve merge conflicts across multiple branches for a project of your choice
- CI/CD Integration with GitHub Actions – set up a basic automated workflow (e.g., linting, testing) triggered on commits/pull requests in your repository
- Repository Recovery Exercise – simulate a scenario with lost or corrupted commits/branches and recover the project using Git's recovery tools

Documentation-Driven Project – build and maintain a project repository with a README, CONTRIBUTING guide, issue templates, and structured commit history reflecting real project documentation practices

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	Version Control with Git	Prem Kumar Ponuthorai, Jon Loeliger	3rd Edition	O'Reilly Media, Inc	2022



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Programming the World Wide Web	Robert W Sebesta	8 th Edition	Pearson	2014
2	Web Programming Building Internet Applications	Chris Bates	3 rd Edition	Wiley India	2014
3	Open Source Web Development with LAMP	James Lee, Brent Ware	1 st Edition	Pearson Education	2013

EBooks and online course materials:

1. <https://git-scm.com/book/en/v2>

Online Courses and Video Lectures:

1. https://online-degree.swayam2.ac.in/mri22_01_d03_sl_el10/preview

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	Lab Component + Activity Based Learning (ABL)	2	14	28
3	Student Study Hours – Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Evaluation of Learning Process	-	-	2
Total Learning Hours / Semester				30

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Evaluation	Weekly Conduction of Experiment + Record + Viva	10
CIE	Conduction of CIE	20
Activity Details	Details of activities to be conducted Collaborative Project Management Using Git & GitHub	20
Total		50



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Articulation Matrix

Course Outcomes	Program Outcomes													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO1 1	PSO 1	PSO 2	PSO3
CO1	1													
CO2		2												
CO3			2									3		
CO4				2	3				3	3		3		



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	NOSQL DATABASES LABORATORY		
Course Code	25AI407B	(L-T-P) C	(0-0-2) 1
Exam	3 Hrs.	Hours/Week	2
SEE	50 Marks	Total Hours	28P + 2EV = 30
Course Objective: To provide knowledge of NoSQL database concepts and develop practical skills to design and implement scalable applications using MongoDB, Cassandra, and Neo4j. Course Outcomes (Cos): Upon completion of the course, students shall be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Understand the concepts, architecture, and types of NoSQL databases including document, column-family, and graph databases.		
2.	Apply MongoDB operations such as CRUD, query selectors, aggregation pipelines, indexing, and text search for handling structured and semi-structured datasets.		
3.	Analyze data models and query execution techniques in Cassandra and Neo4j for scalable and graph-based applications.		
4.	Demonstrate the implementation of NoSQL database solutions for real-world applications using MongoDB, Cassandra, and Neo4j tools.		

Course Contents

Lab 1: Introduction to NoSQL Databases

- Introduction to NoSQL databases and CAP theorem.
- Comparison between SQL and NoSQL databases.
- Types of NoSQL databases: Key-Value, Document, Column-Family and Graph databases.
- Applications and advantages of NoSQL databases.

Lab 2: Setting Up NoSQL Environment

- Installation and configuration of MongoDB, Cassandra and Neo4j.
- Understanding database architecture and tools.
- Working with shell interface and GUI tools.

Lab 3: MongoDB CRUD Operations

- Database and collection creation.
- JSON/BSON document structure.
- Insert, Find, Update and Delete operations in MongoDB.

Lab 4: MongoDB Query Operations

- Comparison operators (\$gt, \$lt, \$gte, \$lte, \$eq, \$ne).
- Logical operators (\$and, \$or, \$not).
- Sorting and limiting documents.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Lab 5: MongoDB Projection and Filtering

- Field selection and projection.
- Inclusion and exclusion of fields.
- Array projection operators (\$, \$elemMatch, \$slice).

Lab 6: Advanced Query Selectors in MongoDB

- Geospatial selectors.
- Bitwise selectors.
- Array queries and logical filtering techniques.

Lab 7: MongoDB Aggregation Operations

- Aggregation framework.
- Aggregation operators: \$avg, \$sum, \$min, \$max, \$push and \$addToSet.
- Grouping operations and aggregation expressions.

Lab 8: Aggregation Pipeline in MongoDB

- Aggregation pipeline stages.
- \$match, \$group, \$sort, \$project, \$skip and \$limit operations.
- Multiple pipeline queries.

Lab 9: MongoDB Indexing and Query Optimization

- Unique indexes.
- Sparse indexes.
- Compound indexes and multikey indexes.
- Query optimization techniques.

Lab 10: MongoDB Text Search

- Text indexing concepts.
- Phrase search and relevance score.
- Excluding words and phrases in text search.

Lab 11: Cassandra Database Operations

- Cassandra architecture and data modeling.
- Keyspaces, tables and clustering columns.
- CQL commands and query execution.

Lab 12: Neo4j Graph Database Operations

- Introduction to graph databases.
- Nodes, relationships and properties.
- Cypher query language and graph queries.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Practical Components

Guided Experiments:

1. Study and compare SQL and NoSQL databases and prepare a comparative analysis report based on different NoSQL models and applications.
2. Install and configure MongoDB, Cassandra and Neo4j databases and verify database connectivity and execution environment.
3. Perform CRUD operations on student, employee or product collections using MongoDB commands.
4. Develop MongoDB queries using WHERE conditions, logical operators, sorting and limit operations on collections.
5. Execute projection and filtering operations to retrieve selected fields and array elements from collections.
6. Implement advanced query selectors including geospatial and bitwise selectors on sample datasets.
7. Perform aggregation operations on sales or e-commerce datasets and analyze grouped results.
8. Design and execute aggregation pipelines for report generation and data analysis applications.
9. Create different types of indexes and analyze query performance before and after indexing.
10. Implement text search operations on catalog or product datasets and retrieve relevant search results.
11. Develop aggregation pipelines integrated with text search for analytical applications.
12. Create Cassandra tables and execute CQL queries; develop graph databases and execute Cypher queries in Neo4j.

PART B: Open Ended Experiments

1. E-Commerce Product Management System – build using MongoDB with CRUD operations, aggregation reports, and text search features
2. Social Network Analysis / Recommendation System – build using Neo4j or Cassandra for relationship analysis and graph-based queries
3. Hospital/Patient Management System – design using MongoDB to manage patient records, appointments, and doctor schedules with aggregation-based reporting
4. IoT Sensor Data Analytics – model and store time-series sensor data in Cassandra and analyze trends using CQL queries
5. Library Management System – implement using MongoDB with collections for books, members, and transactions, including indexing for fast search
6. Fraud Detection / Transaction Network – model financial transactions as a graph in Neo4j to detect suspicious patterns or fraud rings
7. Movie/Streaming Recommendation Engine – design a content or collaborative recommendation



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

system using Neo4j graph relationships or MongoDB aggregation

8. Real Estate Listing Platform – build using MongoDB with geospatial queries for location-based property search and filtering
9. Employee/Organization Hierarchy System – model organizational structure and reporting relationships using Neo4j graph queries
10. Multi-Database Comparative Application – implement the same real-world use case (of your choice) separately in MongoDB, Cassandra, and Neo4j, and compare performance, query complexity, and data modeling trade-offs.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	MongoDB: The Definitive Guide	Kristina Chodorow	3rd Edition	O'Reilly	2019
2.	NoSQL Distilled	Pramod J. Sadalage & Martin Fowler	1st Edition	Addison Wesley	2012

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	NoSQL for Mere Mortals	Dan Sullivan	1st Edition	Pearson	2015
2.	Professional NoSQL	Shashank Tiwari	1st Edition	Wiley	2011
3.	Graph Databases	Ian Robinson, Jim Webber & Emil Eifrem	2nd Edition	O'Reilly	2015

Online Courses and Video Lectures:

1. [MongoDB University](#)
2. [Neo4j GraphAcademy](#)
3. [Apache Cassandra Documentation](#)
4. [MongoDB Full Course – freeCodeCamp](#)
5. [Neo4j Tutorial for Beginners](#)

MOOCS:

1. [Coursera – Introduction to MongoDB](#)
2. [edX – Big Data and NoSQL Systems](#)
3. [Udemy – MongoDB Complete Developer Course](#)

Teaching -Learning– Evaluation Scheme:

Sl. No	Teaching and Learning Method	No. of Hours/ Week	No. of Weeks	Hours/ Semester
1	Lab Conduction	2	14	28
2	Evaluation	-	-	2
Total Learning Hours / Semester				30



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Internals	Continuous Evaluation – 20 Marks	20
Activity (PBL)	Project-Based Learning Activity	10
Laboratory Performance and Viva	Continuous Assessment	20
Total		50

Course Articulation Matrix

Course Outcomes	Program Outcomes														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 1 1	PO1 2	PSO 1	PSO 2	PSO3
CO1	3	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	3	2	3	-	-	-	-	-	-	-	3	2	-
CO3	3	2	3	3	2	-	-	-	-	-	-	-	2	3	-
CO4	3	3	3	3	3	-	-	-	2	2	-	-	3	3	2



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	UNIX AND SHELL PROGRAMMING LABORATORY		
Course Code	25AI407C	L-T-P-C	(0-0-2)1
Exam	3	Hours / Week	2
SEE	50 Marks	SEE	50 Marks
Total Hours			28L+2EV = 30
Course Objective: To provide students with practical skills in shell scripting for automation and system administration, building on UNIX fundamentals covered in the Operating Systems Lab, with emphasis on advanced scripting constructs, debugging, and real-world sysadmin-style automation tasks.			
Course Outcomes (COs): Upon the completion of the course the students will be able to:			
#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Apply shell scripting constructs — arrays, functions, argument parsing (getopts), and here-documents — to automate system tasks.	1,3,5	-
2	Develop automation and system-administration scripts for monitoring, backup, log management, and scheduling.	1,2,3,5	1
3	Design and implement complete shell-based utilities/tools that solve real administrative problems.	1,3,5,9,10	1
4	Analyze and debug shell scripts using signal handling (trap) and shell debugging techniques (set -x/-e/-u).	1,2,5	-

Course Contents

Week 1: Shell Scripting Fundamentals Revisited

Variables, quoting rules, arithmetic expansion, indexed arrays and associative arrays. Iterating over arrays and performing array-based data storage.

Week 2: Advanced Control Structures

Conditional expressions with test/[[]], case statements for multi-way branching, nested loops operating on array data.

Week 3: Functions and Argument Handling

Defining functions with return values and local variables, working with positional parameters (\$1, \$@, \$#), and parsing command-line options using getopts.

Week 4: Advanced I/O and Redirection

Here-documents and here-strings for inline input, process substitution (<(...), >(...)), and advanced file-descriptor redirection using exec.

Week 5: Pattern Processing with awk

Field-based text processing, awk scripts for column extraction, computed fields, and generating tabular summary reports.

Week 6: Signal Handling and Debugging

Using trap to catch signals (e.g., SIGINT) and perform cleanup; debugging scripts with set -x, set -e, and set -u; understanding exit-status chaining (&&, ||).



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Week 7: Environment and Shell Customization

Customizing .bashrc/.profile, defining environment variables, aliases and functions, and modifying PATH for custom utilities.

Week 8: File and Directory Automation

Batch file operations using find with -exec, automated organization of files by type/date/pattern.

Week 9: Process and Job Automation

Background job control, scheduling recurring tasks with cron, one-time scheduling with at, and monitoring job status.

Week 10: System Monitoring Scripts

Scripts to monitor disk usage, memory, and CPU load, with threshold-based alerting.

Week 11: Backup and Log Management

Automated backup scripts with timestamped archives, backup rotation, and basic log-rotation strategies.

Week 12: Networking and Remote Script Basics

Basic networking commands, connectivity checks to a list of hosts, and an introduction to remote command execution.

Practical Components

Guided Experiments:

1. Write a shell script demonstrating indexed and associative arrays — store and display a set of student names and marks, then compute the class average.
2. Write a shell script using a case statement to implement a simple text-based menu system with at least four options.
3. Write a shell script with functions that use positional parameters and getopts to accept command-line options (e.g., -n name -a age) and display formatted output.
4. Write a shell script that uses a here-document to generate a formatted report, and process substitution to compare the output of two commands.
5. Write an awk script to process a space/CSV-delimited data file and generate column-wise summary statistics (sum, average, count).
6. Write a shell script that uses trap to gracefully handle Ctrl+C and clean up temporary files; enable set -x to debug its execution.
7. Write a shell script to customize the shell environment — define aliases, functions, and PATH additions in a startup file, and verify they take effect.
8. Write a shell script using find with -exec to batch-rename or organize files in a directory by their extension.
9. Write a shell script to schedule a recurring task using cron and verify its execution through a log file.
10. Write a shell script to monitor disk usage and print an alert message when usage exceeds a specified threshold.
11. Write a shell script to back up a specified directory into a timestamped archive and remove backups



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

older than a specified number of days.

12. Write a shell script that checks connectivity to a list of hosts supplied in a file and reports the status of each.

PART B: Open Ended Experiments

1. System Monitoring Dashboard – build a shell script that continuously reports CPU, memory, disk usage, and running processes in a readable format
2. Automated Backup Utility – design a script that backs up a chosen directory with timestamped archives and optional compression
3. Log File Analyzer – write a script that parses any system/application log file of your choice to extract errors, patterns, and generate a summary report
4. Batch File Renamer/Organizer – create a script that organizes files in a directory into folders based on file type, date, or a naming pattern
5. User Account Management Tool – build an interactive script to add, delete, or modify user accounts and report their status
6. Automated Report Generator – design a script that collects data (disk usage, logged-in users, processes) periodically and emails/logs a formatted report
7. Text Processing Toolkit – build a menu-driven script that performs multiple text operations (word count, duplicate removal, case conversion, pattern search) on a file of the user's choice
8. Simple Task Scheduler – write a script that schedules and runs a set of commands/scripts at user-defined intervals, logging execution status
9. Network/Connectivity Checker – design a script that monitors connectivity to a list of hosts/servers and alerts when one becomes unreachable
10. Custom Shell-Based Mini Utility – design and implement a shell-based tool solving a real administrative problem of your choice (e.g., disk cleanup advisor, process killer by name, config file validator)

Proposed Assessment Plan (for 50 marks of CIE):					
Tool		Remarks		Marks	
CIE		Laboratory CIE		30	
Record		Laboratory Record Submission		10	
Continuous Evaluation		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	Class Room Teaching		2	14	28
2	Evaluation of Learning Process		-	-	2
Total Learning Hours / Semester					30



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Articulation matrix

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



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	iOS App Development with Swift		
Course Code	25AI407D	(L-T-P) C	(3-0-2) 4
Exam	3 Hrs.	Hours/Week	5 (3L + 2P)
SEE	50 Marks	Total Hours	42L + 28P + 2ELP = 72

Course Objective:

Introduce students to structured programming using Apple Swift, covering iOS app development, data types, control structures, functions, collections, and UIKit. Students will design, code, debug, test, and document programs using Xcode and Interface Builder.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Demonstrate understanding of Swift fundamentals, iOS, Xcode, and the Xcode development environment.	1,2	-
2	Handle and store data using clearly defined types, operators, and control flow structures.	1,3	-
3	Design and build basic iOS apps using Interface Builder, Storyboards, and UIKit components.	3,5	1
4	Create multi-scene applications using navigation controllers, tab bar controllers, and segues.	3,5	1

Course Contents

Lab 1: Setting Up the Xcode Environment

- Install Xcode from the Mac App Store and configure the iOS Simulator.
- Set up a Swift Playground and verify the environment by running a Hello World program.
- Declare constants and variables using let and var. Print values using print().

Program: Write a Swift Playground program that declares your name, age, and favourite number using let and var, then prints them using string interpolation. Example output: "My name is Ravi, I am 20 years old and my favourite number is 7."

Lab 2: Data Types and Operators

- Understand Swift data types: Int, Double, Float, Bool, String, and Character.
- Use arithmetic operators (+, -, *, /, %) and comparison operators (==, !=, <, >, <=, >=).
- Explore type inference and explicit type annotation.

Program: Write a Swift program that accepts two integers and performs all arithmetic operations (addition, subtraction, multiplication, division, modulus) on them. Display the results with appropriate labels. Also check and print whether the first number is greater than, less than, or equal to the second.

Lab 3: Control Flow – Conditionals

- Implement if, if-else, and if-else if ladder for decision making.
- Use switch statements for multi-case branching.
- Understand the use of where clauses and range matching in switch.

Program: Write a Swift program that takes a student's score (0–100) as input and prints the grade using a switch statement: A (90–100), B (75–89), C (60–74), D (45–59), F (below 45). Also print a message like "Excellent!", "Good", "Average", or "Fail" accordingly.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Lab 4: Control Flow – Loops

- Use for-in loops with ranges and collections.
- Implement while and repeat-while loops.
- Apply break and continue to control loop execution.

Program: Write a Swift program to print the multiplication table of a given number (1–10) using a for-in loop. Then use a while loop to find and print all even numbers between 1 and 50. Finally, use repeat-while to keep asking the user to guess a secret number until they get it right.

Lab 5: Xcode – Building, Running, and Debugging

- Create a new Single View App project in Xcode.
- Build and run the app on the iOS Simulator.
- Set breakpoints, step through code, and use the debug console to inspect variable values.

Program: Create a simple iOS app that displays a UILabel with the text "Welcome to Swift!" on the screen. Add a breakpoint inside viewDidLoad(), run the app in the Simulator, inspect the label's text property in the debug console, and then modify it programmatically to display your name.

Lab 6: Strings and Functions

- Perform string operations: concatenation, interpolation, length, uppercase, lowercase, contains, and replace.
- Define functions with parameters and return values.
- Understand internal and external parameter labels.

Program: Write a Swift program with the following functions: (1) greet(name: String) -> String that returns "Hello, <name>!"; (2) reverseString(_ str: String) -> String that returns the reversed string; (3) isPalindrome(_ str: String) -> Bool that checks if a string reads the same forwards and backwards. Call all three functions and print results.

Lab 7: Structures and Classes

- Define a struct with stored properties and methods.
- Define a class, create instances, and access properties.
- Implement inheritance and override methods in a subclass.

Program: Define a struct Student with properties: name (String), rollNo (Int), marks (Double), and a method grade() -> String that returns the grade based on marks. Create at least three Student instances and print each student's name, roll number, marks, and grade. Then create a class Animal with a speak() method, and a subclass Dog that overrides speak() to print "Woof!".

Lab 8: Collections – Arrays and Dictionaries

- Declare, initialise, and modify Arrays.
- Use Dictionaries with key-value pairs for data storage and lookup.
- Iterate over collections using for-in loops and apply common methods like append, remove, sort, filter, and map.

Program: Write a Swift program that (1) creates an array of 10 integers, finds the sum, average, maximum, and minimum values; (2) creates a Dictionary mapping student names to their marks, then prints only those students who scored above 75; (3) uses filter and map to create a new array containing the squares of all even numbers from the original array.

Lab 9: Loops with Collections and UIKit Introduction

- Use for-in and enumerated() to iterate over arrays with index.
- Introduction to UIKit: UILabel, UIButton, UIImageView, and UITextField.
- Connect UI elements to code using IBOutlet and IBAction.

Guided Project – Apple Pie: Build the Apple Pie word-guessing game from the App Development with Swift textbook. Implement the game logic using arrays (for letters and wrong guesses), loops to update the display, and UIKit controls for the letter buttons and image view showing the apple tree.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Lab 10: Display Data and Controls in Action

- Display dynamic data using UILabel and UIImageView.
- Accept user input via UITextField and UISlider.
- Handle button tap events with IBAction and update UI in response.

Program: Build an iOS app with a UITextField for the user to enter their name, a UISlider to select an age (0–100), and a UIButton labelled Submit. When the button is tapped, display a greeting in a UILabel: "Hello, <name>! You are <age> years old." Validate that the name field is not empty; if empty, show an alert saying "Please enter your name."

Lab 11: Auto Layout and Stack Views

- Apply Auto Layout constraints (leading, trailing, top, bottom, width, height) in Interface Builder.
- Use UIStackView (horizontal and vertical) to create adaptive layouts.
- Test the layout on multiple device sizes (iPhone SE, iPhone 15, iPad) using the Simulator.

Program: Design a Profile Card screen in Xcode using Interface Builder. The card must contain a circular UIImageView (placeholder image), UILabels for Name, Designation, and Email, and a UIButton labelled Contact. Use a vertical UIStackView to organise all elements. Apply constraints so the card appears correctly on both iPhone SE and iPhone 15 Pro without overlapping or clipping.

Lab 12: Optionals and Type Casting

- Declare optionals and safely unwrap using if-let and guard-let.
- Use optional chaining (?.) and nil-coalescing operator (??) in expressions.
- Apply type casting operators: as?, as!, and is for type inspection.

Program: Write a Swift program that (1) defines a function findUser(id: Int) -> String? that returns a name for known IDs and nil for unknown ones; call it and safely unwrap using if-let; (2) uses guard-let inside a function to validate that a given String can be converted to an Int, and returns early with an error message if not; (3) creates an array of type [Any] containing Int, String, and Double values, then uses a for-in loop with type casting (is and as?) to print each value with its type.

Lab 13: Enumerations and Segues

- Define enumerations with raw values and associated values.
- Use enums in switch statements for clean, readable branching.
- Create segues between view controllers in a storyboard and pass data using prepare(for:sender:).

Program: Define an enum Direction with cases: north, south, east, west. Write a function move(direction: Direction) that prints the movement. Then build a two-screen iOS app: Screen 1 has a UITextField and a UIButton labelled "Send to Next Screen". On button tap, perform a segue to Screen 2 and display the entered text in a UILabel using prepare(for:sender:).

Lab 14: Navigation Controllers and Tab Bar Controllers

- Embed view controllers in a UINavigationController for stack-based navigation.
- Configure a UITabBarController with at least three tabs, each with an icon and title.
- Manage the back button and pass data back using unwind segues or delegation.

Program: Build an iOS app with a UITabBarController containing three tabs: (1) Home – displays a welcome message; (2) Calculator – a basic calculator with +, -, *, / operations using UITextField and UIButton; (3) About – shows your name, roll number, and a short bio. Apply proper Auto Layout and ensure navigation works correctly between all screens.

Lab 15: View Controller Lifecycle and Multi-Screen Workflows

- Understand and log viewDidLoad, viewWillAppear, viewDidAppear, viewWillDisappear, and viewDidDisappear.
- Manage state and persist user selections across view controllers.

Guided Project – Personality Quiz: Build the Personality Quiz app from the App Development with Swift



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

textbook. The quiz must have at least four questions with multiple-choice and range-input answer types. Use enumerations to define answer options, segues to navigate between questions, and a results screen that computes and displays the personality type based on the user's answers.

Lab 16: Project-Based Lab – Final iOS App

- Integrate all concepts learned: Swift fundamentals, UIKit, Auto Layout, navigation, data handling, and lifecycle.
- Design, build, test, and debug a complete iOS application from scratch.
- Present the app to the class explaining design decisions, code structure, and features implemented.

Project: Design and develop a fully functional iOS app of your choice (e.g., a Student Marks Tracker, a To-Do List app, a Quiz app, or a Personal Expense Manager). The app must include: at least three screens connected via navigation or tab bar, user input with validation, data stored in arrays or dictionaries, proper use of optionals, enumerations, functions, and structures, Auto Layout for multiple device sizes, and clean code documentation with comments.

PART B: Open Ended Experiments

1. Student Marks Tracker App – build a multi-screen app to record, calculate, and display student grades using arrays/dictionaries
2. Personal Expense Manager – design an app to log expenses by category with running totals and simple summaries
3. To-Do List App – build a task manager with add/edit/delete/complete functionality and persistent state across screens
4. Quiz/Trivia App – design a multi-question quiz app (of your own theme) with scoring and a results screen
5. Recipe Book App – build an app displaying a list of recipes with detail screens, images, and ingredient lists
6. Unit Converter App – design a multi-tab app converting between units (currency, length, temperature, etc. of your choice)
7. Habit/Fitness Tracker – build an app to log daily habits or workouts with a history view and simple stats
8. Contact/Address Book App – design an app to add, search, and manage contact details with a detail view per contact
9. Weather-Style Info App – build an app displaying static or user-entered location-based information across multiple screens with tab/navigation controllers
10. Custom iOS App – design and build a complete original iOS app of your choice integrating navigation, data handling, optionals, enums, and Auto Layout across at least three screens

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1.	App Development with Swift (Swift 4 Edition)	Apple Education	Swift 4 Ed.	Apple Inc.	2018
2.	Swift Programming: The Big Nerd Ranch Guide	Matthew Mathias, John Gallagher	3rd Edition	Big Nerd Ranch Guides	2020



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	iOS Programming: The Big Nerd Ranch Guide	Christian Keur, Aaron Hillegass	7th Edition	Big Nerd Ranch Guides	2020
2	Learning Swift: Building Apps for macOS, iOS, and Beyond	Jonathon Manning, Paris Buttfield-Addison, Tim Nugent	3rd Edition	O'Reilly Media	2018
3	Swift in Depth	Tjeerd in 't Veen	1st Edition	Manning Publications	2018

eBooks and Online Course Materials:

1. <https://developer.apple.com/swift/resources/>
2. <https://docs.swift.org/swift-book/documentation/the-swift-programming-language/>

Online Courses and Video Lectures:

1. <https://developer.apple.com/tutorials/swiftui>
2. <https://cs193p.sites.stanford.edu/> (Stanford CS193p – iOS App Development)

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	Lab Component + Activity Based Learning (ABL)	2	14	28
3	Student Study Hours – Self Learning	-	-	-
4	Tutorial Component	-	-	-
5	Evaluation of Learning Process	-	-	2
Total Learning Hours / Semester 72				

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
Continuous Evaluation	Weekly Lab Conduction + Record + Viva	10
CIE	Conduction of CIE (3 Unit Exams)	20
Activity Details	Guided Projects: Light App, Apple Pie Game, Personality Quiz App	20
Total		50



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Articulation Matrix

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



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

ENVIRONMENTAL SCIENCE PROJECT			
Course Code	25EVS	CIE Marks	50
Course Type	PROJ	SEE Marks	50
Teaching Hours/Week (L:T:P:S)	0:0:2:0	Total Marks	100
Total Hours of Pedagogy	26 hours	Exam Hours	3
Credits	01	Semester	IV

Course Objectives:

1. To develop students awareness, understanding, and responsibility toward the environment.
2. To study real-world environmental issues through field surveys, case studies, and environmental audits.
3. To apply scientific and engineering principles to design feasible and sustainable solutions to environmental problems.
4. To analyze environmental data and propose remedial or preventive measures for improving biodiversity, air quality, and thermal comfort.

About the Course:

The Environmental Science Project is an applied learning component designed to develop students' awareness, understanding, and responsibility toward the environment. It provides an opportunity to study real-world environmental issues and apply scientific and engineering principles to design feasible and sustainable solutions.

The topics under environment include, but are not limited to, climate change, biodiversity, air and water pollution, land use, excess use of natural resources, earthquakes, rise in the earth's temperature, power generation, soil erosion, and environment-related programmes.

The project involves problem identification, field surveys, case studies, data collection, environmental audits, analysis, and proposal of remedial or preventive measures aimed at improving biodiversity, air quality, and thermal comfort.

Students can take up projects individually or in a group not exceeding 4 students. Students can opt for an interdisciplinary project based on their interest.

Guidelines for Conducting the Environmental Science Project:

1. Students may undertake the project individually or in a group of not more than 4 members, and may opt for an interdisciplinary project based on interest.
2. Each student/group shall identify a genuine environmental issue in consultation with the faculty guide.
3. A faculty member shall be allotted as a guide/mentor to monitor the progress of the project.
4. The project shall involve problem identification, field surveys, data collection, environmental audits, analysis, and the proposal of remedial or preventive measures.
5. Students shall maintain a project log/diary recording weekly progress, field visits, sampling / measurement data, and observations.
6. The project work shall be documented as a report and presented before an evaluation committee.
7. Wherever applicable, students should collaborate with Pollution Control Boards, forest/environment departments, local bodies, NGOs, or research institutions.
8. Ethical conduct, safety during field/lab work, and adherence to environmental regulations must be maintained throughout the project.



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Suggested Project Domains (Indicative, not exhaustive):

Climate Change: Carbon footprint estimation, greenhouse gas monitoring, climate adaptation/mitigation studies.

- Biodiversity: Flora/fauna surveys, habitat assessment, green-cover mapping, conservation initiatives.
- Air Quality: Ambient air monitoring, AQI analysis, indoor air-quality assessment, emission reduction measures.
- Water Resources: Water-quality testing, rainwater harvesting, wastewater treatment, water conservation.
- Land and Soil: Soil erosion assessment, land-use change studies, solid-waste management.
- Energy and Resources: Renewable power generation, energy audits, sustainable use of natural resources.
- Thermal Comfort & Urban Environment: Urban heat-island studies, green building/landscaping, microclimate improvement.

Course Outcomes (COs):

On completion of this course, students will be able to:

CO	Course Outcome Statement
CO1	Identify and analyze a real-world environmental problem through field surveys, case studies, and environmental audits.
CO2	Collect and analyze environmental data using appropriate scientific and engineering methods.
CO3	Design and propose feasible, sustainable remedial or preventive solutions to the identified environmental issue.
CO4	Document and communicate the project outcomes through reports and presentations, demonstrating environmental responsibility and ethics.

CO–PO / PSO Mapping:

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

Note: 1 – Low, 2 – Medium, 3 – High level of correlation; '-' indicates no correlation.

Continuous Internal Evaluation (CIE):

The Environmental Science Project carries 50 CIE marks. The Semester End Examination (SEE) carries 50 SEE marks. The CIE shall be evaluated continuously by the project guide and a departmental evaluation committee based on the following components:

Evaluation Component	Marks
Problem identification, field survey & literature/case study	20
Data collection, environmental audit & periodic reviews (project	20



MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

diary/log)	
Analysis and design of remedial/preventive solution (technical work)	30
Project report	15
Final presentation, demonstration & viva-voce	15
Total	100

A minimum of 40% (40 marks) in CIE is required for a student to be declared as passed in the course.

Suggested Project Timeline:		
Weeks	Activity	Deliverable
1–2	Problem identification, site/field selection, need analysis	Problem statement & synopsis
3–5	Field surveys, case studies, data collection & environmental audit	Survey/audit data
6–10	Data analysis, design of remedial/preventive solution	Analysis & solution design
11–12	Validation/demonstration of measures, report writing	Project report & demo
13	Final presentation and viva-voce	Final evaluation

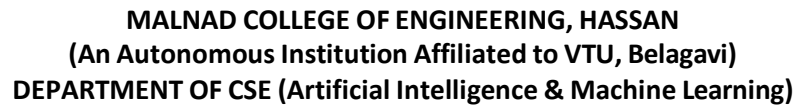
Reference Resources:

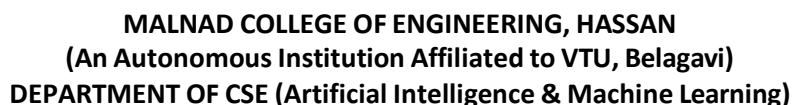
1. Y. Anjaneyulu, Introduction to Environmental Science, BS Publications.
2. Erach Bharucha, Textbook of Environmental Studies for Undergraduate Courses, UGC, Universities Press.
3. Central / State Pollution Control Board (CPCB / KSPCB) guidelines and reports — <https://cpcb.nic.in>
4. United Nations Sustainable Development Goals (SDGs) — <https://sdgs.un.org/goals>
5. Ministry of Environment, Forest and Climate Change (MoEFCC), Govt. of India — <https://moef.gov.in>



MALNAD COLLEGE OF ENGINEERING, HASSAN
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DEPARTMENT OF CSE (Artificial Intelligence & Machine Learning)

Course Title	BIOLOGY FOR ENGINEERS				
Course Code	25AI409	(L-T-P)C	(0-2-0)1		
Exam	3 Hrs.	Hours/Week	2		
SEE	50 Marks	Total Hours	28		
Course Objective: Realization of relation between Natural Engineering and man-made Engineering.					
Course outcomes: At the end of course, student will be able to:					
#	Course Outcomes	Mapping to PO's	Mapping to PSO's		
1.	To familiarize engineering students with basic biological concepts	1	-		
2.	To involve students in an interdisciplinary vision of biology and engineering	2	-		
3.	To gain an appreciation for how biological systems can be designed and engineered to substitute natural system	2	-		
4.	To develop biological models using AI tools	3	-		
MODULE – 1			6 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			6 Hrs.		
Artificial Intelligence and Biology: Applications of AI in medical imaging, neural engineering, systems biology, microbiome and data mining.					
Text Books:					
Sl.No	Book Title	Authors	Edition	Publisher	Year
1.	Bioinspired Engineering	Jenkins, C.H., NY	1 st	Momentum press	2012
2.	A Practical Guide to Bio- inspired Design	Hashemi Farzaneh, Helena, Lindemann, Udo	1 st	Springer	2019
Proposed Assessment Plan (for 50 marks of CIE):					
Tool		Remarks		Marks	
CIE	CIE1				
	CIE2				
	CIE3				
Activity Details					

[illegible]



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

[illegible]

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.			

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. BasavaraddiV: Yoga in School Health, MDNIY NewDelhi. 2009
3. Dr.HR.Nagendra: Yoga Research and application (Vivekanda Kendra Yoga Prakashana Bangalore)
4. Dr.Shirley Telles: Glimpses of Human Body (Vivekanda KendraYoga Prakashana Bangalore).

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.

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