MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Affiliated to VTU, Belagavi)

Autonomous Programme

Bachelor of Engineering

Department Of
Information Science & Engineering

SCHEME and SYLLABUS
(2022 Admitted Batch)

Academic Year 2025-26

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
Department of Information Science & Engineering

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

The department will be a premier centre focusing on knowledge dissemination and generation to address the emerging needs of information technology in diverse fields.

MISSION OF THE DEPARTMENT

1. To make students competent to contribute towards the development of IT field
2. Promote learning and practice of latest tools and technologies among students and prepare them for diverse career options
3. Collaborate with industry and institutes of higher learning for Research and Development, innovations and continuing education
4. Developing capacity of teachers in terms of their teaching and research abilities
5. Develop software applications to solve engineering and societal problems

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
Department of Information Science & Engineering

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: be successful professionals in IT industry with good design, coding and testing skills, capable of assimilating new information and solve new problems

PEO2: communicate proficiently and collaborate successfully with peers, colleagues and organizations

PEO3: be ethical and responsible members of the computing profession and society

PEO4: acquire necessary skills for research, higher studies, entrepreneurship and continued learning to adopt and create new applications

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PROGRAM OUTCOMES (POs)

6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

Upon graduation, students with a degree B.E. in Information Science & Engineering will be able to:

1. Design and develop efficient information systems for organizational needs
2. Ability to adopt software engineering principles and work with various standards of Computing Systems.

Scheme of Evaluation (Theory Courses)

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

Scheme of Evaluation (Laboratory Courses)

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

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

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

COURSE TYPES

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

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Semester-wise Credit Distribution

Semester → / Curricular Component ↓	I	II	III	IV	V	VI	VII	VIII	Total Credits
Basic Science Course (BSC)	4	4	4	1					**13**
Engineering Science Course (ESC)/ Emerging Technology Course (ETC)/Programming Language Course	3	6	3	3					**15**
Professional Core Course (PCC)	10	7	13	15	12	11	8		**76**
Professional Elective Course (PEC)					3	3	3	3	**12**
Open Elective Course (OEC)						3	3	3	**9**
Project/Mini Project/Internship (PI)					1	2	4	10	**17**
Humanities and Social Sciences, Management Course (HSMC)	1	1			4				**6**
Ability Enhancement Course (AEC)/ Skill Enhancement Course (SEC)	2	2	1	1	3	1			**10**
Universal Human Value Course (UHV)			1	1					**2**
Total Credits	**20**	**20**	**22**	**21**	**23**	**20**	**18**	**16**	**160**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

THIRD SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	BSC	22MAIS301	Mathematics for Information Science Engineering	3	2	0	5	50	50	100	4
2	IPCC	22IS302	Digital Design & Computer Organization	3	0	2	5	50	50	100	4
3	PCC	22IS303	Operating Systems	3	2	0	5	50	50	100	4
4	IPCC	22IS304	Data Structures and Applications	3	0	2	4	50	50	100	4
5	PCCL	22IS305	Unix Lab	0	0	2	2	50	50	100	1
6	ESC	22IS306X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
7	UHV	22SCR	Social Connect and Responsibility	0	0	2	2	100	-	100	1
8	AEC/SEC	22IS307X	Ability Enhancement Course/Skill Enhancement Course - III	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
9	BSC	22BCM301	Bridge Mathematics-I (Mandate AuditCourse for Diplomaentry students)	3	0	0	3	100	-	100	A
Total							35				22
Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)			
22IS306A	OOP with Java	22IS306C	Discrete Mathematical Structures
22IS306B	OOP with C++	22IS306D	Graph Theory and Combinatorics
Ability Enhancement Course – III			
22IS307A	R Programming	22IS307C	Data Visualization with Python
22IS307B	Data Analytics with Excel	22IS307D	Version Controller withGiT

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

FOURTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	22IS401	Software Engineering	2	2	0	4	50	50	100	3
2	IPCC	22IS402	Microprocessor and Microcontroller	3	0	2	4	50	50	100	4
3	IPCC	22IS403	Database Management Systems	3	0	2	5	50	50	100	4
4	IPCC	22IS404	Design and Analysis of Algorithms	3	0	2	5	50	50	100	4
5	ESC	22IS405X	ESC/ETC/PLC	2	0	2	4	50	50	100	3
6	UHV	22UHV	Universal Human Values	0	2	0	2	50	50	100	1
7	AEC/SEC	22IS406X	Ability Enhancement Course/Skill Enhancement Course - IV	If the course is a Theory				50	50	100	1
				1	0	0	1				
				If the course is a laboratory							
				0	0	2	2				
8	BSC	22BEIS407	Biology for Engineers	0	2	0	2	50	50	100	1
Total							28				21
Note: AEC, SEC, ETC courses are to be chosen suitably by the BOS of the programme											

Engineering Science Course (ESC/ETC/PLC)			
22IS405A	C# and .Net Technologies	22IS405C	Optimization Techniques
22IS405B	Internet of Things	22IS405D	Probabiltiy, Stastistics and queing
Ability Enhancement Course – III			
22IS406A	Green IT and Sustainability	22IS406C	Introduction to Web Technology
22IS406B	User Interface Design	22IS406D	Technical writing usingLatex

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

FIFTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	22IS501	Computer Networks	3	0	2	5	50	50	100	4
2	PCC	22IS502	Theoretical Foundations of Computation	2	2	0	4	50	50	100	3
3	IPCC	22IS503	Full Stack Development	3	0	2	5	50	50	100	4
4	PCCL	22IS504	Data Visualization Lab	0	0	2	2	50	50	100	1
5	HSMC	22IS505	Entrepreneurship and Management	3	0	0	3	50	50	100	3
6	HSMC	22EVS	Environmental Studies	0	2	0	2	50	50	100	1
7	PEC	22IS5XX	Professional Elective Course - I	3	0	0	3	50	50	100	3
8	AEC	22RIP	Research Methodology and IPR	2	2	0	4	50	50	100	3
9	PI	22IS506	Mini Project	0	0	2	2	50	50	100	1
Total							30				23

Professional Elective Course I			
22IS551	Software Testing	22IS553	Object Oriented Modelling and Design
22IS552	Robotic Process Automation	22IS554	Service Oriented Architecture

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

SIXTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PCC	22IS601	Cryptography, Network Security and Cyber Law	3	0	0	3	50	50	100	3
2	IPCC	22IS602	Artificial Intelligence and Machine Learning	3	0	2	5	50	50	100	4
3	IPCC	22IS603	Cloud Computing	3	0	2	5	50	50	100	4
4	PI	22IS604	Main Project Phase - I	0	0	4	4	50	50	100	2
5	PEC	22IS6XX	Professional Elective Course - II	3	0	0	3	50	50	100	3
6	OEC	22OEIS6X	Open Elective Course - I	3	0	0	3	50	50	100	3
7	OEC	22SW01	Swayam NPTEL – 1	0	1 (A)	0	1 (A)	-	-	-	A
8	AEC	22ASK	AEC/SEC	0	0	2	2	50	50	100	1
Total							25				20

Note: The course 22ASK Will be handled by tap office. It will be conducted during the vacation after the 5th semester.

Professional Elective Course - II			
22IS661	Data Mining and Warehousing	22IS663	Mobile Computing Applications
22IS662	Big Data Technologies	22IS664	Block Chain Technology

Open Elective Course - I			
22OEIS61	Web Technologies	22OEIS63	Internet of Things
22OEIS62	Java Programming	22OEIS64	Data Science

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

SEVENTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	IPCC	22IS701	Deep Learning	3	0	2	5	50	50	100	4
2	IPCC	22IS702	Data Science using R	3	0	2	5	50	50	100	4
3	PI	22IS703	Main Project Phase - II	0	0	8	8	50	50	100	4
4	PEC	22IS7XX	Professional Elective Course - III	3	0	0	3	50	50	100	3
5	OEC	22OEIS7X	Open Elective Course – II	3	0	0	3	50	50	100	3
Total							24				18

Professional Elective Course - III			
22IS771	Virtual Reality and Augmented Reality	22IS773	Computer Vision Using OpenCV
22IS772	Parallel Computing	22IS774	Generative Artificial Intelligence

Open Elective Course - II			
22OEIS71	Fundamentals of Database Management System	22OEIS73	Fundamentals of Block Chain
22OEIS72	Introduction to Big Data	22OEIS74	Introduction to Data Science

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

EIGHTH SEMESTER											
Sl. No	Course Category	Course Code	Course Title	Teaching Hours/Week				Exam Marks			Credits
				L	T	P	Total	CIE	SEE	Total	
1	PEC	22SW02	Professional Elective (NPTEL Online Course)	3	0	0	3	-	100	100	3
2	OEC	22SW03	Open Elective (NPTEL Online course)	3	0	0	3	-	100	100	3
3	PI	22INT	Internship (Research/Industry) (15-20 weeks)	0	0	12	12	100	100	200	10
Total							18				**16**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Program Outcome (PO) and Program Specific Outcome (PSO) Mapping

Sl. No.	Subject Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1	22IS701	✓	✓		✓							✓			
2	22IS702	✓	✓	✓		✓							✓		✓
3	22IS703			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	22IS771	✓		✓		✓								✓	✓
5	22IS772	✓	✓	✓	✓	✓						✓		✓	✓
6	22IS773	✓		✓		✓									
7	22IS774	✓	✓	✓		✓	✓					✓		✓	✓
8	22OEIS71	✓	✓	✓	✓		✓					✓			
9	22OEIS72	✓	✓			✓									
10	22OEIS73	✓	✓							✓	✓		✓		
11	22OEIS74	✓	✓	✓		✓								✓	✓
12	22INT	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	**Deep Learning**		
Course Code	**22IS701**	**(L-T-P) C**	**(3-0-2) 4**
Exam	**3**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**50 (36L + 14P)**

Course Objective: To introduce students to the fundamental concepts and techniques of deep learning by building on machine learning foundations, enabling them to design, implement, and evaluate deep neural networks for solving real-world problems in areas such as image processing, sequence modeling, and pattern recognition.

Course Outcomes:

	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the foundational concepts of machine learning and the motivations for deep learning.	1,4,2,11	-
2	Apply neural network architectures and training algorithms to build and train deep feedforward models.	1,3,5	1,2
3	Analyze and implement regularization techniques to improve model generalization and robustness.	2,4,5	-
4	Design and evaluate deep learning models for visual and sequential data using CNNs and RNNs.	1,3,5,11	1,2

MODULE - 1	**9 Hours**

Basics of Machine Learning: Learning Algorithms, Capacity, Overfitting and Underfitting, Hyperparameters and Validation Sets, Estimator, Bias and Variance, Maximum Likelihood Estimation, Bayesian Statistics, Stochastic Gradient Decent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

Deep Feedforward Networks: Multilayer Perceptron, Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation Algorithm

MODULE - 2	**9 Hours**

Regularization: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations, Bagging, Dropout.

Convolutional Networks: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features.

MODULE - 3	**9 Hours**

Sequence Modeling: Recurrent and Recursive Nets: Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Encoder-Decoder Sequence-to-Sequence Architectures, Deep Recurrent Networks, Recursive Neural Networks, Echo State Networks, The Long Short-Term Memory and Other Gated RNNs

MODULE - 4	**9 Hours**

Practical Methodology: Performance Metrics, Default Baseline Models, Determining Whether to Gather More Data, Selecting Hyperparameters, Debugging Strategies, Example: Multi-Digit Number **Recognition. Applications**: Vision, NLP, Speech.

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Deep Learning (Adaptive Computation and Machine Learning Series)	Ian Good Fellow, Yoshua Bengio and Aaron Courville	4th	MIT Press (3 January 2017)	2020
2	Neural Networks and Learning Machines	Simon S. Haykin	3rd	PHI Learning	2021

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
	Introduction to Artificial Neural Networks	Gunjan Goswami, S.K. Kataria& Sons	4th	PHI Learning	2012
	Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms	Nikhil Buduma	3rd	O"Reilly Publications	2016

E Books and online course materials:

1. https://onlinecourses.nptel.ac.in/noc20_cs11/preview
2. https://onlinecourses.nptel.ac.in/noc25_cs21

Online Courses and Video Lectures:

1. https://www.coursera.org/specializations/deep-learning
2. https://www.coursera.org/learn/neural-networks-deep-learning

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30

Activity Details	1. Integrated Lab Conduction – 10 Marks 2. Mini Project based on Deep Learning – 10 Marks Students shall design and implement a mini project applying deep learning techniques to a real-world problem in domains such as image recognition, natural language processing, or sequence prediction. The project must involve model building, training, evaluation, and visualization. Assessment will be based on problem formulation, network design, implementation quality, and final presentation.	20
Total		**50**

Laboratory Plan:

Lab Program	Program Details
1	Write a simple Python implementation of linear regression using SGD from scratch without using scikit-learn.
2	Design and implement a neural network to generate word embeddings for words in each document corpus using an embedding layer.
3	Write a program to demonstrate the working of a deep neural network (DNN) for a classification task using a suitable dataset (e.g., MNIST or Iris).
4	Design and implement a Convolutional Neural Network (CNN) to classify images from a standard dataset such as CIFAR-10 or MNIST.
5	Build and demonstrate an autoencoder neural network for compressing and reconstructing image data.
6	Design and implement a deep learning network for the classification of textual documents (e.g., using IMDB reviews dataset).

Course Articulation Matrix

Course Outcomes		Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO1 1**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2		2							1			
CO2	3		2		2								3	2
CO3		2		3	2									
CO4	3		2		2						2		3	3

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	Data Science using R		
Course Code	22IS702	(L-T-P) C	(3-0-2) 4
Exam	3	Hours/Week	5
SEE	50 Marks	Total Hours	50 (36L + 14P)

Course Objective: Apply the principles of data science for solving real time problems**.**
Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe various Data Science processes like statistical modelling, Exploratory data analysis, Data visualization.	1, 2, 4, 5	1
2.	Apply various feature selection algorithms for effective decision making.	2, 3, 5	1, 2
3.	Develop and evaluate effective visualization for the given data and predictive models using R	2, 3, 5,12	1, 2
4.	Design and implement recommendation systems and apply dimensionality reduction techniques to build user-facing data products.	2, 3, 5,12	1, 2

MODULE - 1 **9 Hours**

Introduction: What is Data Science? Big Data and Data Science hype - and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets needed. Statistical Inference - Populations and samples, Statistical modelling, probability distributions, fitting a model. Introduction to R, R Language Basics , Data Structures in R , Data Import & Export , Data Manipulation with dplyr , Data Cleaning & Pre-processing , Data Visualization with ggplot2 , Working with Dates and Times, Basic Statistics in R

MODULE - 2 **9 Hours**

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA. The Data Science Process, Case Study: RealDirect (online real estate firm). **Three Basic Machine Learning Algorithms** - Linear Regression

MODULE - 3 **9 Hours**

Three Basic Machine Learning Algorithms (continued…): k-Nearest, Neighbors (k-NN), k-means. One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam. Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web.

MODULE - 4 **9 Hours**

Recommendation Systems: Building a User Facing Data Product Algorithmic ingredients of a Recommendation Engine, Dimensionality Reduction, Singular Value Decomposition, Principal Component Analysis, Exercise: build your own recommendation system. Data Visualization Data Visualization History, What Is Data Science, Redux?, A Sample of Data Visualization Projects

Prescribed Text Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Doing Data Science, Straight Talk from The Frontline.	Cathy O'Neil and Rachel Schutt	3rd	O'Reilly	2023

Reference Books:

Sl. No	Book Title	Authors	Edition	Publisher	Year
1	Mining of Massive Datasets	Jure Leskovek, Anand Rajaraman and Jeffery Ullman	7th	Tata McGraw-Hill	2021
2	Machine Learning: A Probabilistic Perspective	Kevin P. Murphy.	8th	Narosa publishing house	2020

Online Courses and Video Lectures:

1. https://onlinecourses.nptel.ac.in/noc21_cs69/preview
2. https://www.coursera.org/specializations/generative-ai-for-data-scientists

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	Integrated Lab Conduction – 10 Marks Mini Project execution – 10 Marks Students are required to identify a real-world problem, apply relevant data science techniques using R, and present their findings through a working prototype and report. Evaluation will be based on innovation, implementation, and presentation.	20
Total		**50**

Laboratory Plan:

Lab Program	Program Details
1	Perform EDA on a built-in dataset (e.g., mtcars or iris). Show structure, summary, boxplots, and histograms.
2	Implement a simple linear regression model using the mtcars dataset. Visualize and interpret the result.

3	Use the iris dataset to perform kNN classification. Normalize data, split dataset, and evaluate accuracy.
4	Perform K-Means clustering on the iris dataset. Use 3 clusters and compare with actual species.
5	Create a simple spam filter using Naive Bayes. Use basic word features and predict message type.
6	Perform SVD on a matrix and reconstruct it using U, D, and V matrices. Show original and reconstructed values.
7	Apply PCA on the iris dataset. Plot the first two principal components and explain the variance explained.

Course Articulation Matrix

Course Outcomes		**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**P O 1 1**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	1		2	2								1	
CO2		3	2		3								3	1
CO3		2	2		3							2	3	1
CO4		2	3		3							3	3	1

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	MAIN PROJECT WORK PHASE - 2		
Course Code	22IS703	**(L-T-P) C**	(0-0-8) 4
Exam	3	**Hours/Week**	8
SEE	50 Marks	**Total Hours**	40

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Implement the design with appropriate techniques, resources and contemporary tools Implement the design with appropriate techniques, resources and contemporary tools	3,5	**1,2**
2	Communicate effectively with team members and mentors, make presentations and prepare technical document	9,10,11,12	2
3	Use ethical practices in all endeavors	6, 7, 8	-
4	Share the responsibilities for carrying out the project & playing individual roles appropriately	9	2

The project teams will implement the project started in their seventh semester

The project work is to be evaluated in three stages:

- **Stage I (30M) -** First internal evaluation shall be taken up during this phase. This includes presentation on fine tuning of SRS & Design carried out in seventh semester.
- **Stage II (20 M) –** Mid phase evaluation shall be taken up during this phase. This includes presentation, intermediate project demonstration, draft copy of the paper
- **Stage III (50 M) –** Final project Demo, report submission and details of technical paper publication.

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

Course Articulation Matrix

Course Outcomes		**Program Outcomes**												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO12**	**PSO 1**	**PSO 2**
CO1			3		3								2	2
CO2									3	3	3	3		2
CO3						3	3	3						
CO4									3					2

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	**Virtual Reality and Augmented Reality**		
Course Code	22IS771	**(L-T-P)C**	**(3-0-0) 3**
Exam	50	**Hours/Week**	**3**
SEE	50	**Tota Hours**	**40**

Course Objective: The course provides the basics of VR, AR, and MR, and creates simple interactive applications using Unity and Blender.

Course Outcomes: After completing the course, the students will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	**Describe** the basics, history, and uses of Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), along with the related hardware, software, and human perception	1	1,2
2	**Apply** Unity programming skills to create and manipulate scenes, objects, and user interactions in virtual environments.	3,5	1,2
3	**Develop** simple interactive applications using modeling tools like Blender and integrate them with Unity for animation and particle effects.	1,3,5	1,2
4	**Analyze** different tracking technologies, calibration methods, and computer vision	1,2,5	2

MODULE-1	**10 Hrs.**

Introduction: Virtual Reality, Augmented Reality, Mixed Reality, applications. **Birds-eye view:** Hardware, Software, Human Physiology and perception, History of VR and AR **Programming with Unity:** Unity Basics, Manipulating the Scene, Code blocks and Methods, Debugging Conditional and looping statements.

MODULE-2	**10 Hrs.**

Geometry of Virtual Worlds: Geometric models, Transforming models, 2D and 3D rotation yaw, pitch, and roll. Viewing Transformations, Chaining the Transformations **Programming with Unity:** Working with objects, Working with Scripts, Player movement, Camera Movement, Menu and UI, Advanced 3D movement

MODULE-3	**10 Hrs.**

Mouse-Aimed camera: First Person Controller, Third Person Controller **Modeling Tools:** An introduction to different modeling tools, Blender, Modeling of an object, Sculpting objects, Importing from Blender to Unity, Modifiers, Particle system, Animation.

MODULE-4	**10 Hrs.**

Tracking: Definition and scope, Applications of Tracking: Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion Computer Vision for Augmented Reality: Marker-based tracking, Marker-less tracking

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	Virtual Reality	Steven M. LaValle	-	-	2017
2.	Game Programming with Unity and C#	Casey Hardman	-	Apress	2020
3.	Augmented Reality Principles and Practice	Dieter Schmalstieg Tobias Höllerer	-	Pearson Education	2016

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	AR and VR Using the WebXR API	Rakesh Baruah	-	-	2021

MOOC Courses:

1. **https://iitvirtualrealitycourse.com/iit-delhi-executive-programme-in-virtual-and-augmented-reality/?utm_source=google&utm_medium=search&utm_campaign=IITD_EPVAR_02_0825_Google-search_P-01662&utm_term=ar%20course&gad_source=1&gad_campaignid=22628972876&gbraid=0AAAADhJCZXFXnZBPcmZGqPaESOd6I8kZ&gclid=CjwKCAjw6s7CBhACEiwAuHQcko1piaCfNIMFQIwa0JCr-UEK3s2i471qqLGjBQRzjKLQGUqmijobthoCeH0QAvD_BwE**

2. **https://elearn.nptel.ac.in/shop/completed-courses/short-term-programs-completed/foundation-course-on-virtual-reality-and-augmented-reality/?v=c86ee0d9d7ed**

E Books and online course materials:

1. **https://** http://vr.cs.uiuc.edu/
2. **https://** https://doi.org/10.1007/978-1-4842-5656-5

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30

Activity Details	**Details of activities to be conducted:** 1. **Activity 1:** Presentation on a course-related topic – 15 Marks: Each student will deliver a presentation on a topic relevant to Virtual Reality, Augmented Reality, or Mixed Reality, including application scenarios or tools like Unity and Blender. 2. **Activity 2:** Quiz covering core concepts from the syllabus – 5 Marks	20
Total		**50**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Articulation Matrix

Course Outcomes		Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**
CO1	3												2	2
CO2			3		3								2	2
CO3	3		3		3								2	2
CO4	3	3			3									2

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	**Parallel Computing**		
Course Code	22IS772	**(L-T-P)C**	**(3-0-0) 3**
Exam	50	**Hours/Week**	**3**
SEE	50	**Tota Hours**	**40**

Course Objective: To introduce the fundamentals of parallel computing and develop practical skills in programming with OpenMP, MPI, CUDA C, and OpenACC for building efficient parallel applications.

Course Outcomes: After completing the course, the students will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the fundamentals of multi-core and many-core architectures, including their design principles and performance characteristics.	1, 2, 11	1
2	Apply parallel programming constructs to develop programs that leverage concurrency and shared memory/multi-threading models.	1, 3, 5	1, 2
3	Analyze the efficiency, scalability, and performance of parallel programs on multi-core and many-core systems.	1, 2, 4, 5	1, 2
4	Design and implement parallel computing solutions for real-world problems using CPU and GPU architectures.	1, 3, 4, 5, 11	1, 2

MODULE-1 **10 Hrs.**

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

MODULE-2 **10 Hrs.**

Input and output - MIMD systems, GPUs**, Performance –**Speedup and efficiency in MIMD systems, Amdahl′s law, Scalability in MIMD systems, Taking timings of MIMD programs, GPU performance. **Distributed memory programming with MPI –** MPI functions, The trapezoidal rule in MPI, Dealing with I/O, Collective communication, MPI-derived data types.

MODULE-3 **10 Hrs.**

Distributed memory programming with MPI (Continue..) Performance evaluation of MPI programs, A parallel sorting algorithm. **Shared-memory programming with OpenMP –** openmp programs and directives, The trapezoidal rule, Scope of variables, The reduction clause, loop carried dependency, scheduling, producers and consumers, Caches, cache coherence and false sharing in openmp, tasking, thread safety.

MODULE-4 **10 Hrs.**

GPU programming with CUDA - GPUs and GPGPU, GPU architectures, Heterogeneous computing, Threads, blocks, and grids Nvidia compute capabilities and device architectures, Vector addition, Returning results from CUDA kernels, CUDA trapezoidal rule I, CUDA trapezoidal rule II: improving performance, CUDA trapezoidal rule III: blocks with more than one warp.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	An Introduction to parallel programming	Peter S Pacheco, Matthew Malensek –Morgan Kauffman	Second Edition	Morgan Kaufmann	2011
2.	Parallel Programming in C with MPI and OpenMp	Michael J Quinn		McGrawHill	2011

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1.	OpenACC for Programmers: Concepts and Strategies	Sunita Chandrasekaran, Guido Juckeland	1	Addison-Wesley	2018

E Books and online course materials:

1. **https://** http://vr.cs.uiuc.edu/
2. **https://** https://doi.org/10.1007/978-1-4842-5656-5

Mooc Courses:

1. **https://onlinecourses.nptel.ac.in/noc24_cs63/preview**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	**Details of activities to be conducted:** **Activity 1:** Demonstration, Presentation, Report on a course-related topic – 20 Marks Each student will present a topic related to parallel computing paradigms, tools (such as OpenMP, MPI, and Design a CUDA,) real-world applications, demonstrating conceptual clarity and relevance.	20
Total		**50**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Articulation Matrix

Course Outcomes	Program Outcomes													
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2									1		1	
CO2	3		2		3								2	3
CO3	2	3		3	2								2	2
CO4	3		3	2	3						2		3	3

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	**Computer Vision Using OpenCV**		
Course Code	**22IS773**	**(L-T-P) C**	**(3-0-0) 3**
Exam	**3**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: Introduce the students to the applications of computer vision.
Course outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply state-of-the-art architectures such as R-CNN and YOLO for object detection.	1	-
2.	Analyze images in the frequency domain using the Discrete Fourier Transform (DFT) and understand the properties of the 2-D DFT.	3	-
3.	Critically evaluate the performance and limitations of different image representation, segmentation, and feature extraction techniques.	3,5	-
4.	Develop video analytics techniques to real-world problems.	3,5	-

MODULE - 1 **10**

Image Representation and Description: Representation schemes, Boundary descriptors, Region descriptors Binary Machine Vision: Thresholding, Segmentation, Connected component labeling, Hierarchal segmentation, Spatial clustering, Split& merge, Rule-based Segmentation, Motion-based segmentation. Area Extraction: Concepts, Data-structures, Edge, Line-Linking, Hough transform, Line Fitting, Curve fitting (Least-square fitting).

MODULE - 2 **10**

Introduction to Computer Vision: Basic concepts: pixel representation of an image, Image in frequency domain, different color models, and their transformation, Filtering and Convolution, Image preprocessing using PIL/Pillow, OpenCV, and Keras: reading multiple images from a directory, plotting, enhancement, filtering, re-scaling, morphological operations and image data augmentation.

MODULE - 3 **10**

Image Enhancement and Filtering: Color Spaces, Color Transforms, Image Filtering, Image Smoothing, Image Gradients.

Advanced Image Processing and Computational Photography: Hough Transforms, High Dynamic Range Imaging, Seamless Cloning, Image Inpainting. Geometric Transforms and Image Features: Geometric Transforms, Image Features, Feature Matching, **Application**: Image Alignment, Application: Creating Panorama, Application: Finding Known Objects using OpenCV

MODULE - 4 **10**

Deep Learning with OpenCV: Image Classification- Image Classification using Caffe and Tensorflow, Object Detection - Single Shot MultiboxDetector(SSD), You Only Look Once Detector(YOLO), Face Detection-SSD based Face Detector, Human Pose Estimation-Open Pose**.**

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Deep Learning for Natural Language Processing Creating Neural Networks with Python	Palash Goyal, Sumit Pandey, Karan Jain	1st	Apress (Berkeley, CA)	2018
2	Introductory techniques for 3-D Computer Vision	Emanuele Trucco and Alessandro Verri	1st	Prentice Hall (Upper Saddle River, NJ)	1998
3	Multiple View Geometry in Computer Vision	Richard hartley and Andrew Zisserman	2nd	Cambridge University Press	2004

Reference Books:

Sl. No	Title	Authors	Publisher	Edition	Year
1	Speech Communications: Human and Machine	D. O'Shaughnessy	IEEE Press / Wiley	2nd	2007
2	Vector Quantization and Signal Compression	A. Gersho, R. M. Gray	Kluwer Academic / Springer	1st (reprinted)	1991
3	Digital Processing of Speech Signals	L. R. Rabiner, R. W. Schafer	Prentice Hall / Pearson	1st	1978
4	Introduction to Data Compression	K. Sayood	Morgan Kaufmann / Elsevier	5th	2017
5	Natural Language Understanding	James Allen	Pearson / Benjamin Cummings	2nd	1995
6	Information Storage and Retrieval Systems: Theory & Implementation	G. J. Kowalski, M. T. Maybury	Springer	2nd	2002
7	Natural Language Processing and Text Mining	Anne Kao, Stephen R. Poteet (eds.)	Springer–Verlag London / Springer Science	1st	2010

E Books and online course materials:

1. https://github.com/PacktPublishing/Learning-OpenCV-4-Computer-Vision-with-Python-Third-

Edition?utm_source=chatgpt.com

2. https://github.com/PacktPublishing/Learning-OpenCV-4-Computer-Vision-with-Python-Third-Edition?utm_source=chatgpt.com

Online Courses and Video Lectures:

1. https://www.coursera.org/learn/introduction-computer-vision-watson-opencv?utm_source=chatgpt.com
2. https://www.mooc-list.com/tags/opencv?utm_source=chatgpt.com

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	**Details of activities to be conducted:** **Activity 1:** Infrastructure Automation with Terraform – 15 Marks **Activity 2:** Quiz covering core concepts from the syllabus – 5 Marks	20
Total		**50**

Course Articulation Matrix

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

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	Generative Artificial Intelligence		
Course Code	22IS774	**(L-T-P) C**	(3-0-0) 3
Exam	3	**Hours/Week**	3
SEE	50 Marks	**Total Hours**	40

Course Objective: To provide foundational understanding of generative models and equip students with practical skills in building and evaluating Generative AI applications using models such as VAEs, GANs, diffusion models, and LLMs.

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Apply the concepts and principles of Generative Artificial Intelligence to solve engineering and domain-specific problems.	1,2,3,11	**1,2**
2.	Design and implement generative AI models using modern tools, techniques, and frameworks.	1,3,4,5	1,2
3.	Critically analyze advanced topics and real-world applications of Generative AI across diverse domains.	1,2,3,4,11	1,2
4.	Identify and address ethical challenges in Generative AI, emphasizing fairness, accountability, transparency, and human-centered design.	6,11	2

MODULE - 1	**10**

Introduction to Generative Deep Learning: Generative Modeling, What Is Generative Modeling?, Historical perspective on Generative AI, Generative Versus Discriminative Modeling, Introduction to Large Language Models (LLMs), Applications of Large Language Models, Limitations and Risks of Large Language Models

MODULE - 2	**10**

Variational Autoencoders Introduction: Autoencoders, The Autoencoder Architecture the Encoder, The Decoder, Joining the Encoder to the Decoder, Analysis of the Autoencoder,

Building a Variational Autoencoder: The Encoder, The Loss Function, Analysis of the Variational Autoencoder, Using VAEs to Generate Faces, Training the VAE, Analysis of the VAE, Generating New Faces, Latent Space Arithmetic, Morphing Between Faces

MODULE - 3	**10**

Generative Adversarial Networks: Introduction to GAN (GAN), The Discriminator, The Generator,

Cycle GAN Overview: The Generators (U-Net), The Discriminators, Compiling the Cycle GAN, Training the Cycle GAN, Analysis of the Cycle GAN, Creating a Cycle GAN to Paint Like Monet, the Generators (ResNet), Analysis of the Cycle GAN,

Neural Style Transfer: Content Loss, Style Loss, Total Variance Loss, Running the Neural Style Transfer, Analysis of the Neural Style Transfer Model

MODULE - 4	**10**

Diffusion Models: Introduction, Denoising Diffusion Models (DDM), The Flowers Dataset, The Forward Diffusion Process, The Reparameterization Trick, Diffusion Schedules, the Reverse Diffusion Process, Energy-Based Models Introduction,

Energy-Based Models: The MNIST Dataset, The Energy Function, Sampling, Using Langevin Dynamics,

Bias and Fairness in Generative AI: Understanding Bias in AI, Types of biases (algorithmic, data, societal), Fairness Metrics, Statistical parity, equal opportunity, disparate impact, Mitigation Strategies, Pre-

processing, in-processing, and post-processing techniques,
Ethical Design and Deployment of Generative AI: Ethical AI Design Principles, Human-centered design, ethical by design, Deployment Challenges, Real-world implementation, monitoring, and feedback loops, Responsible AI Frameworks, Guidelines and best practices for ethical deployment

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play	David Foster	Second edition	O'Reilly Media	2023

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Deep Learning (Adaptive Computation and Machine Learning Series)	Ian Good Fellow, YoshuaBengio and Aaron Courville	4th	MIT Press (3 January 2017)	2020
2	Neural Networks and Learning Machines	Simon S. Haykin	3rd	PHI Learning	2021

E Books and online course materials:

1. https://onlinecourses.nptel.ac.in/noc20_cs11/preview
2. https://onlinecourses.nptel.ac.in/noc25_cs21

Online Courses and Video Lectures:

1. https://www.coursera.org/specializations/deep-learning
2. https://www.coursera.org/learn/neural-networks-deep-learning

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	**Details of activities to be conducted:** **Activity 1:** Presentation on a course-related topic – 15 Marks Each student will present on a Generative AI model or application (e.g., VAEs, GANs, Diffusion Models, LLMs), covering technical workflow, real-world use cases, or ethical implications. **Activity 2:** Quiz covering core concepts from the syllabus – 5 Marks	20
Total		**50**

Proposed Assessment Plan (for 50 marks of CIE):

Course Articulation Matrix

Course Outcomes		Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	2	2								2		3	2
CO2	3		3	2	3								3	3
CO3	2	2	3	2	2						2		2	3
CO4						3					3			2

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	**Fundamentals of Database Management System**		
Course Code	**22OEIS71**	**(L-T-P)C**	**(3-0-0) 3**
Exam	50	**Hours/Week**	**3**
SEE	50	**Tota Hours**	**40**

Course Objective: Acquire the knowledge, skills and tools to manage big data.
Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Explain the fundamental concepts, architecture, and advantages of database systems in real-world applications.	1,11	-
2	Interpret and design Entity-Relationship diagrams for simple scenarios.	1,2,3	-
3	Create and manipulate relational database tables using basic SQL commands.	1,3,4,5,11	-
4	Illustrate the role of transactions and good design practices in ensuring data integrity and consistency.	1,2,6,11,12	-

MODULE-1	**10**
Introduction to Databases: Need for Databases, Characteristics of Database Approach, Advantages of Using DBMS, Real-life Examples of Databases, Users of Database Systems, Basic Concepts of Data Models, Schemas and Instances, Three-schema Architecture, Introduction to DBMS Software, Overview of Database Languages and Interfaces, Introduction to ER Model, Entity Types, Attributes, Keys, Relationship Types, ER Diagrams	
MODULE-2	**10**
Relational Model Concepts: Tables (Relations), Rows and Columns, Primary Keys and Foreign Keys, Basic Relational Operations – Selection, Projection, Joins (only concept), Examples of Simple Queries in Tabular Format, **Introduction to SQL**: SQL Data Types, Creating Tables, Inserting Data, Basic SQL Queries – SELECT, WHERE, ORDER BY, GROUP BY, Simple Aggregate Functions	
MODULE-3	**10**
Modifying Data: INSERT, DELETE, UPDATE, Altering Table Structure, Using Views in SQL, Simple Use Cases of Views, Basic Constraints – NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY, **Introduction to Database Design** – Good Table Design Practices, Redundancy and Anomalies, Overview of Normalization (only intuitive understanding – 1NF, 2NF, 3NF – no theory)	
MODULE-4	**10**
Introduction to Transactions: What is a Transaction?, Real-life Examples (Banking, Railway Booking), Importance of ACID Properties (intuitive), Concept of Concurrent Transactions (simple illustration), SQL Support for Transactions – COMMIT and ROLLBACK, Database Use Cases in Real World – Banking, Inventory, Library, Healthcare, Education	

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Hadoop for Dummies	Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, Roman B. Melnyk	2nd	John Wiley & Sons	2017
2	Data Analytics	Anil Maheshwari	1st	McGraw Hill Education	2017

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Big Data Analytics Introduction to Hadoop, Spark and Machine Learning	Raj kamal and Preethi Saxena	-	McGraw Hill Education	2018
2	Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem	Douglas Eadline	1st	Pearson Education	2016

Mooc Courses:

1. **https://www.tutorialspoint.com/mongodb/mongodb_overview.html**
2. **https://nptel.ac.in/courses/106105175**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	**Details of activities to be conducted:** **Activity 1:** Presentation on a course-related topic – 15 Marks Each student will present on a topic related to database systems—such as data modeling, SQL operations, normalization, or real-world DBMS applications—demonstrating clarity of concept and relevance. **Activity 2:** Quiz covering core concepts from the syllabus – 5 Marks	20
Total		**50**

Course Articulation Matrix

Course Outcomes		Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1									1			
CO2	2	2	2											

CO3	3		3	1	2					2			
CO4	2	2		1		2				2			

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	**Introduction To Big Data**		
Course Code	**22OEIS72**	**(L-T-P)C**	**(3-0-0) 3**
Exam	50	**Hours/Week**	**3**
SEE	50	**Tota Hours**	**40**

Course Objective: Acquire the knowledge, skills and tools to manage big data.
Course Outcomes: At the end of course, student will be able to:

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Describe the concepts of HDFS, MapReduce framework, Data mining techniques for data analytics.	1	-
2	Describe architectural elements of HDFS, Map Reduce, YARN.	1	-
3	Apply big data concepts and techniques to address issues in a given scenario.	2	-
4	Demonstrate the MapReduce programming model to process the big data along with Hadoop tools.	5	-

MODULE-1	**10**

Introducing Hadoop and Seeing What It's Good for – Big Data and the Need for Hadoop, The Origin and Design of Hadoop, Examining the Various Hadoop Offerings. **Use Cases for Big Data in Hadoop** – The Keys to Successfully Adopting Hadoop, Log Data Analysis, Data Warehouse Modernization, Fraud detection, Risk modeling, Social Sentiment Analysis, Image Classification, Graph Analysis, To Infinity and Beyond

Storing Data in Hadoop: The Hadoop Distributed System – Data Storage in HDFS, Sketching Out the HDFS Architecture, HDFS Federation, HDFS High Availability.

MODULE-2	**10**

MapReduce Programming – Thinking in Parallel, Seeing the Importance of Map Reduce, Doing Things in Parallel: Breaking Big Problems into Many Bite-Size Pieces, Writing Map Reduce Applications, Getting Your Feet Wet: Writing a Simple Map Reduce Application.

Frameworks for Processing Data in Hadoop: YARN and Map Reduce – Running Application Before Hadoop 2, Seeing a World Beyond Map Reduce, Real-time and Streaming Applications

MODULE-3	**10**

Data Warehousing: Introduction, Design Consideration, DW Development Approaches, DW Architectures

Data Mining: Introduction, Gathering, and Selection, data cleaning and preparation, outputs of Data Mining, Data Mining Techniques.

MODULE-4	**10**

Text Mining: Introduction, Text Mining Applications, Text Mining Process, Term Document Matrix, Mining the TDM, Comparison, Best Practices

Web Mining: Introduction, Web Content Mining, Web Structured Mining, Web Usage Mining, Web Mining Algorithms..

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Hadoop for Dummies	Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, Roman B. Melnyk	2nd	John Wiley & Sons	2017
2	Data Analytics	Anil Maheshwari	1st	McGraw Hill Education	2017

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Big Data Analytics Introduction to Hadoop, Spark and Machine Learning	Raj kamal and Preethi Saxena	-	McGraw Hill Education	2018
2	Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem	Douglas Eadline	1st	Pearson Education	2016

Mooc Courses:

1. **https://onlinecourses.nptel.ac.in/noc20_cs92/preview**

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	**Details of activities to be conducted:** **Activity 1:** Presentation on a course-related topic – 15 Marks Each student will deliver a presentation on big data topics such as Hadoop ecosystem, MapReduce, Data Mining, Text Mining, or Web Mining, showcasing theoretical knowledge and practical relevance. **Activity 2:** Quiz covering core concepts from the syllabus – 5 Marks	20
Total		**50**

Course Articulation Matrix

Course Outcomes		Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO12**	**PSO1**	**PSO2**
CO1	3													
CO2	3													
CO3		3												

CO4					3								

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	**Fundamentals of Block Chain**		
Course Code	**22OEIS73**	**(L-T-P)C**	**(3-0-0) 3**
Exam	**50**	**Hours/Week**	**3**
SEE	**50**	**Tota lHours**	**40**

Course Objective: The course provides the fundamentals, models and technologies of Block chain.
Course Outcomes: After completing the course, the students will be able to

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Understand the types, benefits and limitations of blockchain and bitcoin.	1	-
2	Explore the blockchain decentralization, cryptography concepts and smart contracts.	2	-
3	Comprehend the blockchain applications outside of currencies.	1	-
4	Demonstrate topics and participate in quizzes to assess knowledge.	9,10,12	-

MODULE-1	**10 Hrs.**

Blockchain 101: Distributed systems, History of blockchain: Introduction to Blockchain, Types of blockchain, Tiers of blockchain technology, CAP theorem and blockchain, Benefits and limitations of blockchain.

MODULE-2	**10 Hrs.**

Decentralization and Cryptography: Decentralization using blockchain, Methods of decentralization, Routes to decentralization, Blockchain and full ecosystem decentralization, Smart contract, Decentralized organizations, Platforms for decentralization. **Symmetric Cryptography:** Cryptographic primitives-Symmetric cryptography, Asymmetric cryptography

MODULE-3	**10 Hrs.**

Introducing Bitcoin: Bitcoin definition, Transactions, Blockchain, The bitcoin network, Wallets, Bitcoin Payments. **Alternative Coins:** Theoretical foundations, Bitcoin limitations, Namecoin, Litecoin **Smart Contracts:** Definition, Ricardian contracts.

MODULE-4	**10 Hrs.**

Ethereum 101: Introduction, Ethereum blockchain, Etherium Network**,** Components of the Ethereum blockchain The Ethereum Virtual Machine (EVM) **Blockchain-Outside of Currencies:** Internet of Things, Government, Health, Finance, Media.

Prescribed Text Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Mastering Blockchain - Distributed ledgers, Decentralization and smart contracts explained	Imran Bashir	3rd	Packt Publishing Ltd	2017
2	Bitcoin and Cryptocurrency Technologies:A Comprehensive Introduction.	Arvind Narayanan, Joseph Bonneau, Edward W. Felten, Andrew Miller, Steven Goldfeder and Jeremy Clark.,	2nd	Princeton University Press	2016

Reference Books:

Sl.No	BookTitle	Authors	Edition	Publisher	Year
1	Blockchain Basics:ANon- Technical Introduction in 25 Steps,	Daniel Drescher	First Edition	Apress	2017
2	Mastering Bitcoin: Unlocking Digital Cryptocurrencies	Andreas M. Antonopoulos	First Edition	O'Reilly Media	2014

E Books and online course materials:

1. **https://** onlinecourses.nptel.ac.in/noc22_cs44/preview
2. **https://** onlinecourses.swayam2.ac.in/aic21_ge01/preview

Mooc Course:

2. https://onlinecourses.nptel.ac.in/noc20_cs92/preview

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	**Details of activities to be conducted:** **Activity 1:** Presentation on a course-related topic – 15 Marks Each student will present on a blockchain-related topic such as decentralization, cryptography, smart contracts, Bitcoin, Ethereum, or blockchain applications in various domains, focusing on clarity and applicability. **Activity 2:** Quiz covering core concepts from the syllabus – 5 Marks	20
Total		**50**

Course Articulation Matrix

Course Outcomes		Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO 11**	**PO12**	**PSO1**	**PSO2**
CO1	3												2	2
CO2			3		3								2	2
CO3	3		3		3								2	2
CO4	3	3			3									2

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	**Introduction to Data Science**		
Course Code	**22OEIS74**	**(L-T-P) C**	**(3-0-0) 3**
Exam	**3**	**Hours/Week**	**3**
SEE	**50 Marks**	**Total Hours**	**40**

Course Objective: Apply the principles of data science for solving real time problems**.**

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1.	Describe various Data Science processes like statistical modelling, Exploratory data analysis, Data visualization.	1, 2, 4, 5	**1**
2.	Apply various feature selection algorithms for effective decision making.	2, 3, 5	1, 2
3.	Develop effective visualization for the given data using R	2, 3, 5	1, 2
4.	Develop and evaluate predictive models using machine learning techniques in R.	2, 3, 5	1, 2

MODULE - 1	**10**

Introduction: What is Data Science? Big Data and Data Science hype - and getting past the hype, Why now? – Datafication, Current landscape of perspectives, Skill sets needed. Statistical Inference - Populations and samples, Statistical modelling, probability distributions, fitting a model.

MODULE - 2	**10**

Exploratory Data Analysis and the Data Science Process - Basic tools (plots, graphs and summary statistics) of EDA, Philosophy of EDA. The Data Science Process, Case Study: RealDirect (online real estate firm).

Three Basic Machine Learning Algorithms - Linear Regression

MODULE - 3	**10**

Three Basic Machine Learning Algorithms (Continued…): k-Nearest, Neighbors (k-NN), k-means. One More Machine Learning Algorithm and Usage in Applications - Motivating application: Filtering Spam. Why Linear Regression and k-NN are poor choices for Filtering Spam, Naive Bayes and why it works for Filtering Spam, Data Wrangling: APIs and other tools for scrapping the Web.

MODULE - 4	**10**

Feature Generation and Feature Selection Motivating Application: user (customer) retention, Feature Generation Feature Selection algorithms, Filters; Wrappers; Decision Trees, Random Forests. Data Visualization - Data Visualization History, What Is Data Science, Redux?, A Sample of Data Visualization Projects

Prescribed Text Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Doing Data Science, Straight Talk from The Frontline.	Cathy O'Neil and Rachel Schutt	3rd	O'Reilly	2023

Reference Books:

Sl.No	Book Title	Authors	Edition	Publisher	Year
1	Mining of Massive Datasets	Jure Leskovek, Anand Rajaraman and Jeffery Ullman	3th	Tata McGraw-Hill	2014
2	Machine Learning: A Probabilistic Perspective	Kevin P. Murphy.	5th	Narosa publishing house	2013

Online Courses and Video Lectures:

3. https://onlinecourses.nptel.ac.in/noc21_cs69/preview
4. https://www.coursera.org/specializations/generative-ai-for-data-scientists

Proposed Assessment Plan (for 50 marks of CIE):

Tool	Remarks	Marks
CIE	Three CIEs conducted for 20 marks each and reduced to 10 marks	30
Activity Details	**Details of activities to be conducted:** **Activity 1:** Presentation on a course-related topic – 15 Marks Students are required to deliver a presentation on a selected topic related to Data Science, demonstrating their understanding of key concepts, tools, or real-world applications. Evaluation will be based on content clarity, technical depth, presentation skills, and relevance to the course. **Activity 2:** Quiz covering core concepts from the syllabus – 5 Marks	20
Total		**50**

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Articulation Matrix

Course Outcomes		Program Outcomes												
COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**
CO1	3	1		2	2								1	
CO2		3	2		3								3	1
CO3		2	2	2	3								3	1
CO4		2	3	2	3								3	1

MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Affiliated to VTU, Belagavi)
DEPARTMENT OF INFORMATION SCIENCE & ENGINEERING

Course Title	Internship (Research / Industry) (14-16 Weeks)		
Course Code	22INT	**(L-T-P) C**	(0-0-12) 10
Exam	3	**Weeks**	14-16
SEE	100 Marks	**Total Hours**	--

Course Objective: It involves a short theoretical or experimental research project supervised by a researcher/ To bridge the gap between the theoretical knowledge obtained in the classrooms and the practical skills required in the actual workplace

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

#	Course Outcomes	Mapping to PO's	Mapping to PSO's
1	Get exposure to real world job environment and gain practical experience	1,2,3,4,5,10,11,12	**1,2**
2	Generating technical paper/s and publish in refereed journal/s and conferences	1,2,8,9,10,11,12	2

Guidelines for Research Internship III

Purpose	It involves a short theoretical or experimental research project supervised by a researcher.
Skills acquired	• Planning and scheduling. • Documentation. • Critical thinking. • Data collection. • Data analysis. • Appreciating and practicing the ethical values.
Expected Outcomes	• Generating technical paper/s and publish in refereed journal/s. • Possibility of acquiring an intellectual ownership and patent. • Build a prototype for an idea on which the research was carried out. • File patent/s.
Selection	• In consultation with a researcher/ researchers working in MCE researchCentre • A research institute • Company's R and D department.
Team Size	Can be carried out either individually or in a team(**Upto 5 students**)
Venue	Laboratory of college research institute Company's R and D department.

Supervision	Internship shall be carried out under the supervision of a faculty mentor* atthe department level For all students attending in-house internship, the attendance should be maintained by the Faculty mentor

Parameters for Assessment	Diary Report presentation skill Technical Paper Recommendation Letter from the guide
Evaluation	CIE (100 Marks)–The CIE marks shall be awarded by a committee* consisting of the faculty mentor and two faculty members of the Department,one of whom shall be the Guide (applicable for in-house interns). The schedule for evaluation will be announced by chairman BOE at the end of thesemester. The Evaluation can be done in *phases as decided by the internal BOS* of the department. The contents of the report and the evaluation Rubrics will be set by the Department based on the assessment parameters SEE (100 Marks)– Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and viva voce
***For interdisciplinary internship its necessary to involve an expert from each discipline**	
Guidelines for Industry Internship III	
Purpose	To bridge the gap between the theoretical knowledge obtained in the classrooms and the practical skills required in the actual workplace
Skills acquired	• Applying the theoretical knowledge in a practical scenario • Build confidence in applying the skills learnt • Documentation • Communication • Appreciating and practicing the ethical values
Expected Outcomes	• Get exposure to a real world job environment and gain practical experience • Build confidence in applying the skills learnt. • Enhances Placement Opportunity
Selection	• Can select individually • Can seek the help from the department
Team Size	Can be carried out either individually or in a team(not exceeding 5 students).
Venue	In a domain specific organization
Supervision	Internship shall be carried out under the supervision of a faculty mentor* atthe department level. One faculty mentor can supervise a maximum of 20 students.

Parameters for Assessment	Diary Report presentation skill Recommendation Letter from the guide
Evaluation	**CIE (100 Marks)** -The CIE marks shall be awarded by a committee* consisting of the faculty mentor and two faculty members of the Department,one of whom shall be the Guide (applicable for in-house interns). The schedule for evaluation will be announced by chairman BOE at the end of thesemester. The Evaluation can be done in ***phases as decided by the internal BOS*** of the department. The contents of the report and the evaluation Rubrics will be set by the Department based on the assessment parameters **SEE (100 Marks)-** Contribution to the internship and the performance of each group member shall be assessed individually in semester end examination (SEE) conducted at the department. Marks shall be awarded based on the evaluation of the diary, report, presentation skill and viva voce
*For interdisciplinary internship its necessary to involve an expert from each discipline	

Course Articulation Matrix

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