माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
Deemed University
(Declared under Distinct Category by Ministry of Education, Government of India)
NAAC ACCREDITED WITH A++ GRADE
Centre for Artificial Intelligence

BOARD OF STUDIES (BoS) PROCEEDING
of
CENTRE FOR ARTIFICIAL INTELLIGENCE

[under the Madhav Institute of Technology & Science-Deemed University (MITS-DU)]

(Meeting Dated - 06 June, 2025)

माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
Deemed University
(Declared under Distinct Category by Ministry of Education, Government of India)
NAAC ACCREDITED WITH A++ GRADE

Centre for Artificial Intelligence

Board of Studies (BoS) in Centre for Artificial Intelligence

[under the Madhav Institute of Technology & Science-Deemed University (MITS-DU)]

(Meeting Dated - 06 June, 2025)

Courses where revision was carried out							
Course name	**Course Code**	**Year/ Date of introduction**	**Year/ Date of revision**	**Percentage of content added or replaced**	**Agenda Item No.**	**Page No.**	**Link of relevant documents/ minutes**
Electronic Systems	24251103	2022	2025	6%	6	2	https://web.mitsgwalior.in/board-of-studies-bos-cai
Design & Analysis Of Algorithms	31242102/ 24242102/ 27242102/ 28242102	2020	2025	12%	2	1	https://web.mitsgwalior.in/board-of-studies-bos-cai
Computer Networks	31242104/ 24242104/ 27242104/ 28242104	2021	2025	8%	2	1	https://web.mitsgwalior.in/board-of-studies-bos-cai

New Courses added					
Course name	**Course Code**	**Activities/contents which have a bearing on increasing skill and employability**	**Agenda Item No.**	**Page No.**	**Link of relevant documents/ minutes**
Knowledge Representation and Reasoning	31242103	Expert systems, Fuzzy logic, Knowledge graphs, Large Language Models.	2	1	https://web.mitsgwalior.in/board-of-studies-bos-cai

Date: 6.6.2025

Minutes of Meeting of Board of Studies (BoS)
in
Centre for Artificial Intelligence
[under the Madhav Institute of Technology & Science-Deemed University (MITS-DU)]

The meeting of the Board of Studies (BoS) in the Centre for Artificial Intelligence (under MITS-DU) was held on 06 June, 2025 at 11:00 AM in offline/online mode (though video conferencing). During the meeting following were present:

1.	Dr. Rajni Ranjan Singh	Chairperson
2.	Dr. Dilip Singh Sisodia *Associate Professor and HoD,* *Department of Computer Science & Engineering,* *NIT Raipur*	Expert Member (Nominated by the Hon'ble Vice Chancellor, MITS-DU)
3.	Dr. Manish Pandey *Associate Professor,* *Department of Computer Science & Engineering,* *MANIT Bhopal.*	Expert Member (Nominated by the Hon'ble Vice Chancellor, MITS-DU)
4.	Dr. Pawan Dubey	Member
5.	Dr. Tej Singh	Member
6.	Dr. Bhagat S. Raghuwanshi	Member
7.	Dr. Sunil Kumar Shukla	Member

The following deliberation took place in the meeting:

Agenda Item 1	To confirm the minutes of previous BoS meeting held in the month of December 2024 **The minutes of the previous BoS meeting held on 05 December, 2024 were presented, discussed and confirmed.**
Agenda Item 2	To review and finalize the syllabi of all courses of UG programmes - B. Tech. and B.Arch. III Semester (for batch admitted in 2024-25) along with their COs and CO-PO/PSO matrix. **The syllabi along with the course outcomes of each course of B. Tech. III Semester in Artificial Intelligence/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2024 – 25 (under the flexible curriculum), was analyzed, discussed and recommended. The syllabus of all the courses of III semester in each branch is annexed as Annexure-I.**
Agenda Item 3	To review and finalize the Experiment list/ Lab manual and project list under Macro Project-I for all the Laboratory Courses to be offered in UG programmes – B.Tech. and B.Arch. III Semester (for batch admitted in 2024-25) along with their COs and CO-PO/PSO matrix. **The Experiment list/ Lab manual for all the Laboratory Courses and Macro Project-I of B. Tech. III Semester in Artificial Intelligence/ Information Technology (Artificial Intelligence and Robotics)/**

	Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2024 – 25 (under the MITS-DU), was discussed and recommended. The experiment list/Lab manual and Macro Project-I list is annexed as Annexure-II.
Agenda Item 4	To review and finalize the courses for Self-learning/Presentation to be offered from SWAYAM/NPTEL/MOOC based platform for UG programmes – B.Tech. and B.Arch., III Semester (for batch admitted in 2024-25). **The List of courses for Self-learning/Presentation to be offered from SWAYAM/NPTEL/MOOC based platform for B. Tech. III Semester in Artificial Intelligence/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2024 – 25 (under the MITS-DU), was discussed and recommended. The same is annexed as Annexure-III.**
Agenda Item 5	To propose the list of professional certification platforms and relating certifications with specific domains/areas of certification. {representative list to be prepared} **The List of professional certification platforms and relating certifications in Artificial Intelligence/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2024 – 25 (under the MITS-DU), was discussed and recommended. The same is annexed as Annexure-IV.**
Agenda Item 6	To review & finalize the courses and syllabi for all UG programmes - B. Tech. and B.Arch., I Semester (for batch - to be admitted in 2025-26) along with their COs and CO-PO/PSO matrix. **The syllabi along with the course outcomes of each course of B. Tech. I Semester in Artificial Intelligence/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2025 – 26 (under the flexible curriculum), was analyzed, discussed and recommended. The syllabus of all the courses of I semester in each branch is annexed as Annexure-V.**
Agenda Item 7	To review / update and finalize the Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I to be offered in B.Tech. and B.Arch., I semester (for 2025-26 admitted batch) along with their COs and CO-PO/PSO matrix. **The Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I of B. Tech. I Semester in Artificial Intelligence/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning, batch admitted in academic session 2025 – 26 (under the MITS-DU), was discussed and recommended. The experiment list/Lab manual and Micro Project-I list is annexed as Annexure-VI.**
Agenda Item 8	To review and finalize the syllabi of PG Programmes (MCA/MBA/MUP), III semester (admitted in 2024-25 session) along with their COs. **NA**
Agenda Item 9	To review and finalize the courses and syllabi for all courses for PG Programmes (M.E./M.Tech./MCA/MBA/MUP), I semester (2025-26 admitted batch) along with their Course Outcomes (COs). **NA**

Agenda Item 10	To review and finalize the syllabus/module content for Classified Novel Engaging Courses to be offered in PG programmes, I semester (2025-26 admitted batch). **NA**
Agenda Item 11	To review the CO attainments, identify gaps and suggest corrective measures for the improvement in CO attainment levels for the courses taught in first semester, July-December 2024 Session. **The CO attainments, gap analysis and corrective measures taken (for the courses taught during July-Dec. 2024 Session) were presented, reviewed and analysed during the meeting. The same is annexed as Annexure - VII.**
Agenda Item 12	To consider and review the curriculum feedback from various stakeholders, its analysis and impact report. {Curriculum offered under MITS –DU structure (i.e. 2024-25 admitted batch) to be considered} **The curriculum feedback from various stakeholders, its analysis and impact report (for the courses taught during July-Dec. 2024 Session) was presented, reviewed and analysed during the meeting. The same is annexed as Annexure - VIII.**
Agenda Item 13	Any other Matter **The Academic Advisory Cell (ACC) of the MITS-DU in its meeting on 30th May 2025 recommended some changes in the Scheme Structure of 2024-25 and 2025-26 admitted batches. The changes were presented, discussed and recommended in the meeting. The updated scheme structures of 2024-25 and 2025-26 admitted batches are annexed as Annexure-IX and X respectively.**

Suggestions by the external experts/members:

It was suggested to include some contents of Unit - V in the lab experiments of the Design and Analysis of Algorithms course. The same was then updated in the syllabus.

The meeting ended with the vote of thanks to all the members.

Dr. Pawan Dubey **Dr. Tej Singh** **Dr. Bhagat S. Raghuwanshi** **Dr. Sunil Kumar Shukla**

Present in Online mode

Dr. Dilip Singh Sisodia
Associate Professor and HoD,
Department of Computer Science & Engineering,
NIT Raipur

Present in Online mode.

Dr. Manish Pandey
Associate Professor,
Department of Computer Science & Engineering,
MANIT Bhopal.

06/06/25

Dr. Rajni Ranjan Singh
Head, Centre for Artificial Intelligence [Chairperson, BoS]

ANNEXURE-I

Syllabi
of all courses of
B. Tech. III Semester
Artificial Intelligence (AI)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning
[under the MITS-DU]
under the flexible curriculum along with their COs
(Batch admitted in academic session 2024 – 25)

Centre for Artificial Intelligence

PROBABILITY AND RANDOM PROCESSES
(31242101/ 24242101/ 27242101/ 28242101)

COURSE OBJECTIVES

- To learn central tendency, skewness and kurtosis.
- To describe probability theory and distribution
- To familiarize with correlation and regression
- To know about the hypothesis analysis
- To explore the theory of attributes and rules of association

Unit I

Measure of Central Tendency: Measures of Averages and Standard Deviation, Moments about origin and mean, Moment Generating Function, Skewness and Kurtosis.

Unit II

Probability & Regression: Definition of Probability: Classical and Axiomatic Approaches, Laws of Total and Compound Probability, Conditional Probability, Curve Fitting, Correlation and Regression.

Unit III

Probability Distribution: Probability Distribution Function, Probability Density Function, Central Limit Theorem, Binomial Distribution, Poisson Distribution, Normal Distribution, Exponential Distribution, Uniform Distribution.

Unit IV

Testing of Hypothesis: Testing of Hypothesis, Chi-squared test, t-test, F-test, Z-test, Analysis of Variance: One-way and Two-way Classifications.

Unit V

Random Variables & Processes: Concept of Random Variable, One-Dimensional Random Variable, Two-Dimensional Random Variable, Distribution Function, Joint Probability Distribution Function, Marginal Probability Distribution, Cumulative Probability Distribution, Conditional Distribution Function.

RECOMMENDED BOOKS

1. M Ray and H.S. Sharma: Mathematical Statistics, Ram Prasad Publications, 3rd Edition, 2017.
2. V.K. Kapoor, S.C. Gupta: Statistical Methods, S. Chand & Company, 11th Edition, 2018.
3. T. Veerarajan: Probability, Statistics and Random Processes, McGraw-Hill, 3rd Edition, 2008.
4. S. M. Rose: Introduction to Probability Models, Elsevier, 10th Edition, 2011.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1: Gain knowledge of measures of central tendency
CO2: Evaluate the skewness, kurtosis, curve fitting, correlation and regression.
CO3: Interpret the theory of probability and its distributions
CO4 Examine the test of hypothesis.
CO5: Compute random variables with random process

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	3	1	1				1	2	1	2	2
CO2	3	2	2	3	1	1			1	1	2	2	2	2
CO3	3	2	2	2	1	1	1			1	2	2	2	3
CO4	3	3	2	3	1	1	1		2	1	2	2	2	3
CO5	3	2	2	3	2	1				1	1	2	2	2

Centre for Artificial Intelligence

DESIGN & ANALYSIS OF ALGORITHMS

(31242102/24242102/27242102/28242102)

COURSE OBJECTIVES

- To introduce the topic of algorithms as a precise mathematical concept.
- To study the techniques like recursion, divide and conquer, dynamic programming, greedy approach, backtracking and branch and bound.
- To practice their skills on many well-known algorithms and data structures designed to solve real-life problems.

Unit I

Introduction to Computational Model: Algorithms and its Importance, Recurrences and Asymptotic Notations, Mathematical Analysis of Non-Recursive and Recursive Algorithms.

Unit II

Divide and Conquer Method: Introduction and its Examples such as Finding the Maximum and Minimum, Binary Search, Merge Sort, Quick Sort and Strassen's Matrix Multiplication.
Greedy Method: Introduction, Characteristics, Examples of Greedy Methods such as Single-Source Shortest Paths, Minimum Cost Spanning Trees: Prim's and Kruskal's Algorithm, Knapsack Problem, Dijkstra's Single Source Shortest Path Algorithm, Optimal Storage on Tapes.

Unit III

Dynamic Programming: Introduction, The Principle of Optimality, Examples of Dynamic Programming Methods such as – 0/1 Knapsack, Traveling Salesman Problem, Floyd-Warshall's All Pairs Shortest Path, Longest Common Subsequence and Reliability Design, Matrix Chain Multiplication.

Unit IV

Backtracking: Concept and its Examples like 4-Queens Problem, Knapsack problem Hamiltonian Circuit Problem, Graph Coloring Problem etc.
Branch & Bound: Introduction and its Examples like - Traveling Salesperson Problem etc.
NP-Completeness: Introduction, Class P and NP, Polynomial Reduction, NP-Hard and NP-Complete Problems.

Unit V

Algorithms in Machine Learning and Data Science: Gradient Descent and Stochastic Gradient Descent. Parallel and Distributed Algorithms: MapReduce. Algorithms in Blockchain: Proof-of-Work and Proof-of-Stake Algorithms. Quantum Algorithms: Quantum Search Algorithms (Grover's Algorithm).

Centre for Artificial Intelligence

RECOMMENDED BOOKS

1. Fundamentals of Computer Algorithms, Horowitz & Sahani, Universities press.
2. Introduction to Algorithms, Coremen Thomas, Leiserson CE, Rivest RL, PHI.
3. Design & Analysis of Computer Algorithms, Ullmann, Pearson.
4. Algorithm Design, Michael T Goodrich, Robarto Tamassia, Wiley India.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1	Analyze algorithm complexity using asymptotic notations.
CO2	Implement divide & conquer and greedy algorithmic approaches for problem solving.
CO3	Develop dynamic programming solutions for optimization problems.
CO4	Solve problems using backtracking and branch & bound, and classify problems under NP, NP-Complete, and NP-Hard.
CO5	Explore algorithms used in machine learning, blockchain, distributed systems, and quantum computing.

CO-PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2			1		1	1	3	2
CO2	3	3	3	3	2	2			1		1	1	3	2
CO3	3	3	3	3	3	2		1	2	2	1	3	3	3
CO4	3	3	3	3	3	2		1	2	2	1	3	3	2
CO5	3	3	3	3	3	3	3	1	3	2	3	3	3	2

Centre for Artificial Intelligence

KNOWLEDGE REPRESENTATION AND REASONING (31242103)

COURSE OBJECTIVES

- To introduce the principles and techniques used in knowledge representation and inference in AI systems.
- To familiarize students with formal logic systems such as propositional and predicate logic.
- To understand reasoning techniques like rule-based, probabilistic, and non-monotonic reasoning.

Unit I

Introduction to Knowledge Representation: Introduction to KRR in AI, Types of knowledge: Declarative, Procedural, Meta-knowledge, KR properties: Representational adequacy, Inferential adequacy and efficiency, Overview of KR languages, Syntax and semantics of propositional logic.

Unit II

Predicate Logic and Rule-Based Systems: First-order predicate logic: syntax and semantics, Unification and resolution, Forward and backward chaining, Rule-based systems and inference engines, Production systems and expert systems.

Unit III

Structured Representation: Semantic networks and inheritance, Frames and scripts, Conceptual dependency theory, Ontologies: construction and usage, Description Logics.

Unit IV

Reasoning Paradigms: Non-monotonic reasoning: default logic, circumscription, Probabilistic reasoning: Bayesian networks, Fuzzy logic and reasoning, Truth maintenance systems (TMS), Case-based reasoning.

Unit V

Current Trends and Technological Advancements in KRR: Knowledge Graphs (e.g., Google Knowledge Graph, DBpedia, Wikidata), Ontology alignment and reasoning using OWL/RDF, Neural-symbolic integration and differentiable reasoning, Large Language Models (LLMs) and implicit knowledge representation, KRR in real-world applications: intelligent agents, chatbots, robotics.

RECOMMENDED BOOKS

1. Ronald Brachman and Hector Levesque, Knowledge Representation and Reasoning, Morgan Kaufmann, 2004.
2. Elaine Rich and Kevin Knight, Artificial Intelligence, McGraw-Hill, 3rd Edition, 2010.
3. Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Pearson, 4th Edition, 2021.
4. John F. Sowa, Knowledge Representation: Logical, Philosophical, and Computational Foundations, Brooks/Cole, 2000.
5. Frank van Harmelen, Vladimir Lifschitz, and Bruce Porter (Eds.), Handbook of Knowledge Representation, Elsevier, 2007.

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1: Explain the foundational concepts of knowledge representation and use propositional logic to model basic knowledge and inference.

CO2: Apply first-order predicate logic and implement rule-based reasoning methods.

CO3: Design structured knowledge representations using semantic networks, frames, and ontologies.

CO4 Evaluate and implement reasoning techniques under uncertainty using non-monotonic, probabilistic, and fuzzy logic.

CO5: Assess modern advancements in KRR, including neural-symbolic systems, knowledge graphs, and their applications in real-world AI systems.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	2	1	1			1	1		2	2	2
CO2	3	3	2	2	1	1			1	1		2	2	2
CO3	2	2	3	2	2	1	1		1	1	1	2	3	2
CO4	2	3	2	3	2	1	1		1	2	1	3	3	3
CO5	2	2	3	2	3	1		1	1	2	2	3	3	3

Centre for Artificial Intelligence
CONTROL SYSTEMS
(24242103)

COURSE OBJECTIVES

- To understand fundamental concepts of control systems and mathematical modeling of the system.
- To understand the concepts of time response and frequency response analysis of Control Systems.
- To understand the concepts of state variable models, controllability and observability as applicable to linear time invariant systems

Unit I

Introduction to Laplace Transformation, Control system modeling: Basic Elements of Control System, Open loop and Closed loop systems, Transfer function, Modelling of Electric systems, Translational and rotational mechanical systems, Block diagram reduction Techniques, Signal flow graph.

Unit II

Time response analysis: Standard test signals, time response of first order systems, Impulse and Step Response analysis of second order systems, time domain specifications, steady state response, steady state errors and error constants, effects of P, PI, PD and PID.

Unit III

Stability analysis: stability, Routh-Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, effects of adding poles and zeros to G(s)H(s) on the root loci.

Unit IV

State variable analysis: State space representation of Continuous Time systems, State equations, Transfer function from State variable representation, Solutions of the state equations, canonical variable diagonalization, system analysis by transfer function and state space methods for continuous systems. Concept of controllability and observability, design of state feedback controllers, Pole placement by state feedback, set point tracking controller, Compensators – Lead, Lag, and Lead Compensators.

Unit V

Intelligent Control Systems, Model Predictive Control (MPC), Adaptive and Self-Tuning Controllers, Control in Autonomous Systems, Cyber-Physical Systems (CPS) and Networked Control Systems (NCS), Data-Driven and Machine Learning-Based Control.

RECOMMENDED BOOKS

1. Automatic control systems, Benjamin. C. Kuo, Prentice Hall of India.
2. Modern Control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
3. Control Systems Engineering, I.J. Nagrath & M. Gopal, New Age Pub. Company.
4. Control System – Principles and Design, M. Gopal, Tata McGraw Hill.
5. Feedback and Control Systems, Schaum's Outline Series, Tata McGraw Hill.
6. Digital Control and State Variable Methods, M. Gopal, Tata Mcgraw Hill.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1: Explain Laplace transforms, control system modeling, and block diagram simplification.
CO2: Analyze time response of systems and evaluate P, PI, PD, and PID controller effects.
CO3: Examine system stability using Routh-Hurwitz and construct root locus plots.
CO4 Develop state-space models and design controllers using controllability and observability.
CO5: Explore intelligent, adaptive, and machine learning-based control techniques.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	1	1	1	1	1	1	1	2	2	2
CO2	3	3	2	2	1	1	1	1	1	1	1	2	2	3
CO3	3	3	3	2	2	1	1	1	2	1	1	2	2	3
CO4	3	3	3	2	2	1	1	1	2	2	2	2	3	3
CO5	2	2	3	2	3	2	2	1	2	2	2	3	3	3

Centre for Artificial Intelligence

DATABASE MANAGEMENT SYSTEM

(27242103/ 28242103)

COURSE OBJECTIVES

- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modelling, relational, hierarchical and network models.
- To understand and use data manipulation language to query, update and manage a database.

Unit I

DBMS: Database Approach v/s Traditional File Approach, Advantages of Database System, Database Users and Administrator, Database System Environment, Application Architectures, Schemas, Instances, Data Independence, Data Models: Hierarchical Data Model, Network Data Model & Relational Data Model, Comparison between Models. Entities and Relationship Model: Entity types, Entity sets, Attributes and Keys, Relationship Types and Sets, Constraints, Design issue, E-R Diagram, Weak Entity Sets.

Unit II

Relational Model: Structure of Relational Databases: Relation, Attribute, Domain, Tuples, Degree, Cardinality, Views, Database Relations, Properties of Relations, Attributes, Keys, Attributes of Relation, Domain Constraints, Integrity Constraints. Relational Algebra: Concepts and Operations: Select, Project, Division, Intersection, Union, Division, Rename, Join etc.

Unit III

SQL: Purpose of SQL, Data Definition Language (DDL) Statements, Data Manipulation Language (DML) Statements Update Statements & Views in SQL, Data Control Language (DCL), Triggers.
Relational Database Design: Purpose of Normalization, Data Redundancy and Update Anomalies, Functional Dependency, Process of Normalization, Various Normal Forms: 1NF, 2NF, 3NF, BCNF, Decomposition, Desirable Properties of Decomposition: Dependency Preservation, Lossless Join, Problems with Null Valued & Dangling Tuple, Multivalued Dependencies.

Unit IV

Transaction Management: Transaction Concept, Transaction State, Concurrent Executions, Serializability: Conflict and View Serializability, Concurrency Control: Lock-Based Protocol, Recovery: Log-Based Recovery.

Unit V

Big Data and Distributed Databases: CAP theorem, eventual consistency, sharding. NoSQL and NewSQL Databases: Document (MongoDB), Key-Value (Redis), Column-family (Cassandra), Graph (Neo4j), Google Spanner, CockroachDB. Real-Time Data Processing and Streaming

Databases: Apache Kafka, Apache Flink.

RECOMMENDED BOOKS

1. Database System Concepts, Abraham Silberschatz Henry F. Korth S. Sudarshan, McGraw-Hill 6th Edition.
2. Database Management System, Raghu Ramakrishnan Johannes Gehrke, McGraw Hill 3rd Edition.
3. Fundamentals of Database System, Elmasri & Navathe, Addison-Wesley Publishing, 5th Edition.
4. An Introduction to Database Systems, Date C. J, Addison-Wesley Publishing, 8th Edition.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1	Differentiate between traditional file systems and the database approach.
CO2	Construct relational schemas and demonstrate the use of relational algebra operations to query and manipulate relational data.
CO3	Develop SQL queries for data definition, manipulation, and control, and analyze relational schemas for normalization.
CO4	Examine transaction processing concepts and analyze concurrency control and recovery mechanisms in database systems.
CO5	Compare traditional RDBMS with modern distributed and NoSQL databases, and evaluate their suitability for real-time data processing scenarios.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	2	1	1	1	1	1	1	1	1	2	2	2
CO2	3	3	2	2	2	1	1	1	2	2	1	2	2	2
CO3	3	3	2	2	2	1	1	1	2	2	2	2	2	3
CO4	3	3	3	2	2	1	1	1	2	2	2	2	2	3
CO5	2	2	3	2	3	2	2	1	2	2	2	3	3	3

Centre for Artificial Intelligence

COMPUTER NETWORKS

(31242104/ 24242104/ 27242104/ 28242104)

COURSE OBJECTIVES

- Familiarize the student with the basic taxonomy and terminology of the computer networking.
- Provide detailed knowledge about various layers, protocols and devices that facilitate networking.
- Enable Students to deal with various networking problems such as flow control, error control and congestion control.

Unit I

Network Standardization- OSI Reference Model & TCP/IP Reference Model. Performance Criteria- Bandwidth, Throughput, Propagation Time & Transmission Time.
Physical Layer: Network Topologies- Bus, Ring, Star & Mesh, Switching- Circuit Switching, Message Switching & Packet Switching, Multiplexing: FDM – Frequency Division Multiplexing, WDM – Wavelength Division Multiplexing & TDM – Time Division Multiplexing.

Unit II

Data Link Layer: Introduction, Design Issues, Services, Framing, Error Control, Flow Control, ARQ Strategies, Error Detection and Correction, Parity Bits, Cyclic Redundancy Code (CRC), Hamming Codes, MAC Sub Layer- The Channel Allocation Problem, Pure ALOHA, Slotted ALOHA, CSMA, CSMA/CD, IEEE 802.3, IEEE 802.4 and IEEE 802.5.

Unit III

Network Layer & Transport Layer: Introduction, Design Issues, Services, Routing- Distance Vector Routing, Hierarchical Routing & Link State Routing, Shortest Path Algorithm- Dijkstra's Algorithm & Floyd–Warshall's Algorithm, Flooding, Congestion Control- Open Loop & Closed Loop Congestion Control, Leaky Bucket & Token Bucket Algorithm. Connection Oriented & Connectionless Service, IP Addressing.

Unit IV

Presentation, Session & Application Layer: Introduction, Design Issues, Presentation Layer- Translation, Encryption- Substitutions and Transposition Ciphers, Compression- Lossy and Lossless. Session Layer – Dialog Control, Synchronization. Application Layer- Remote Login, File Transfer & Electronic Mail.

Unit V

Software-Defined Networking (SDN), Edge and Fog Computing in Networking, Quantum Networking (Introductory Concepts), Zero Trust Architecture (ZTA), Next-Generation Internet Protocols: Segment Routing, Multipath TCP (MPTCP), QUIC.

RECOMMENDED BOOKS

1. Data Communication and Networking, Behrouz A. Forouzan, McGraw Hill.
2. Computer Networks, Andrew S. Tanenbaum, Pearson Education India.
3. Computer Networks and Internets, Douglas E. Comer, Pearson India.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1	Illustrate network topologies, switching and multiplexing techniques.
CO2	Analyze data link layer protocols for error control and channel access.
CO3	Apply routing algorithms and congestion control mechanisms, and differentiate between connection-oriented and connectionless transport services.
CO4	Describe the functions and services of presentation, session, and application layers.
CO5	Summarize emerging networking technologies and evaluate the advantages of next-generation internet protocols.

CO-PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	1	1	1	1	1	1	1	1	2	2	2
CO2	3	3	2	2	2	1	1	1	1	1	1	2	2	2
CO3	3	3	3	2	2	1	1	1	2	2	2	2	3	3
CO4	2	2	2	1	1	1	1	1	1	1	2	2	3	3
CO5	2	2	2	2	3	2	2	1	2	2	2	3	3	3

Centre for Artificial Intelligence

OPERATING SYSTEMS

(31242105/ 24242105/ 27242105/ 28242105)

COURSE OBJECTIVES

- To provide basic knowledge of computer operating system structures and functioning.
- To compare several different approaches to memory management, file management and process management.
- To understand various problems related to concurrent operations and their solutions.

Unit I

Basics of Operating System: Generations, Types, Structure, Services, System Calls, System Boot, System Programs, Protection and Security.

Process Management: Process Concepts, Process States, Process Control Block, Scheduling-Criteria, Scheduling Algorithms and their Evaluation, Threads, Threading Issues.

Unit II

Process Synchronization: Background, Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classic Problems of Synchronization, Monitors.

Deadlock: System Model, Deadlock Characterization, Deadlock Prevention, Detection and Avoidance, Recovery from Deadlock.

Unit III

Memory Management: Main Memory, Swapping, Contiguous Memory Allocation, Paging, Structure of Page Table, Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Allocation of Frames, Thrashing.

Unit IV

Storage Management: Mass-Storage Structure, Overview, Disk Structure, Disk Attachment, Disk Scheduling.

File System Interface: The Concept of a File, Access Methods, Directory Structure, File System Structure, Allocation Methods, Free-Space Management.

Unit V

Containerization and Operating System-Level Virtualization, Kubernetes and Container Orchestration, Secure Boot, Trusted Execution Environments, OS-level sandboxing and isolation, Microkernel and Exokernel Architectures, GPU/TPU scheduling and driver integration, Lightweight OS (KaiOS, Tizen, PostmarketOS).

RECOMMENDED BOOKS

1. Operating System Concepts, Silberschatz, Ninth Edition, Wiley Publication.
2. Operating Systems, internals and Design Principles, Stallings, Seventh Edition, Pearson Publication.
3. Modern Operating Systems, Tanenbaum, Fourth Edition. Pearson Publication.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1	Describe the fundamental concepts and services of operating systems
CO2	Demonstrate solutions to process synchronization problems and analyze different approaches to deadlock detection, avoidance, and recovery.
CO3	Apply memory management techniques, and evaluate page replacement algorithms.
CO4	Analyze different file systems, storage structures, allocation mechanisms and free-space management methods.
CO5	Evaluate the impact of modern OS-level technologies on performance and security.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	1	1	1	1	1		1	1	2	2	2
CO2	3	2	2	2	2	1	1	1	1	1	2	2	2	2
CO3	3	3	2	2	2	2	1	1	1	1	1	2	3	2
CO4	3	3	2	2	2	2	1	1	1	1	2	2	3	3
CO5	3	3	2	2	3	2	2	2	1	2	2	3	3	3

Centre for Artificial Intelligence
CYBER SECURITY
(31242111/ 24242111/ 27242111/ 28242111)

COURSE OBJECTIVES

- To introduce the basic concepts of cybersecurity.
- To make students aware of various types of cyber threats, vulnerabilities, security policies and cybersecurity tools.
- To build basic skills for protecting information systems.

Unit I

Introduction to Cyber Security: Overview of Cyber Security, Goals of Cyber Security (Confidentiality, Integrity, Availability), Types of cyber attacks: Phishing, Malware, Ransomware, Social Engineering, Malicious Softwares. Hacker and its types. Real-world incidents and their impact, Cyber Ethics and Legal Aspects.

Unit II

Basics of Networking: Internetworking devices, Topologies OSI and TCP/IP models, IP address, DNS, TCP, IP, HTTP, HTTPS, Web Browser, Web Server.

Unit III

Security Mechanisms: Firewalls, Anti-virus, Intrusion Detection Systems (IDS), Intrusion Prevention Systems (IPS), Encryption and Decryption: Symmetric and Asymmetric, Cryptanalysis, Digital Signature, Authentication: Passwords, Biometrics, Multi-Factor Authentication.

Unit IV

System and Application Security: Operating System security basics. Securing mobile devices and apps. Web application vulnerabilities: SQL Injection, XSS, CSRF. Secure coding practices.

Cybercrime, Forensics, and Incident Response: Types of cybercrimes: Identity Theft, Financial Fraud, Cyberbullying. Basics of digital forensics. Cyber law and IT Act (India) overview. Incident response lifecycle and reporting.

Unit V

Cyber Hygiene and Best Practices: Cyber hygiene: Safe browsing, regular updates, backups. Strong password creation and management. Social media safety. Roles of individuals and organizations in ensuring security.

RECOMMENDED BOOKS

1. "Cybersecurity for Beginners" by Raef Meeuwisse – Wiley
2. "Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives" by Nina Godbole and Sunit Belapure – Wiley India
3. "Computer Security: Principles and Practice" by William Stallings and Lawrie Brown – Pearson
4. "Introduction to Cyber Security" by Chwan-Hwa (John) Wu and J. David Irwin – CRC Press
5. "Cybersecurity Essentials" by Charles J. Brooks, Christopher Grow, Philip Craig, Donald Short – Wiley

COURSE OUTCOMES

After completion of this course, the students would be able to:

CO1: Describe fundamental concepts of cyber security and identify common cyber threats and legal implications.
CO2: Explain basic networking concepts.
CO3: Demonstrate common security mechanisms used to protect digital data.
CO4 Analyze cybercrime scenarios and vulnerabilities in systems, and outline procedures for incident response and digital forensics.
CO5: Formulate cyber hygiene strategies and practice safe online behavior to minimize cyber risks.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2		2	1	2		3		2		2	2	2
CO2	3	2			2							1	2	2
CO3	3	2	2		3	1	1					2	2	2
CO4	3	3		3	3	2	1	2		1		2	3	3
CO5	2	1		2	2	3	2	3	2	2	1	3	2	2

ANNEXURE-II

Experiment list/ Lab manual for all the Laboratory Courses and Macro Project-I to be offered in B. Tech. III Semester [Artificial Intelligence (AI)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning] under the flexible curriculum

(Batch admitted in academic session 2024 – 25)

Centre for Artificial Intelligence

PROBLEM SOLVING THROUGH PYTHON PROGRAMMING
(31242106/ 24242106/ 27242106/ 28242106)

List of Programs

1. Display “Hello, World!”
2. Take user input and print it
3. Perform arithmetic operations (add, subtract, multiply, divide)
4. Convert Celsius to Fahrenheit
5. Swap two variables
6. Check if a number is even or odd
7. Find the largest of three numbers
8. Check if a year is a leap year
9. Print multiplication table of a number
10. Compute the factorial of a number (iterative and recursive)
11. Generate Fibonacci series
12. Check if a number is prime
13. Find sum of digits of a number
14. Reverse a number
15. Find the largest and smallest element in a list
16. Count even and odd numbers in a list
17. Remove duplicates from a list
18. Sort a list without using built-in sort
19. Find the frequency of elements in a tuple
20. Convert list to tuple and vice versa
21. Perform set operations: union, intersection, difference
22. Check subset and superset
23. Count the frequency of characters in a string
24. Sort dictionary by key or value
25. Merge two dictionaries
26. Implement a calculator using functions
27. Recursive program for GCD and LCM
28. Recursive function for binary search
29. Lambda function usage examples (sorting, filtering)
30. Remove all punctuation from a string
31. Find the longest word in a sentence
32. read and write to a text file and count the number of lines, words, and characters in a file
33. Copy contents from one file to another using Python
34. Find and replace a word in a file using Python
35. Create a class and object
36. Demonstrate constructor and destructor
37. Implement inheritance
38. Override methods in derived class
39. Handle divide-by-zero error and file-not-found error in Python

Centre for Artificial Intelligence

COURSE OUTCOMES

After completion of the course students will be able to:

CO1: Apply control structures and functions to solve computational problems.
CO2: Develop programs using data types such as lists, tuples, sets, and dictionaries.
CO3: Implement file handling, exception handling, and modular programming practices.
CO4: Use object-oriented programming concepts to build modular and reusable Python code.

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

Centre for Artificial Intelligence

DESIGN & ANALYSIS OF ALGORITHMS LAB

(31242107/ 24242107/ 27242107/ 28242107)

List of Programs

1. Program to calculate time complexity of different sorting algorithms
2. Implement and compare iterative vs recursive Fibonacci computation
3. Measure execution time of basic operations (e.g., searching in arrays)
4. Implement Merge Sort and Quick Sort
5. Implement Binary Search (recursive and iterative)
6. Find Maximum and Minimum in an array using divide and conquer
7. Design and implement solution of following problems using Greedy Algorithms:
    a. Fractional Knapsack Problem
    b. Activity Selection Problem
    c. Huffman Coding
    d. Job Sequencing with Deadlines
    e. Minimum Spanning Tree: Kruskal's and Prim's algorithms
8. Design and implement solution of following problems using Dynamic Programming Approach:
    a. 0/1 Knapsack Problem
    b. Longest Common Subsequence (LCS)
    c. Matrix Chain Multiplication
9. Traverse a graph using Depth-First Search (DFS) and Breadth-First Search (BFS) algorithms.
10. Find a single source shortest path, in a weighted graph, using Dijkstra's Algorithm.
11. Find all-pair shortest paths, in a weighted graph, using Floyd-Warshall Algorithm.
12. Implement the classic word count problem using the MapReduce framework.
13. Implement gradient descent to minimize MSE for a linear regression problem.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1: Apply algorithmic design techniques to solve computational problems.
CO2: Solve real-world problems using different algorithmic design approaches.
CO3: Evaluate algorithm efficiency and understand computational intractability.

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

Centre for Artificial Intelligence

MACRO PROJECT-I

(31242109/ 24242109/ 27242109/ 28242109)

List of Programs

1. Design an ER-diagram for the following:
    a. Library Management System
    b. Online Shopping Database
    c. Examination Result Processing System
2. Design a Student Marksheet System
3. Implement Contact Book using Dictionary
4. Design and implement To-Do List CLI Tool
5. Create a simple Quiz Game
6. Develop a basic ATM Simulator.
7. Develop a Personal Finance Tracker to track income/expenses using Python.
8. Design a Text Analyzer (counts frequency, finds longest word, etc.).
9. Design a Real-Time Chat Application (Console/GUI) using Python sockets or Flask for communication.
10. Create a system which implements route optimizer using Dijkstra algorithm.
11. Create an exam scheduling system using Graph Coloring
12. Develop a File Compressor using Huffman Coding
13. Create an Auto-Correct or Spell Checker using Edit Distance
14. Implement Backup and recovery handling in DBMS.
15. Design a Smart Parking System using algorithmic slot allocation (first-fit, best-fit), user booking via Python interface, and DB to track occupancy.
16. Create an Auction System with Bid Optimization to track users and bids in DB; applies greedy algorithms for winner selection based on utility or price/time factors.
17. Develop a Real-Time Voting App with Conflict Resolution using python and uses Paxos/Raft-inspired algorithm to ensure vote consistency across distributed systems (can simulate using threads).

Note: use SQL at the backend for storing data.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1: Develop database-driven applications using SQL.

CO2: Implement algorithmic solutions using Python for computational and optimization problems.

CO3: Integrate database and algorithmic logic in a cohesive application to solve real-world problems.

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

ANNEXURE-III

List of Courses for Self-learning/Presentation to be offered from SWAYAM/NPTEL/MOOC based Platforms for B. Tech. III Semester [Artificial Intelligence (AI)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning] under the flexible curriculum

(Batch admitted in academic session 2024 – 25)

S.No	Course Name	Duration	link
1	Foundations of Cognitive Robotics	4 weeks	https://onlinecourses.nptel.ac.in/noc25_me126/preview
2	Gender Justice and Workplace Security	4 weeks	https://onlinecourses.nptel.ac.in/noc25_mg131/preview
3	Mobile Virtual Reality and Artificial Intelligence	4 weeks	https://onlinecourses.nptel.ac.in/noc25_cs80/preview
4	Python for Data Science	4 weeks	https://onlinecourses.nptel.ac.in/noc25_cs104/preview

ANNEXURE-IV

List of Professional Certification Platforms and relating Certifications with Specific Domain/Areas of Certification for B. Tech. [Artificial Intelligence (AI)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning] under the flexible curriculum

(Batch admitted in academic session 2024 – 25)

Centre for Artificial Intelligence

List of Professional Certification Courses			
S. No.	**Course Name**	**Duration**	**Link**
1	IBM Full Stack Software Developer Professional Certificate	5 month	https://www.coursera.org/professional-certificates/ibm-full-stack-cloud-developer?utm_source=chatgpt.com#courses
2	Meta Android Developer Professional Certificate	7 weeks	https://www.coursera.org/professional-certificates/meta-back-end-developer
3	Certified Ethical Hacker (CEH)	6 month	https://www.eccouncil.org/train-certify/certified-ethical-hacker-ceh/#section_course_info
4	Oracle Cloud Infrastructure and Technology Exams	6 month	https://education.oracle.com/buy-exam
5	Oracle Cloud Applications DELTA Exams & OCI Multi Cloud Architect Associate Exam	6 month	https://education.oracle.com/buy-exam
6	Oracle Cloud Applications Exams	6 month	https://education.oracle.com/buy-exam
7	Oracle Foundations Exams for Students	6 month	https://education.oracle.com/buy-exam
8	Red Hat System Administration - I/II	3 month	https://courses.networknuts.net/redhat-delhi-lp/?utm_source=google&utm_medium=cpc&utm_campaign=&utm_term=e_red%20hat%20certification&device=c&matchtype=e&adposition=&gad_source=1&gad_campaignid=12435426400&gbraid=0AAAAAD6LwPtvLsGetAR-znoaKueJj8CI4&gclid=Cj0KCQjwgIXCBhDBARIsAELC9ZiPiWYPwF3G8UACFKqLS-i5D4OTXdN5fIJlYzihpuT5U_gJNlXokk8aAh4cEALw_wcB#
9	AWS Certified DevOps Engineer	6 months	https://aws.amazon.com/certification/certified-devops-engineer-professional/
10	AWS Certified Solutions Architect - Professional	6 months	https://aws.amazon.com/certification/certified-solutions-architect-professional/
11	IBM AI Engineering Professional Certificate	4 month	https://www.coursera.org/professional-certificates/ai-engineer
12	CS50's Introduction to Artificial Intelligence with Python	2 months	https://pll.harvard.edu/course/cs50s-introduction-artificial-intelligence-python

Centre for Artificial Intelligence

List of Professional Certification Courses			
13	Microsoft AI & ML Engineering Professional Certificate	6 months	https://www.coursera.org/professional-certificates/microsoft-ai-and-ml-engineering
14	Generative AI Engineering with LLMs Specialization	3 months	https://www.coursera.org/specializations/generative-ai-engineering-with-llms
15	Deep Learning Specialization	6 weeks	https://www.coursera.org/specializations/deep-learning
16	Microsoft AI & ML Engineering Professional Certificate	6 months	https://www.coursera.org/professional-certificates/microsoft-ai-and-ml-engineering
17	Meta Back-End Developer Professional Certificate	7 weeks	https://www.coursera.org/professional-certificates/meta-back-end-developer

ANNEXURE-V

Syllabi
of all courses of
B. Tech. I Semester
Artificial Intelligence (AI)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning
[under the MITS-DU]
under the flexible curriculum along with their COs
(Batch admitted in academic session 2025 – 26)

Centre for Artificial Intelligence

DIGITAL LOGIC DESIGN

(24251101/31251101/27251101/28251101)

COURSE OBJECTIVES

- To understand the fundamental operating components of Digital Computers.
- To learn various number systems, and boolean algebra employed in digital computers.
- To understand the concepts of counters, latches, and flip-flops.

Unit I Basic of Computer and Number System

Components of a Computer System: Introduction, Processor, Arithmetic and Logic Unit, Control Unit, System Bus, Computer Memory and its types; Introduction to Digital Electronics, Needs and Significance, Different Number Systems: Binary Numbers, Octal and Hexadecimal Numbers, Conversions, Complement, Signed Binary Numbers, Binary Arithmetic, Binary Codes.

Unit II Boolean Algebra

Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Boolean Relations, Logic Gates, De Morgan's Theorem, Karnaugh Maps and Simplifications.

Unit III Combinational and Sequential Logic

Combinational Circuits: Half Adder, Full Adder, Binary Adder-Subtractor, Binary Multiplier, Comparator, Decoders, Encoders, Multiplexers.

Sequential Circuits: Latches, Flip-Flops: RS Latches, Level Clocking, D Latches, Edge-triggered D Flip-flop, Edge-triggered JK Flip-flop, JK Master-slave Flip-flop; Registers, Shift Registers, Counters.

Unit IV Memory and Programmable Logic

Introduction to Memory, Memory Decoding, Programmable Devices: Programmable Logic Array (PLA), Programmable Array Logic (PAL), Field-Programmable Gate Array (FPGA).

Unit V Advanced Digital Design

Logic design for neural network inference, Systolic arrays for matrix multiplications. Secure Hardware Design: Logic-level countermeasures for hardware Trojans, Side-channel attack resistance. Classical-to-quantum interface circuits. High-speed serial interfaces (PCIe, USB4, DDR5).

RECOMMENDED BOOKS

1. Digital Design, 6th Edition, M. Morris Mano, Michael D. Ciletti, ISBN-13: 9780134549897. (2018).
2. Fundamentals of logic design, Roth, C. H., Kinney, L. L., & John, E. B. (2004).
3. Digital Electronics: Principles, Devices and Applications, Anil K. Maini, Wiley,(2007).
4. Introduction to digital logic design, Hayes, J. P. Addison-Wesley Longman Publishing Co., Inc..(1993).

COURSE OUTCOMES

After completion of the course, students will be able to:

CO1 explain different number systems and boolean algebra principles.

CO2 evaluate various boolean expressions.

CO3 design combinational and sequential circuits.

CO4 interpret the functionality of memory devices and programmable logic devices.

CO5 create practical digital systems and identify their use in computing and embedded systems.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	1	1	1		1		1	1	1	1	2	1
CO2	3	3	3	2	1		1		1	1	2	2	1	1
CO3	3	3	2	2	1	1			1	1	1	2		2
CO4	3	3	2	2	2	1	1		1	1	2	2	1	2
CO5	3	3	1	1	2	1	1	2	2	1	1	3	2	1

Centre for Artificial Intelligence

FOUNDATIONS OF ARTIFICIAL INTELLIGENCE
(31251102)

COURSE OBJECTIVES

- To provide an overview of the fundamental concepts and techniques used in Artificial Intelligence.
- To develop an understanding of Artificial Intelligence methods related to knowledge representation, reasoning, and learning.

Unit I Introduction to Artificial Intelligence

Fundamentals of Artificial Intelligence: Definitions, Introduction, key concepts, Evolution, Terminology, Approaches and Goals. Ethical aspects of Artificial Intelligence. Relation between Artificial Intelligence, Machine Learning and Deep Learning. Intelligent Agents: Structure, Types and interaction with the environment.

Unit II Problem Solving

State space search; production systems, search space control, Uninformed and Informed Search: depth first search, breadth-first search. Heuristic Search: Best First Search, Hill Climbing. Game Playing: Minimax, alpha-beta pruning.

Unit III Knowledge Reasoning

Introduction to Knowledge representation, Building a Knowledge Base: propositional logic, first order logic and inferencing. Uncertain Knowledge and Reasoning, Probabilities, Bayesian Networks.

Unit IV Learning in Artificial Intelligence

Definition, process, types - unsupervised and supervised learning. Regression, Classification, Bias-Variance trade-off, Overfitting-Underfitting, loss function, cross-validation

Unit V Applications of Artificial Intelligence

Healthcare: Diagnosis, treatment, and medical imaging; Finance: Fraud detection, algorithmic trading, and risk assessment; Transportation: Autonomous vehicles and traffic optimization; Customer service and chatbots; Education: Personalized learning and intelligent tutoring systems.

Centre for Artificial Intelligence

RECOMMENDED BOOKS

1. Artificial Intelligence, Patrick Henry Winston, Third Edition, Addison-Wesley Publishing Company, 2004.
2. Principles of Artificial Intelligence, Nils J. Nilsson, Illustrated Reprint Edition, Springer Heidelberg, 2014.
3. Artificial Intelligence: A Modern Approach, Stuart Russell and Peter Norvig, Pearson, 2016.
4. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivashankar B Nair, 3rd Edition, Tata McGraw Hill, 2011.
5. A first course in artificial intelligence, Khemani, Deepak, McGraw-Hill Education, 2014.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 demonstrate fundamental concepts of Artificial Intelligence.
CO2 evaluate the performance of heuristic and game tree search algorithms for optimized decision-making.
CO3 construct logical models using propositional and first-order logic to infer knowledge from given facts.
CO4 describe the various learning techniques of Artificial Intelligence and its application.
CO5 analyze problem-solving strategies to determine the most effective approach for artificial intelligence based search problems.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	1	2	2	1	1	1	1	1	2	3	3
CO2	3	3	2	2	2	2	1	1	1	1	1	2	2	2
CO3	2	3	2	3	2	1	1	1	1	1	1	2	3	3
CO4	3	2	2	2	3	2	1	2	1	1	2	3	3	3
CO5	3	2	2	1	2	2	2	2	3	3	3	3	3	3

Centre for Artificial Intelligence

INTERNET AND WEB TECHNOLOGIES

(31251103/ 27251102/ 28251103)

COURSE OBJECTIVES

- To understand the fundamental concepts of the Internet and Web technologies.
- To learn about web development technologies.
- To gain hands-on experience in designing and implementing web applications.

Unit I Introduction to the Internet

Evolution of Internet: Usage, Impact; Significance, Applications, WWW, Search Engines, Webpages, Websites, URLs, Web Browsers, Web Servers, Web Crawlers, Web Hosting, Domain Names, and Types of Web Documents.

Unit II Internetworking Devices and Models

Introduction to computer networks and their types: Network Topologies, OSI and TCP/IP models, Functionality and Applications Network Devices: Hubs, Repeaters, Cables, Modems, Routers, Switches, Gateways and Firewalls and Access Points.

Unit III Network Address and Protocols

IP Addressing: Classless and Classful address, Structure and Format of IP Addresses, Subnetting, Supernetting; Public vs. Private IP Addresses, Routing, Network Protocols: HTTP, HTTPS, FTP, SMTP, DNS.

Unit IV HTML (Hypertext Markup Language)

Basic structure of an HTML document, Elements, tags, and attributes; HTML Text Formatting: Headings, paragraphs, and text formatting tags; Lists and Tables: Ordered and unordered lists, Creating and formatting tables; Forms and Inputs: Form elements and attributes, Input types and validation; HTML5 Advanced Features: Semantic elements, Multimedia; Introduction to Cascading Style Sheets (CSS) and XML.

Unit V Applications of Internet and Web Technology

Email and Messaging, Web-based email services, E-commerce: Types of e-commerce (B2B, B2C, C2C), Payment gateways and security; Social Media: Popular social media platforms, Impact on communication and marketing; Cloud Computing: Basics of cloud services (IaaS, PaaS, SaaS).

RECOMMENDED BOOKS

1. Web Applications: Concepts and Real World Design, Knuckles, Wiley-India
2. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel. Pearson, Fifth edition.
3. Computer Networking: A Top-Down Approach by James F. Kurose and Keith W. Ross, Pearson Education Limited; 8th edition, 2021.
4. HTML and CSS: Design and Build Websites by Jon Duckett, Wiley, 2011.

COURSE OUTCOMES

After completion of the course, students will be able to:

CO1 describe the fundamental concepts of the internet and web technologies.

CO2 explain the functioning of Internet protocols and the structure of IP addressing

CO3 analyze the role and functionality of internetworking devices and their impact on network performance and security.

CO4 create web pages, incorporating multimedia elements and forms.

CO5 design and develop a comprehensive web application.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	1	1	3	3	1		1	3	1
CO2	3	3	3	3	1	1		3	3		1	1	3	2
CO3	3	3	3	3	3	3	2	3	2	3	3	3	2	3
CO4	3	3	3	3	3	2		3	3	1		2	3	1
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Centre for Artificial Intelligence

PROBLEM SOLVING AND PROGRAMMING
(24251104/ 31251104/ 27251104/ 28251104)

COURSE OBJECTIVES

- To develop the understanding of algorithms, programming approaches and program documentation techniques.
- To design and implement programming solutions for problem solving.

Unit I

Introduction to Programming, Machine Level Languages, Assembly Level Languages, High Level Languages, Program Execution and Translation Process, Problem solving using Algorithms and Flowcharts. Introduction to Programming: Data Types, Constants, Keywords, Operators & Expressions, Precedence of operators and input/output functions.

Unit II

Control Statements and Decision Making: The goto statement, The if statement, The if- else statement, Nesting of if statements, The conditional expression, The switch statement, The while loop, The do…while loop, The for loop, The nesting of for loops, The break and continue statement.

Unit III

Arrays, Strings & Pointers: One dimensional Arrays, Passing Arrays to Functions, Multidimensional Arrays, Strings, Basics of Pointers & Addresses, Pointer to Pointer, Pointer to Array, Array of Pointers, Types of pointers, Pointer to Strings. Functions: Function Basics, Function Prototypes, Passing Parameter by value and by reference, Passing string to function, Passing array to function, Function returning address, Recursion.

Unit IV

Structures & Union: Pointer to Structure, Self-Referential Structures, Dynamic memory allocation by malloc/calloc function, Storage Classes. File Handling: Defining and Opening a file, Closing Files, Input/output Operations on Files, Predefined Streams, Error Handling during I/O Operations, Command Line Arguments.

Unit V

Basics of graphics libraries (SFML, SDL, OpenGL), Event-driven programming and game loops. Using C++ for performance-critical parts of ML/DL applications. Interfacing with system APIs (Linux syscalls, Windows API).

RECOMMENDED BOOKS

1. The C Programming Language, by Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall.
2. C++ How to Program, by H M Deitel and P J Deitel, Prentice Hall.
3. Programming in ANSI C, by E. Balagurusamy, Tata McGraw-Hill.
4. Schaum's Outline of Programming with C, by Byron Gottfried, McGraw-Hill.
5. The Complete Reference in C++, by Herbert Schildt, 5th Edition, McGraw-Hill.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 describe the basic principles of procedural programming and develop algorithms and flowchart for a given problem.

CO2 design solutions to computational problems using control statements.

CO3 create modular programs using arrays, strings, pointers, and functions.

CO4 apply structures, unions, dynamic memory allocation, and file handling concepts to build efficient data-driven programs.

CO5 develop interactive and high-performance applications.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	2		3	3	1	1	2	3	2
CO2	3	3	3	3	3	2		3	3	1		2	3	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	2	1	3	3	1	1	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Centre for Artificial Intelligence

LINEAR ALGEBRA

(24251105/ 31251105/ 27251105/ 28251105)

COURSE OBJECTIVES

- To understand the concept Matrices and its applications
- To understand the various aspect of algebraic structures
- To explore vector space
- To perceive knowledge of linear transformation and their application

Unit I

Matrix, Rank of Matrix, Echelon form, Normal form of matrix, Solution of simultaneous equation by elementary transformation, Consistency of equation, Eigenvalues and Eigenvectors, Normalized eigenvector, Cayley Hamilton theorem and its application to finding inverse of matrix.

Unit II

Introduction of Groups and its properties, Sub-groups, Coset, Lagrange's theorem for finite groups, Ring and its properties, Field, Integral domain.

Unit III

Vector spaces over the field and its properties, sub-spaces, linear dependent vectors and linear independent vectors, linear combination of vectors, linear span of a set of vectors, basis and dimension of a vector space.

Unit IV

Linear transformation, Kernel and range space of linear transformation, Nullity and Rank, Singular and Non-Singular transformation, Matrix representation of a linear transformation.

Unit V

Inner product spaces, Properties of inner product space, Schwarz's inequality, Triangular inequality, Parallelogram Law, Orthogonality, Pythagoras theorem.

RECOMMENDED BOOKS

1. S. Lipschutz and M. Lipson, Linear Algebra (4th Edition), Schaum's Outline series, Mc-Graw Hill.(2009).
2. S. Boyd and L. Vandenberghe, Introduction to Applied Linear Algebra Vectors, Matrices, and Least Squares, University Printing House, Cambridge CB2 8BS, United Kingdom One Liberty Plaza, 20thFloor,New York, NY10006, USA, (2018).
3. E.Kreyszig: Advance Engineering Mathematics, JohnWiley&Sons,10thEdition(2011).
4. R. K. Jain, S. R. K. Iyengar: Advance Engineering Mathematics, Narosa Publishing House Pvt. Ltd, 5th Edition(2016).

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 determine the solution of Matrix
CO2 find the analytical solution of algebraic structures
CO3 express the vector space
CO4 acquire the knowledge of Linear transformation
CO5 illustrate the concept of Inner product spaces

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	2	1	1	1	1	2	1	1	3	2
CO2	2	3	2	2	1	1	1	1	1	1	1	1	3	2
CO3	3	2	3	2	2	1	1	1	1	2	1	1	3	2
CO4	3	3	3	3	3	2	1	1	1	2	2	2	3	2
CO5	3	2	2	2	2	2	1	1	1	2	1	1	3	2

Centre for Artificial Intelligence

UNIVERSAL HUMAN VALUES & PROFESSIONAL ETHICS (UHVPE)
(24251111/ 31251111/ 27251111/ 28251111)

COURSE OBJECTIVES

- Sensitization of students towards self, family (relationship), society and nature.
- Understanding (or developing clarity) of nature, society and larger systems, on the basis of human relationships and resolved individuals.
- Strengthening of self-reflection.
- Development of commitment and courage to act.

Unit I

Introduction: Need, Basic Guidelines, Content and Process for Value Education: Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.

Unit II

Understanding Harmony in the Human Being: Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of 'I' with the Body.

Unit III

Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship: Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships), and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship, Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship, Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals, Visualizing a universal harmonious order in society.

Unit IV

Understanding Harmony in the Nature and Existence - existence as Coexistence: Understanding the harmony in the Nature, Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature, Understanding Existence as Coexistence of mutually interacting units in all pervasive space, Holistic perception of harmony at all levels of existence.

Unit V

Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human

values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, Competence in professional ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, Ability to identify and develop appropriate technologies and management patterns for above production systems. Strategy for transition from the present state to Universal Human Order: At the level of individual: as socially and ecologically responsible engineers, technologists and managers, At the level of society: as mutually enriching institutions and organizations.

Unit VI

Gender Sensitisation: Introduction to Sex, Gender & Culture, Introduction to Women Studies and Socialisation, including man-woman relationship, work distribution, A brief review of Feminism, Patriarchy, Feminist Studies, Feminist Ideologies. Women and Law Constitutional Provisions and Fundamental rights related to Women.

RECOMMENDED BOOKS AND REFERENCES

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.
2. Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
4. The Story of Stuff (Book).
5. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
6. On Education - J Krishnamurthy
7. Siddhartha - Hermann Hesse
8. Old Path White Clouds - Thich Nhat Hanh
9. On Education - The Mother
10. Diaries of Anne Frank - Anne Frank
11. Life and Philosophy of Swami Vivekananda
12. Swami Vivekananda on Himself
13. Small is Beautiful - E. F Schumacher.
14. Slow is Beautiful - Cecile Andrews
15. Economy of Permanence - J C Kumarappa
16. Bharat Mein Angreji Raj - Pandit Sunderlal
17. Mahatma and the Rose
18. The Poet and the Charkha
19. Rediscovering India - by Dharampal
20. Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
21. Swaraj by Arvind Kejriwal
22. India Wins Freedom - Maulana Abdul Kalam Azad
23. Ramakrishna ki jeevani - Romain Rolland (English)
24. Vivekananda - Romain Rolland (English)
25. Gandhi - Romain Rolland (English)
26. Autobiography of a Yogi – by Paramhansa Yogananda

27. Gandhi and Question of Science – Sahasrabudhe

COURSE OUTCOMES

After completion of the course students will be able:

CO1 to become more aware of their surroundings, society, social problems and their sustainable solutions.

CO2 to become sensitive to their commitment towards what they believe in (humane values. Humane relationships and humane society).

CO3 to apply what they have learnt to their own self in different day-to-day settings in real life.

CO4 to sustain human relationships and human nature in mind.

CO5 to have better critical ability.

CO6 to negotiate living in harmony with self and others.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1						3	3	2				2		
CO2						2	2	3	2	2		2		
CO3	2	2				2	1	2	1	2		3		
CO4						2	3	3	1			2		
CO5	2	3	2	2				2		2		3		
CO6						2	2	3	2	2		3		

Centre for Artificial Intelligence

FOUNDATIONS OF ARTIFICIAL INTELLIGENCE AND ROBOTICS (24251102)

COURSE OBJECTIVES

- Introduce the fundamental concepts of Artificial Intelligence and Robotics.
- Develop an understanding of the ethical, societal, and safety considerations in the deployment of AI and robotic systems.

Unit I: Introduction to Artificial Intelligence

Fundamentals of Artificial Intelligence: Definitions, Introduction, key concepts, Evolution, Terminology, Approaches and Goals. Relation between Artificial Intelligence, Machine Learning and Deep Learning. Intelligent Agents: Structure, Types and interaction with the environment.

Unit II: Problem Solving

State space search; production systems, search space control, Uninformed and Informed Search: depth first search, breadth-first search. Heuristic Search: Best First Search, Hill Climbing. Game Playing: Minimax, alpha-beta pruning.

Unit III Basics of Robotics

Overview: Types of Robots, evolution, and Applications; Interplay between artificial intelligence and Robotics; Introduction to Robot Kinematics: Forward and Inverse Kinematics; Sensors in Robotics: Types (Proximity, Vision, LIDAR); Actuators: Motors and Controllers; Basics of Robot Control: Path Planning and Navigation; Introduction to Robot Operating System (ROS).

Unit IV Artificial intelligence for Robotics

Supervised and Unsupervised Learning; Introduction to Neural Networks; artificial intelligence Algorithms for Robotic Control: Reinforcement Learning, Path Planning Algorithms; Computer Vision in Robotics: Object Detection and Recognition; Sensor Fusion and Localization; Motion Planning for Autonomous Robots. Application of AI in Robotics.

Unit V Ethical, Societal, and Safety Considerations in AI and Robotics

Ethical Issues in AI and Robotics: Privacy, Bias, and Transparency; Societal Impacts: Job Displacement, Social Interactions; Safety and Reliability in Robotic Systems; Standards and Regulations for AI and Robotics.

Centre for Artificial Intelligence

RECOMMENDED BOOKS

1. Industrial Robotics-Technology Programming and Applications by M. P. Groover, M. Weiss, R. N. Nagel and N. G. Odrey of McGraw-Hill Book and Company.
2. Introduction to Robotics by S. K. Saha of Tata McGraw-Hill Publishing Company Ltd.
3. Springer Handbook of Robotics, Siciliano, B. & Khatib, O., 2nd Edition, 2016, Springer.
4. Learning Robotics: From Fundamental Concepts to Advanced Programming, Asada, M. & Fukuda, T., 1st Edition, 2019, CRC Press.
5. Fundamentals of Mechatronics by Musa Jouaneh of Cengage Learning.
6. Artificial Intelligence: A Modern Approach, S. Russell and P. Norvig, Prentice Hall, Third Edition, 2009.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 describe the fundamentals of artificial intelligence and robotics
CO2 compare different problem solving methods that are used in artificial intelligence.
CO3 interpret different mechanisms involved in a robotic system.
CO4 recognize the vision based path planning algorithms in robotics.
CO5 illustrate ethical standards and applications of artificial intelligence and robotics.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	1		2	2	1			1	1	1
CO2	3	3	3	3	1	1	2	1		2	1	1	2	1
CO3	3	3	3	3	1	1	1		1	2	1	3	1	1
CO4	3	3	3	3		1	1	2		1	3	2	1	1
CO5	3	3	3	3	2	2			1	2	3	2	2	2

Centre for Artificial Intelligence

ELECTRONIC SYSTEMS
(24251103)

COURSE OBJECTIVES

- Introduce students to the fundamental concepts of electric circuits .
- Enable students to comprehend the operation of the basics of electrical & electronic components.
- To understand the construction and working principle of magnetic circuits and motors

Unit I

Basic Laws: ohm's law, kirchhoff's voltage and current laws, nodes-branches and loops, series elements and voltage division, parallel elements and current division, understanding the breadboards and its connections. fundamentals of AC circuit components.

Unit II

Semiconductor introduction: insulators, semiconductors and metals, mobility and conductivity, intrinsic and extrinsic semiconductors, charge carriers, carrier generation and recombination, carrier transport: diffusion and drift of carriers, Introduction to mobility and resistivity.

Unit III

Diode and its applications: PN Junction Diode- characteristics and analysis; types of diodes- zener diode, photodiodes, light emitting diode, varactor diode, photodetector, rectifiers: half wave rectifier, full wave rectifier, bridge rectifier, clippers, clamping operation, basic regulator using zener diode.

Unit IV

Bipolar junction transistor and its biasing: bipolar junction transistors: construction and characteristics of BJT, transistor configuration: common Base, common emitter, common collector configuration, transistor as a switch. Integrated circuits (ICs). Introduction to BJT Amplifiers.

Unit V Introduction to microcontroller based electronic systems: arduino and raspberry pi, Jetson Nano, TinyML and Real-Time AI on Microcontrollers, Neuromorphic Computing Systems, Quantum Electronic Systems for AI, Photonic Neural Networks and Optical Computing.

RECOMMENDED BOOKS

1. Integrated Electronics by J. Millman and C.C. Halkias, McGraw Hill Education, India.
2. Electronics Devices and Circuit Theory by R. Boylestad and L. Nashelsky, Pearson India.
3. Electronics Devices and Circuits-II by U. A. Bakshi and A. P. Godse, Technical Publications.
4. Electronic principles by L. Malvino, Tata McGraw Hill Education.
5. Semiconductor Devices by K. Kano, Prentice Hall Publication.
6. Electronic Communication Systems by G. Kennedy, McGraw Hill Education, India.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 illustrate the fundamental behavior of circuit elements in DC circuits.
CO2 explain the working of semiconductor devices
CO3 analyze the functioning of electronic circuits.
CO4 explore the electrical machines and its principles.
CO5 integrate the electronic components and boards

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3		1	1	1	2	2		1	2	1
CO2	3	3	3	3	1				2	1	1		2	2
CO3	3	3	3	3		2	1	1	1		1	1	2	1
CO4	3	3	3	3	1			1	1	1	1		1	2
CO5	3	3	3	3	1	2	1	1	1		2		2	1

Centre for Artificial Intelligence

FOUNDATIONS OF DATA SCIENCE
(27251102)

COURSE OBJECTIVES

- To understand the importance of data pre-processing, exploratory data analysis and other related techniques used in data sciences.
- To perform statistical analysis and extract useful information from the data.

Unit I

Introduction to Data Science: Benefits, uses and facets of data, Data Science Process: overview, retrieving data, Data preparation, Exploratory Data analysis, Basic Statistical descriptions of Data.

Unit II

Describing Data: Types of Data, Numeric, Text, Images, structured data, unstructured data types of Variables, Describing Data with Tables and Graphs, Describing Data with Averages, Describing Variability, Normal Distributions and Standard (z) Scores.

Unit III

Sampling and Estimation: Introduction, Population Parameter & Sample Statistic, Sampling, Probabilistic Sampling, Non-Probability Sampling, Sampling Distribution, Central Limit Theorem, Sample Size Estimation for Mean of the Population, Estimation of Population, Parameters, Method of Moments, Estimation of Parameters Using Maximum Likelihood Estimation.

Unit IV

Data Engineering: Data pre-processing, Data cleaning, Data transformation, Data Integration, Feature Engineering, Feature Extraction, Feature Selection, Feature scaling, Data reduction, Data mining concepts.

Unit V

Data Science Tools, Ethics and Industry Use Cases: IDEs for data science; Introduction to Scikit Learn, numpy, matplotlib, pandas libraries; Data Privacy and Security, Ethical Principles in Data uses, Industry use cases such as Retail, Finance, Healthcare, Manufacturing, Telecommunication, Logistics and supply chain, Transportation, Entertainment and media, Agriculture etc.

RECOMMENDED BOOKS

1. Doing Data Science: Straight Talk from the Frontline, by Rachel Schutt and Cathy O'Neil, O'REILLY, ISBN:978-1-449-35865-5, 1st edition, 2013.
2. Data Science from Scratch: First Principles with Python by Joel Grus, O'Reilly Media ISBN: 978-1491901427, 1st Edition, 2015.
3. The Data Science Design Manual, Steven S. Skiena, ISBN: 978-3319554433, Springer 2017.
4. Introduction to Statistical Learning by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani, Springer, ISBN: 978-1461471370, 2013
5. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking" by Foster Provost and Tom Fawcett, O'Reilly Media ISBN-13: 978-1449361327, 2018

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 define the basic operations and applications related to various kinds of data.

CO2 describe various types of data and identify appropriate describing methodology for each.

CO3 implement mathematical sampling and estimation techniques on data for information extraction.

CO4 analyze feature engineering concepts for different applications.

CO5 illustrate data science tools, techniques and ethical aspects.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	1	1		1				3	1	3	3	2
CO2	3	3	3	2		2	1		2	2	2	3	2	3
CO3	3	3	2	3	3	1				1	2	3	2	3
CO4	3	1	1	1		1	2			1	1	3	2	2
CO5	3	3	3	3	3	2		3	2	3	2	3	3	3

Centre for Artificial Intelligence

FOUNDATIONS OF MACHINE LEARNING
(28251102)

COURSE OBJECTIVES

- To provide the fundamental knowledge of Artificial Intelligence and Machine Learning.
- To understand the basic working of techniques used in machine learning.
- To investigate applications of machine learning techniques in the real world.

Unit I

Introduction to Artificial Intelligence, History of Artificial Intelligence, Artificial Intelligence Problem, Approaches, Goals, Purpose, Scope, Terminology, Industrialization and its Impact, Evolution of Industry, Relation between Artificial Intelligence, Machine Learning, Deep Learning.

Unit II

Conventional Programming Vs Machine Learning, Data/Information/Knowledge, Type of Data: Structure, Non-Structure, Semi Structure, Data Types: Categorical/Nominal/Ordinal, Categorical and Continuous Data, Skewness and Correlation, Data Types Conversion, Model, Algorithm, Model Development Life Cycle, Learning, Training, Testing, Validation, Importance of Data.

Unit III

Introduction to Machine Learning: Basic Concepts of Machine Learning, Types of Learning: Supervised, Unsupervised and Reinforcement Learning, Design and Analysis of Machine Learning Experiments: Guidelines for machine learning experiments, Factors, Response, and Strategy of experimentation, Regression Vs Classification.

Unit IV

Supervised Learning: Linear and Logistic Regression, Linear models for classification, Sigmoid, Logistic regressions with examples. Unsupervised Learning: Clustering, Common distance measures, Hierarchical algorithms, partitioning algorithms, k-means; Cross-Validation and Resampling methods, measuring classifier performance.

Unit V

Machine Learning in Real World: Speech Processing, Natural Language Processing, Planning, manufacturing industry, logistic industry, Retail industry. Defense, Cyber Security, Agriculture, E-commerce, Finance, Smart Devices.

RECOMMENDED BOOKS

1. Artificial Intelligence: A Modern Approach by Stuart J. Russell and Peter Norvig, Prentice Hall Fourth Edition May 2022.
2. Artificial Intelligence: Elaine Rich, Kevin Knight, 2010, Tata McGraw-Hill Education Pvt. Ltd.
3. Foundations_of_Machine_Learning: Mehryar Mohri, Afshin Rostamizadeh, and Ameet Talwalkar MIT Press, Second Edition, 2018.
4. Pattern Recognition and Machine Learning, Christopher M. Bishop
5. Introduction to Machine Learning using Python: Sarah Guido

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 define basic concepts of Artificial Intelligence.

CO2 identify different types of data and appropriate conversion methods for each.

CO3 explain the concepts of machine learning.

CO4 contrast between Supervised and Unsupervised Machine Learning approaches.

CO5 analyze the real world problems and applications of artificial intelligence and machine learning

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	1	1	3	3	1		1	3	1
CO2	3	3	1	3	1	1		3	3		1	1	3	2
CO3	3	3	3	3	3	3		3	3	1		2	3	2
CO4	3	3	3	3	3	2	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Centre for Artificial Intelligence

LANGUAGE LAB

(31251110/ 24251110/ 27251110/ 28251110)

COURSE OBJECTIVES

- The course intends to build the required communication skills of the students to communicate effectively in real-life situations like starting a talk and be comfortable using English language.
- It aims at teaching students to appreciate English language through the study of scientific, creative, and academic text.
- The course is designed to acquaint students with structure of English language used in literature, functional varieties, figurative language, and verbal concomitance.
- The students are expected to enrich their knowledge of language, culture, and ethics through this course.

Unit I

Communication: Approaches, Elements, Verbal and Nonverbal Communication; Barriers to Communication; Johari Communication Window.

Unit II

Listening: Factors Affecting Listening and Improving Listening.

Unit III

Speaking: Public Speaking & Delivering Presentation.

Unit IV

Reading: Reading Passages & Comprehension: Steps and Methods.

Unit V

Writing: Essentials of good writing; Drafting CV/biodata/Résumé.

Language Laboratory:

- The objective of the language lab is to expose students to a variety of listening and speaking drills. This would especially benefit students who are deficient in English and it also aims at confidence building for interviews and competitive examinations. The Lab is to cover the following syllabus.
    a. Communication lab exercises as specified in Lab Manual
    b. Listening skills (using Marc Hancock, CUP).
    c. Speaking skills
    d. Oral presentation.

RECOMMENDED BOOKS

1. Understanding Human Communication, By Ronald Alderman by OUP.
2. Communication Skills for Engineers, Pearson Education.
3. Practical English Grammar by Thomson Martinet, Oxford University Press.
4. A Handbook of Language Laboratory by P Sreekumar, Cambridge University Press.

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 speak clearly effectively and appropriately in a public forum to a variety of audiences and purposes.

CO2 prepare oral dialogues and arguments within the engineering profession effectively.

CO3 demonstrate knowledge and comprehension of major text and traditions in language as well as its social, cultural, and historical context.

CO4 read a variety of Text analytically to demonstrate in writing and/or speech the interpretation of texts.

CO5 interpret text written in english assessing the results in written and oral arguments using appropriate material for support.

CO-PO Mapping Matrix

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1						1	1	1	3	3	1	2	1	1
CO2	3	1				1	1	1	3	3	1	2	1	1
CO3			3			3	3	1	2	2		2	1	1
CO4						1	1	1	2	3	1	2	1	1
CO5						1	1	1	2	3	1	2	1	1

ANNEXURE-VI

Experiment list/ Lab manual for all the Laboratory Courses and Micro Project-I to be offered in B. Tech. I Semester [Artificial Intelligence (AI)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning] under the flexible curriculum

(Batch admitted in academic session 2025 – 26)

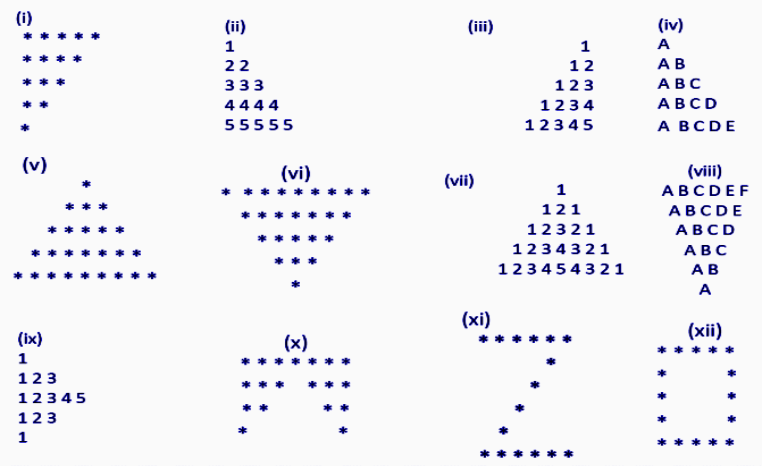
Centre for Artificial Intelligence

PROBLEM SOLVING AND PROGRAMMING LAB

(24251106/ 31251106/ 27251106/ 28251106)

List of Programs

1. Implementation of basic arithmetic operations on two numbers entered by the user and display the results.
2. Calculate and display the volume of a cylinder by taking height and radius as input from the user.
3. Realize the below mentioned expressions and display the values of dependent variables. The values of independent variables should be entered by the user:
    a. V = u + at
    b. S = ut+1/2at^2
    c. T=2*a+√b+9c
4. Create a program which takes name, roll no. and marks, obtained by a student in 5 subjects of 100 marks each, from the user and display the name, roll no. and percentage score secured.
5. Swap values of two variables with and without using the third variable.
6. Write a program to illustrate the use of unary prefix and postfix increment and decrement operators.
7. Find the largest of three numbers, entered by the user, using ternary operators.
8. Calculate the roots of quadratic equations, by taking the coefficients of the quadratic equation from the user as input.
9. Create a program which checks whether an integer entered by the user is prime or not.
10. Create a program which computes the SGPA of a student, in a semester, as per MITS norms.
11. Create a program which checks whether a year entered by the user is a leap year or not.
12. Calculate the sum of digits of an integer, entered by the user, using a for loop.
13. Create a separate program to display the following patterns using for loop:



14. Calculate factorial of a number using recursion.
15. Write a program which adds two matrices of the same order, entered by the user.
16. Perform addition and subtraction of two complex numbers, entered by the user; use structure data-type to represent the given complex numbers.
17. Write a program which copies the contents of one text file into another file, using various file handling operations available in C++.

Centre for Artificial Intelligence

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 apply basic programming concepts

CO2 illustrate the concepts of procedural programming

CO3 debug programs for error handling.

CO4 apply file handling concepts in programs for file manipulations.

CO5 design suitable programming solutions using procedural paradigms for real world problems.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	1	1	3	3	1		1	3	1
CO2	3	3	3	3	3	2		3	3	1		2	3	2
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	2	1	3	3	1	1	2	3	3
CO5	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Centre for Artificial Intelligence

INTERNET AND WEB TECHNOLOGIES LAB

(31251107/ 27251107/ 28251107)

List of Programs

1. Design a network with two PCs connected through a switch, assign appropriate IP addresses, and ensure successful communication.
2. Create a network topology that includes two subnets connected by a router. Assign IP addresses and verify connectivity between devices.
3. Construct a network with a server configured to provide FTP services. Assign IP addresses and allow PCs to upload and download files via FTP.
4. Design a network with an SMTP server to handle email communication. Assign IP addresses, configure email clients on PCs, and send test emails.
5. Create a network with a DNS server that resolves domain names for multiple devices. Ensure that PCs can access each other and external services using domain names instead of IP addresses.
6. Develop a network that integrates both SMTP and FTP services on a single server. Configure the PCs to access email services and file transfers.
7. Formulate a network topology where the DNS server resolves the domain name of an FTP server, allowing PCs to access it using the domain name instead of the IP address.
8. Design a simple HTML document with a proper structure, including DOCTYPE declaration, html, head, and body elements.
9. Apply text formatting tags to enhance the appearance of text in an HTML document.
10. Create a web page that includes both ordered and unordered lists, as well as a formatted table.
11. Design a form in HTML that includes different input types, such as text, email, password, radio buttons, checkboxes, and a submit button.
12. Integrate multimedia elements like audio, video, and images into an HTML document.
13. Design a responsive web page using CSS media queries to adapt the layout for different screen sizes.

NOTE: ***Networking experiment to be performed on CISCO Packet Tracer.***

COURSE OUTCOMES

After completion of the course, students will be able to:

CO1 design network topologies with IP addressing and device connectivity.

CO2 develop networks integrating SMTP and FTP services.

CO3 construct networks with FTP, SMTP, and DNS configurations.

CO4 create structured and responsive web pages using HTML and CSS.

CO5 formulate network solutions using DNS and FTP integration.

CO6 design suitable websites for appropriate catering of web users needs related to real-world problems.

Centre for Artificial Intelligence

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	1	1	3	3	1		1	3	1
CO2	3	3	3	3	1	1		3	2		1	1	3	2
CO3	3	3	3	3	3	2		3	3	1		2	3	2
CO4	3	3	2	3	3	3		3	3	3	3	3	2	3
CO5	3	3	3	3	3	2	1	3	3	1	1	2	3	3
CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Centre for Artificial Intelligence

ELECTRONIC SYSTEMS LAB
(24251107)

List of Experiments

1. Familiarization of electronic components and measure and types of resistor.
2. To determine energy, value stored in capacitor and familiar with inductor
3. To measure and confirm ohm's law and explain for resistance in series and parallel.
4. To determine the V-I characteristics of P-N junction diodes its static and dynamic resistance.
5. To analyze the characteristics of zener diodes and hence, calculate the dynamic resistance.
6. To study voltage regulator circuits using zener diodes.
7. To verify the waveform of a half wave rectifier.
8. To explain and verify the center tapped and bridge full wave rectifier.
9. To study and plot the input and output characteristics of common emitter
10. To analyze and plot the input and output characteristics of a common base .

COURSE OUTCOMES

After completion of the course students will be able to:

CO1 inspect electronics circuits.

CO2 test the working of different electronic circuits.

CO3 analyzes the BJT in various electronic circuits.

CO4 determine and analyze the V-I characteristics of a P-N junction diode.

CO5 analyze the characteristics of a zener diode

CO6 Verify and compare the waveforms of half wave and full wave rectifiers.

CO-PO Mapping Matrix														
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	3	1	1	3	3	1		1	3	1
CO2	3	3	1	3	1	1		3	3		1	1	3	2
CO3	3	3	3	3	3	3		3	3	1		2	3	2
CO4	3	3	3	3	3	2	3	3	3	3	3	3	3	3
CO5	3	3	3	3	3	2	1	3	3	1	1	2	3	3
CO6	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Centre for Artificial Intelligence

Micro Project-I

(24251109)

List of Projects

1. Build a two-player console-based Tic-Tac-Toe game where players take turns marking a 3x3 grid.
2. Develop an address book application to store and manage contacts' names, phone numbers, and addresses.
3. Create a program to manage student records, including information like name, ID, and grades. Users can add, update, and view student data.
4. Create a simple banking system that allows users to open accounts, deposit and withdraw money, and check their account balances.
5. Design a Library Management System using C++ to manage books, students, and borrowing records using structures and file I/O.
6. Design a Student Report Card Generator which Collects and stores marks, calculates grades, and generates reports using functions and structures.
7. Create an Inventory Management System which allows product listing, quantity update, and order tracking via a C++ console interface.
8. Design a C++ based Quiz Management System using procedural logic, menus, and score evaluation.
9. Design and analysis of a Zener Diode-based voltage regulator circuit.
10. Design and analyze transistors as a switch.
11. Verification of ohm’s law and analysis of resistive circuits: series and parallel configurations.
12. Designing a series circuit using breadboard and connecting wires.
13. Measure the various circuit components using Multimeter.
14. Designing a parallel circuit using a breadboard.
15. Perform the circuit analysis.
16. Design a Smart LED Intensity Controller that uses LDR and op-amp to automatically control brightness based on ambient light.
17. Design a Temperature-Based Fan Speed Control that uses LM35 temperature sensor with op-amp comparator and triac to vary fan speed.
18. Designing the resistor and led circuit using a breadboard.
19. Design a Sound-Activated LED Lights (Clap Switch) containing Audio sensor + flip-flop logic to toggle lighting.
20. Create a Traffic Light Controller with Sequential logic using timers and counters (or implemented on 8051/Arduino).

Centre for Artificial Intelligence
Micro Project-I
(31251109/ 27251109/ 28251109)

List of Projects

1. Build a two-player console-based Tic-Tac-Toe game where players take turns marking a 3x3 grid.
2. Develop an address book application to store and manage contacts' names, phone numbers, and addresses.
3. Create a program to manage student records, including information like name, ID, and grades. Users can add, update, and view student data.
4. Create a simple banking system that allows users to open accounts, deposit and withdraw money, and check their account balances.
5. Design a Library Management System using C++ to manage books, students, and borrowing records using structures and file I/O.
6. Design a Student Report Card Generator which Collects and stores marks, calculates grades, and generates reports using functions and structures.
7. Create an Inventory Management System which allows product listing, quantity update, and order tracking via a C++ console interface.
8. Design a C++ based Quiz Management System using procedural logic, menus, and score evaluation.
9. A multi-page Static University Website for showcasing a fictional college with events, contact, and gallery pages.
10. Create an Online Photo Gallery using HTML-based image grid with clickable previews and captions.
11. Design an educational website using HTML5 and CSS that includes interactive multimedia elements such as video and audio clips. The website should be responsive and designed to provide an engaging user experience.
12. Design a personal profile page with basic information, a profile picture, and social media links.
13. Create an Online Resume Builder using HTML/CSS frontend that takes user input and dynamically generates a resume layout.
14. Design a web portal for employee management.
15. Create a platform combining a responsive web interface with FTP for file management, SMTP for email notifications, and DNS for domain resolution.
16. Implement a network that includes multiple subnets connected by routers, with integrated SMTP, FTP, and DNS services. Ensure that the network supports seamless communication, file transfers, and domain name resolution across all devices.
17. Create a Student Management with Web Reporting using C++ backend to store student data, generate HTML report cards for browser viewing.
18. Design a Local File Search Engine with Web UI where C++ program scans local files, and results are displayed using an HTML-based interface.
19. Create an online voting system in which C++ handles voting logic and data; HTML used to present results and login options.
20. Design an E-commerce Simulation System in which C++ backend manages product info, stock, and orders; HTML used for user-facing catalog and invoice reports.

ANNEXURE-VII

Review of CO Attainments, Identified Gaps and Suggested Corrective Measures for the Improvement in CO Attainment Levels for the Courses Taught in B. Tech. I Semester [Artificial Intelligence (AI)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning]

(July-December 2024 Session)

Centre for Artificial Intelligence

CO attainment with Gap Analysis and action taken (AI, AIR, AIDS and AIML) for July-Dec. 2024

					Direct Attainment					Indirect Attainment				
Faculty Name	**Branch & Semester**	**Cource name & Code**		**Course Outcome Statements**	**Minor 1 Evaluation**	**Minor 2 Evaluation**	**Quiz/ Assignment [For Lab courses use rubrics of daily evaluation]**	**Major Evaluation**	**Direct CO attainment**	**Indirect CO Attainment**	**Overall CO attainment**	**Target (To be set for Overall CO Attainment)**	**Attained/not attained**	**Action taken for Not Attained**
Dr. Tej Singh	**AI - 1st**	**Digital Logic Design (31241101)**	**CO1**	explain different number systems and boolean algebra principles	2.96		2.98	2.86	**2.93**	2.65	**2.87**	2	Attained	-
			CO2	evaluate various boolean expressions	2.96		2.96	2.96	**2.96**	2.59	**2.89**	2	Attained	-
			CO3	design combinational circuits like adders, subtractors, encoders, and decoders		2.97	2.97	2.99	**2.98**	2.53	**2.89**	2	Attained	-
			CO4	analyze the operation of sequential circuits including latches, flip-flops, and counters		2.96	2.97	2.98	**2.97**	2.35	**2.85**	2	Attained	-
			CO5	interpret the functionality of memory devices and programmable logic devices			2.97	2.98	**2.98**	2.53	**2.89**	2	Attained	Lab experiment should be conducted for better understanding
Dr. Neelam Arya	**AI - 1st**	**Foundations of Artificial Intelligence (31241102)**	**CO1**	demonstrate fundamental concepts of Artificial Intelligence.	2.4		3	1	**2.13**	2.13	**2.13**	2.2	Not Attained	-
			CO2	evaluate the performance of heuristic and game tree search algorithms for optimized decision-making.	2.8		3	1.33	**2.38**	1.99	**2.3**	2.2	Attained	-
			CO3	examine heuristic-based solutions for constraint satisfaction problems and demonstrate their real-world application.		2.9	3	1	**2.3**	2.02	**2.24**	2.2	Attained	-
			CO4	construct logical models using propositional and first-order logic to infer knowledge from given facts.		2.9	3	1	**2.3**	2.03	**2.25**	2.2	Attained	-
			CO5	describe the various learning techniques of Artificial Intelligence and its application.		2.3	3	2.78	**2.69**	2.06	**2.56**	2.2	Attained	-
Dr. Sanjeev Kr. Dwivedi and Dr. Sunil Kr. Shukla	**AI - 1st**	**Problem Solving and Programming Lab (31241106)**	**CO1**	apply basic programming concepts	2.1	2.40	2.80	2.67	**2.49**	2.45	**2.48**	2	Attained	-
			CO2	illustrate the concepts of procedural programming	2.3	2.50	2.70	2.33	**2.46**	2.82	**2.53**	2.2	Attained	-
			CO3	debug programs for error handling.	1.6	1.90	2.40	2..15	**2.1**	2.66	**2.21**	2.2	Attained	-
			CO4	apply file handling concepts in programs for file manipulations.		1.80	2.65	1.90	**2.12**	2.42	**2.18**	2	Attained	-
			CO5	design suitable programming solutions using procedural paradigms for real world problems.		2.20	2.25	2.40	**2.28**	2.35	**2.29**	2	Attained	-
Ms. Aditi Samadhiya /(Dr. Sanjeev Dwivedi)	**AI - 1st**	**Universal Human Values & Professional Ethics (31241111)**	**CO1**	to become more aware of their surroundings, society, social problems and their sustainable solutions.	3		3	3	**3**	2.32	**2.86**	2	Attained	-
			CO2	to become sensitive to their commitment towards what they believe in (humane values. Humane relationships and humane society).	3		2.56	2.79	**2.78**	2.25	**2.67**	2	Attained	-
			CO3	to apply what they have learnt to their own self in different day-to-day settings in real life.		3	2.8	2.28	**2.69**	2.29	**2.61**	2	Attained	-
			CO4	to sustain human relationships and human nature in mind.		3	3	3	**3**	2.27	**2.85**	2	Attained	-
			CO5	to have better critical ability.		2	3	3	**2.67**	2.17	**2.57**	2	Attained	-
			CO6	to negotiate living in harmony with self and others.			3	3	**3**	2.21	**2.84**	2	Attained	-
Dr. Tej Singh	**AIR - 1st**	**Digital Logic Design (24241101)**	**CO1**	explain different number systems and boolean algebra principles	2.98		2.96	2.96	**2.97**	2.28	**2.83**	2	Attained	-
			CO2	evaluate various boolean expressions	2.97		2.96	2.88	**2.94**	2.15	**2.78**	2	Attained	-
			CO3	design combinational circuits like adders, subtractors, encoders, and decoders		2.98	2.98	2.97	**2.98**	2.11	**2.81**	2	Attained	-
			CO4	analyze the operation of sequential circuits including latches, flip-flops, and counters		2.96	2.98	2.98	**2.97**	1.96	**2.77**	2	Attained	-

Centre for Artificial Intelligence

CO attainment with Gap Analysis and action taken (AI, AIR, AIDS and AIML) for July-Dec. 2024

					Direct Attainment					Indirect Attainment				
Faculty Name	**Branch & Semester**	**Cource name & Code**		**Course Outcome Statements**	**Minor 1 Evaluation**	**Minor 2 Evaluation**	**Quiz/ Assignment [For Lab courses use rubrics of daily evaluation]**	**Major Evaluation**	**Direct CO attainment**	**Indirect CO Attainment**	**Overall CO attainment**	**Target (To be set for Overall CO Attainment)**	**Attained/not attained**	**Action taken for Not Attained**
			CO5	interpret the functionality of memory devices and programmable logic devices			2.99	2.98	**2.99**	1.93	**2.78**	2	Attained	Lab experiment should be conducted for better understanding
Dr. Neeraj Mishra	**AIR - 1st**	**Foundations of Artificial Intelligence and Robotics (24241102)**	**CO1**	describe the fundamentals of artificial intelligence and robotics	3		3	3	**3**	2.32	**2.86**	2	Attained	-
			CO2	compare different problem solving methods that are used in artificial intelligence.	3		2.56	2.79	**2.78**	2.25	**2.67**	2	Attained	-
			CO3	interpret different mechanisms involved in a robotic system.		3	2.8	2.28	**2.69**	2.29	**2.61**	2	Attained	-
			CO4	identify the components for implementing a robotic system.		3	3	3	**3**	2.27	**2.85**	2	Attained	-
			CO5	recognize the vision based path planning algorithms in robotics.		2	3	3	**2.67**	2.17	**2.57**	2	Attained	-
Dr. Pawan Dubey	**AIR - 1st**	**Electronic Systems (24241103)**	**CO1**	illustrate the fundamental behavior of circuit elements in DC circuits.	2.50	2.01	3.00	3.00	**2.26**	2.24	**2.26**	2	Attained	Target level will be increased
			CO2	explain the working of semiconductor devices	2.70	1.97	3.00	3.00	**2.34**	2.38	**2.35**	2	Attained	More HOT questions assignment will be provided
			CO3	analyze the functioning of electronic circuits.	2.79	1.84	3.00	1.20	**1.94**	2.23	**2**	2	Attained	Target level will be increased
			CO4	explore the electrical machines and its principles	2.00	1.84	3.00	2.00	**1.95**	2.29	**2.02**	2	Attained	Target level will be increased
			CO5	integrate the electronic components and boards	2.00	1.87	3.00	2.00	**1.96**	2.29	**2.03**	2	Attained	Target level will be increased
Dr. Divya Chaturvedi	**AIR - 1st**	**Linear Algebra (24241105)**	**CO1**	I am able to determine the solution of matrix	3		3	3	**3**	2.33	**2.87**	2	Attained	-
			CO2	I am able to find the analytical solution of algebraic structures	3		3	3	**2.5**	2.2	**2.44**	2	Attained	-
			CO3	I am able to express the vector space		3	3	3	**2.5**	2.27	**2.45**	2	Attained	-
			CO4	I am able to acquire the knowledge of linear transformation		2.41	3	3	**2.3**	2.37	**2.31**	2	Attained	-
			CO5	I am able to illustrate the concept of inner product space			3	1	**2.7**	2.27	**2.61**	2	Attained	-
Dr. Hardev Singh Pal	**AI&DS - 1st**	**Digital Logic Design (27241101)**	**CO1**	explain different number systems and boolean algebra principles	2.22		3	2.11	**2.44**	2.25	**2.4**	2	Attained	-
			CO2	evaluate various boolean expressions	1.89		3	2.56	**2.48**	2.2	**2.42**	2	Attained	-
			CO3	design combinational circuits like adders, subtractors, encoders, and decoders		2.78	3	1.11	**2.3**	2.25	**2.29**	2	Attained	-
			CO4	analyze the operation of sequential circuits including latches, flip-flops, and counters		2.33	3	1	**2.11**	1.85	**2.06**	2	Attained	-
			CO5	interpret the functionality of memory devices and programmable logic devices			3	2.78	**2.89**	2.1	**2.73**	2	Attained	-
Dr. Abhishek Bhatt	**AI&DS - 1st**	**Foundations of Data Science (27241102)**	**CO1**	define the basic operations and applications related to various kinds of data.	1.98		3	2.11	**2.36**	2.25	**2.34**	2	Attained	-
			CO2	describe various types of data and identify appropriate describing methodology for each.	2.67		3	2.56	**2.74**	2.2	**2.63**	2	Attained	-
			CO3	implement mathematical sampling and estimation techniques on data for information extraction.		2.57	3	2.19	**2.59**	2.25	**2.52**	2	Attained	-
			CO4	analyze feature engineering concepts for different applications.		2.13	3	2.46	**2.53**	1.85	**2.39**	2	Attained	-

Centre for Artificial Intelligence

CO attainment with Gap Analysis and action taken (AI, AIR, AIDS and AIML) for July-Dec. 2024

					Direct Attainment					Indirect Attainment				
Faculty Name	**Branch & Semester**	**Cource name & Code**		**Course Outcome Statements**	**Minor 1 Evaluation**	**Minor 2 Evaluation**	**Quiz/ Assignment [For Lab courses use rubrics of daily evaluation]**	**Major Evaluation**	**Direct CO attainment**	**Indirect CO Attainment**	**Overall CO attainment**	**Target (To be set for Overall CO Attainment)**	**Attained/not attained**	**Action taken for Not Attained**
			CO5	illustrate data science tools and techniques.			3	2.78	**2.89**	2.1	**2.73**	2	Attained	-
Dr. Arun Kumar	**AI&DS - 1st**	**Internet and Web Technologies (27241103)**	**CO1**	describe the fundamental concepts of the internet and web technologies.	2.66		2.84	2.1	**2.53**	2.7	**2.56**	2.2	Attained	-
			CO2	explain the functioning of Internet protocols and the structure of IP addressing		2.32	2.72	1.97	**2.34**	2.8	**2.43**	2.2	Attained	-
			CO3	create web pages, incorporating multimedia elements and forms	2.31		2.23	3	**2.51**	2.6	**2.53**	2.2	Attained	-
			CO4	analyze the role and functionality of internetworking devices and their impact on network performance and security.		2.62	2.64	1.19	**2.15**	2.64	**2.25**	2	Attained	-
			CO5	evaluate different web application frameworks and cloud computing services.			2.1	2.06	**2.08**	2.56	**2.18**	2	Attained	-
Dr. Mir Shahnawaz Ahmad	**AI&DS - 1st**	**Problem Solving and Programming (27241104)**	**CO1**	describe the basic principles of procedural programming and develop algorithms and flowchart for a given problem.	2.76		2.88	2.1	**2.58**	2.7	**2.6**	2.2	Attained	-
			CO2	design solutions to computational problems using control statements.	2.32		2.75	1.97	**2.35**	2.5	**2.38**	2	Attained	-
			CO3	create modular programs using arrays, strings, pointers, and functions.		2.32	1.58	3	**2.3**	2.2	**2.28**	2	Attained	-
			CO4	apply structures, unions, dynamic memory allocation, and file handling concepts to build efficient data-driven programs.		2.03	1.71	1.19	**1.64**	2	**1.71**	1.5	Attained	-
			CO5	develop interactive and high-performance applications.			3	3	**3**	2.4	**2.88**	1.5	Attained	-
Dr. Atul Kumar Ray	**AI&DS - 1st**	**Linear Algebra (27241105)**	**CO1**	Determine the solution of Matrix related problems	3		3	3	**3**	2.49	**2.9**	2	Attained	-
			CO2	Find the analytical solution of algebraic structures	3		3	3	**3**	2.22	**2.84**	2	Attained	-
			CO3	Express the linear combination of vectors		3	3	3	**3**	2.33	**2.87**	2	Attained	-
			CO4	Acquire the knowledge of Linear transformation to you		2.5	3	3	**2.83**	2.22	**2.71**	2	Attained	-
			CO5	Illustrate the concept of Inner product spaces			3	1.4	**2.2**	2.33	**2.23**	2	Attained	-
Dr. Mir Shahnawaz Ahmad	**AI&DS - 1st**	**Problem Solving and Programming Lab (27241106)**	**CO1**	apply basic programming concepts	2.3	2.6	2.8	2.46	**2.54**	2.92	**2.62**	2.2	Attained	-
			CO2	illustrate the concepts of procedural programming	2.4	2.2	2.9	2.53	**2.51**	2.66	**2.54**	2.2	Attained	-
			CO3	debug programs for error handling.	1.9	1.8	2.4	2.01	**2.03**	2.12	**2.05**	2	Attained	-
			CO4	apply file handling concepts in programs for file manipulations.		2.1	2.45	2.11	**2.22**	2.1	**2.2**	2	Attained	-
			CO5	design suitable programming solutions using procedural paradigms for real world problems.		2.4	2.38	2.26	**2.35**	2.4	**2.36**	2	Attained	-
Dr. Arun Kumar and Mrs. Geetika Hazra	**AI&DS - 1st**	**Internet and Web Technologies Lab (27241107)**	**CO1**	create structured and responsive web pages using HTML and CSS	2.4	2.6	2.5	2.48	**2.5**	2.9	**2.58**	2.2	Attained	-
			CO2	develop networks integrating SMTP and FTP services	1.8		2.4	2.21	**2.14**	2.3	**2.17**	2	Attained	-
			CO3	design suitable websites for appropriate catering of web users needs related to real-world problems.		2.3	2.48	2.34	**2.37**	2.6	**2.42**	2.2	Attained	-
Dr. Arun Kumar	**AI&DS - 1st**	**Micro Project-I (27241109)**	**CO1**	Apply fundamental programming and web development skills to design and implement functional prototypes for real-world problems.	2.6		2.67	2.53	**2.6**	2.8	**2.64**	2	Attained	-

Centre for Artificial Intelligence

CO attainment with Gap Analysis and action taken (AI, AIR, AIDS and AIML) for July-Dec. 2024

					Direct Attainment					Indirect Attainment				
Faculty Name	**Branch & Semester**	**Cource name & Code**		**Course Outcome Statements**	**Minor 1 Evaluation**	**Minor 2 Evaluation**	**Quiz/ Assignment [For Lab courses use rubrics of daily evaluation]**	**Major Evaluation**	**Direct CO attainment**	**Indirect CO Attainment**	**Overall CO attainment**	**Target (To be set for Overall CO Attainment)**	**Attained/not attained**	**Action taken for Not Attained**
			CO2	Analyze user requirements and system specifications to develop modular and maintainable software and web-based applications.	2.2		2.28	2.36	**2.28**	2.6	**2.34**	2	Attained	-
			CO3	Design and integrate multiple network and system services (FTP, SMTP, DNS) in a simulated environment to support secure and efficient communication.		2.16	2.01	1.9	**2.02**	2.14	**2.04**	2	Attained	-
Dr. Abhishek Bhatt	**AI&ML - 1st**	**Digital Logic Design (28241101)**	**CO1**	explain different number systems and boolean algebra principles	3.00		3	2.11	**2.70**	2.65	**2.69**	2	Attained	-
			CO2	evaluate various boolean expressions	3.00		3	2.56	**2.85**	2.59	**2.8**	2	Attained	-
			CO3	design combinational circuits like adders, subtractors, encoders, and decoders		3.00	3	2.27	**2.76**	2.53	**2.71**	2	Attained	-
			CO4	analyze the operation of sequential circuits including latches, flip-flops, and counters		2.96	3	2.36	**2.77**	2.35	**2.69**	2	Attained	-
			CO5	interpret the functionality of memory devices and programmable logic devices			3	2.87	**2.94**	2.53	**2.86**	2	Attained	-
Dr. Bhagat S. Raghuwanshi	**AI&ML - 1st**	**Foundations of Machine Learning (28241102)**	**CO1**	define basic concepts of Artificial Intelligence.	3.00		3.00	2.61	**2.87**	2.65	**2.83**	2	Attained	-
			CO2	identify different types of data and appropriate conversion methods for each.	3.00		3.00	2.50	**2.83**	2.59	**2.78**	2	Attained	-
			CO3	contrast between Supervised and Unsupervised Machine Learning approaches.		3.00	3.00	2.23	**2.74**	2.53	**2.7**	2	Attained	-
			CO4	explain the preprocessing methods used in machine learning.		2.96	3.00	2.11	**2.69**	2.35	**2.62**	2	Attained	-
			CO5	explore the latest trends in artificial intelligence.			3.00	2.50	**2.65**	2.53	**2.63**	2	Attained	Industry experts sessions needed to be conducted for better understanding
Dr. Arun Kumar	**AI&ML - 1st**	**Internet and Web Technologies (28241103)**	**CO1**	describe the fundamental concepts of the internet and web technologies.	2.66		2.84	2.1	**2.53**	2.7	**2.56**	2.2	Attained	-
			CO2	explain the functioning of Internet protocols and the structure of IP addressing		2.32	2.72	1.97	**2.34**	2.8	**2.43**	2.2	Attained	-
			CO3	create web pages, incorporating multimedia elements and forms	2.31		2.23	3	**2.51**	2.6	**2.53**	2.2	Attained	-
			CO4	analyze the role and functionality of internetworking devices and their impact on network performance and security.		2.62	2.64	1.19	**2.15**	2.64	**2.25**	2	Attained	-
			CO5	evaluate different web application frameworks and cloud computing services.			2.1	2.06	**2.08**	2.56	**2.18**	2	Attained	-
Dr. Shipra Shukla	**AI&ML - 1st**	**Problem Solving and Programming (28241104)**	**CO1**	describe the basic principles of procedural programming and develop algorithms and flowchart for a given problem.	3		3	2.58	**2.86**	2.48	**2.78**	2.2	Attained	-
			CO2	design solutions to computational problems using control statements.	2.9	2.75	2.9	3	**2.89**	2.48	**2.81**	2.2	Attained	-
			CO3	create modular programs using arrays, strings, pointers, and functions.			3	3	**3**	2.48	**2.9**	2.5	Attained	-
			CO4	apply structures, unions, dynamic memory allocation, and file handling concepts to build efficient data-driven programs.		2.2	3	2.05	**2.42**	2.4	**2.42**	2	Attained	-
			CO5	develop interactive and high-performance applications.		2.75	2.75	2.9	**2.8**	2.36	**2.71**	2	Attained	-

Centre for Artificial Intelligence

CO attainment with Gap Analysis and action taken (AI, AIR, AIDS and AIML) for July-Dec. 2024

					Direct Attainment					Indirect Attainment				
Faculty Name	**Branch & Semester**	**Cource name & Code**		**Course Outcome Statements**	**Minor 1 Evaluation**	**Minor 2 Evaluation**	**Quiz/ Assignment [For Lab courses use rubrics of daily evaluation]**	**Major Evaluation**	**Direct CO attainment**	**Indirect CO Attainment**	**Overall CO attainment**	**Target (To be set for Overall CO Attainment)**	**Attained/not attained**	**Action taken for Not Attained**
Dr. Atul Kr. Ray	**AI&ML - 1st**	**Linear Algebra (28241105)**	**CO1**	Determine the solution of Matrix related problems	3		3	3	**3**	2.42	**2.88**	2	Attained	-
			CO2	Find the analytical solution of algebraic structures	3		3	3	**3**	2.28	**2.86**	2	Attained	-
			CO3	Express the linear combination of vectors		3	3	3	**3**	2.35	**2.87**	2	Attained	-
			CO4	Acquire the knowledge of Linear transformation to you		2.6	3	3	**2.87**	2.35	**2.77**	2	Attained	-
			CO5	Illustrate the concept of Inner product spaces			3	1.5	**2.25**	2.19	**2.24**	2	Attained	-
Dr. Arun Kumar and Dr. Hardev Singh Pal	**AI&ML - 1st**	**Internet and Web Technologies Lab (28241107)**	**CO1**	create structured and responsive web pages using HTML and CSS	2.4	2.6	2.5	2.48	**2.5**	2.9	**2.58**	2.2	Attained	-
			CO2	develop networks integrating SMTP and FTP services	1.8		2.4	2.21	**2.14**	2.3	**2.17**	2	Attained	-
			CO3	design suitable websites for appropriate catering of web users needs related to real-world problems.		2.3	2.48	2.34	**2.37**	2.6	**2.42**	2.2	Attained	-
Dr. Arun Kumar and Mr. Khemchand Shakywar	**AI&ML - 1st**	**Micro Project-I (28241109)**	**CO1**	Apply fundamental programming and web development skills to design and implement functional prototypes for real-world problems.	2.6		2.67	2.53	**2.6**	2.8	**2.64**	2	Attained	-
			CO2	Analyze user requirements and system specifications to develop modular and maintainable software and web-based applications.	2.2		2.28	2.36	**2.28**	2.6	**2.34**	2	Attained	-
			CO3	Design and integrate multiple network and system services (FTP, SMTP, DNS) in a simulated environment to support secure and efficient communication.		2.16	2.01	1.9	**2.02**	2.14	**2.04**	2	Attained	-
Ms. Aditi Samadhiya/ (Dr. Sanjeev Dwivedi)	**AI&ML - 1st**	**Universal Human Values & Professional Ethics (28241111)**	**CO1**	to become more aware of their surroundings, society, social problems and their sustainable solutions.	3		3	3	**3**	2.32	**2.86**	2	Attained	-
			CO2	to become sensitive to their commitment towards what they believe in (humane values. Humane relationships and humane society).	3		2.8	3	**2.93**	2.25	**2.79**	2	Attained	-
			CO3	to apply what they have learnt to their own self in different day-to-day settings in real life.		3	2.8	2.25	**2.68**	2.29	**2.6**	2	Attained	-
			CO4	to sustain human relationships and human nature in mind.		3	3	3	**3**	2.27	**2.85**	2	Attained	-
			CO5	to have better critical ability.		2	3	3	**2.67**	2.17	**2.57**	2	Attained	-
			CO6	to negotiate living in harmony with self and others.			3	3	**3**	2.21	**2.84**	2	Attained	-
				Attainment Levels	**Excellent (3)**	**Very Good (2)**	**Good (1)**							
					70%	**60%**	**50%%**							

Total CO Attainment = 80% of Direct CO Attainment + 20% of Indirect CO Attainment

ANNEXURE-VIII

Review of Curriculum Feedback from various Stakeholders, its Analysis and Impact Report for the Courses Taught in B. Tech. I Semester [Artificial Intelligence (AI)/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning]

(July-December 2024 Session)

Action Taken on Student Feedback of Course Curriculum: July-Dec 2024

Based on the feedback data received from total **210**students (First semester of AI, AIDS, AIML and AIR) for the academic session July-Dec 2024, following points have been analysed:

It has been observed that, majority of the students of AI, AIML, AIDS and AIR (First semester) are strongly agreed, some of the students are agreed and none of them have strongly disagreed with the syllabus/ content that they have studied.

Some students have suggested the following changes in the course curriculum:

I. There should be one course on Artificial Intelligence needs to be added so that it would be easier to meet current needs
II. There is a need to add vectors along with array and pointer in Problem Solving and Programming
III. Remove the file handling in Problem Solving and Programming
IV. Course content of Foundations of Data Science needs to be updated.

The above mentioned suggestions were analysed by respective course committees and the actions taken foreach is given in the below table.

COURSE CURRICULUM FEEDBACK (by Students on MOODLE)

Branch/ Semester	Subject Name	Student Feedback (Comments)		Response to student comments/ Analysis
AIDS I[st]Sem	**Foundations of Data Science (27241102)**	**Mention the course / contents which in your opinion is outdated & needs to be removed.**	some topics from units are Repitative and doesnt need to be this repitative again and again.	The suggestions have beenforwarded to thecoursecommittee forfurther action.
		Name course / contents which needs to be updated.	Data science processes has been mentioned In unit 1 and Unit 4 twice.	The suggestions have beenforwarded to thecoursecommittee forfurther action.
		Is any new course required to meet current needs?	aws and tablue,power bi,and how to use ai,and how to write prompt for ai	Already part of syllabus and will cover inupcoming semester
AIML I[st]Sem	**Problem Solving and Programming (28241104)**	Name course / contents which needs to be updated.	We have to add vectors along with array and pointer in it rather than file handling	Already part of syllabus and will cover inupcoming semester

(Responses to Student Feedback Comments)

Course-wise Analysis of Curriculum Feedback by Students for Artificial intelligence

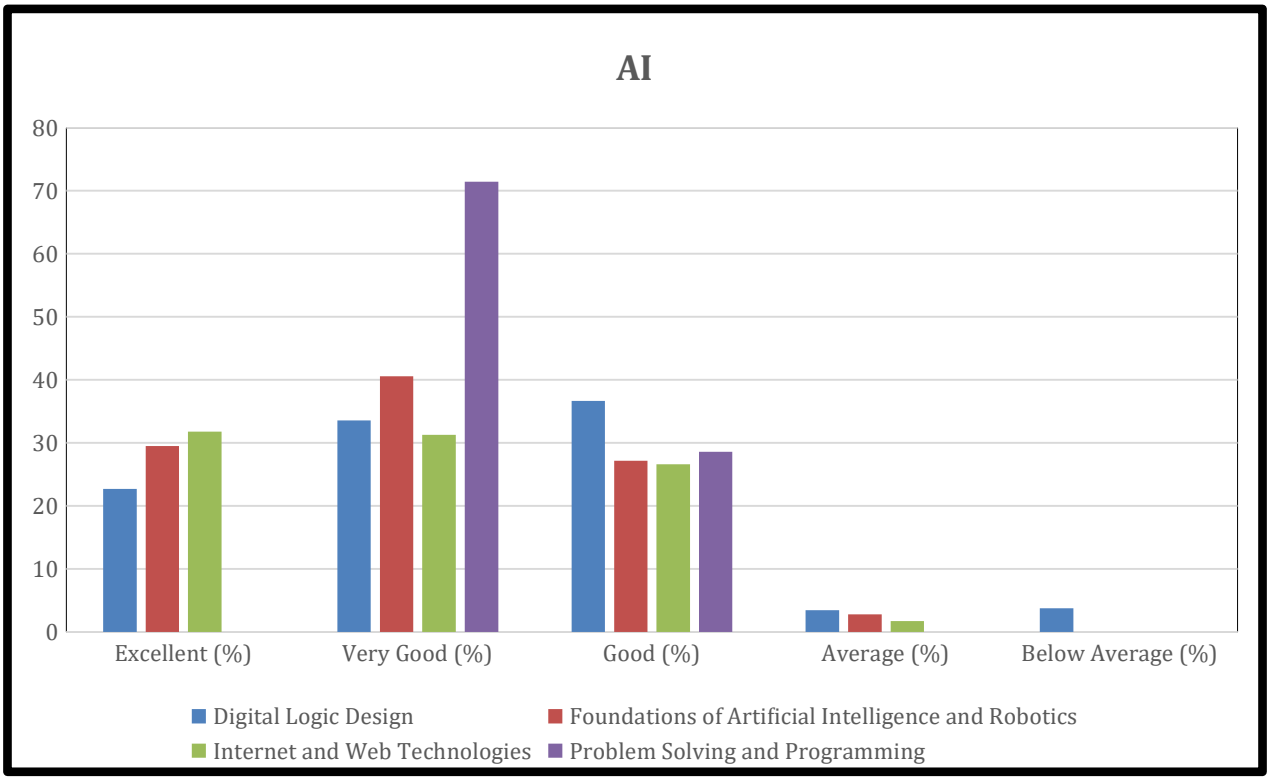
(Average value of responses (on a scale of 1 to 5) 5:Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)

Centre for Artificial Intelligence

AI Ist Semester							
Subject name/ code	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations .**
Digital Logic Design (31241101)	3.58	3.76	3.76	3.67	3.71	3.5	3.76
Foundations of Artificial Intelligence and Robotics (31241102)	3.96	3.96	4.0	3.96	4.06	3.90	3.90
Internet and Web Technologies (31241103)	4	4	4.09	4	4.05	3.98	4
Problem Solving and Programming (31241104)	3.5	3.75	3.75	3.75	3.75	3.75	3.75

Centre for Artificial Intelligence

AI Ist Semester								
Parameter(Average Grading)				Excellent (%)	Very Good (%)	Good (%)	Average (%)	Below Average (%)
Subject Code	Subject Name	Semester	Faculty Name					
31241101	**Digital Logic Design**	1	Dr. Tej Singh	22.67	33.54	36.65	3.42	3.73
31241102	Foundations of Artificial Intelligence and Robotics	1	Dr. Neelam Arya	29.49	40.55	27.19	2.76	0.00
31241103	Internet and Web Technologies	1	Dr. Shubha Mishra	31.77	31.28	26.60	1.72	0.00
31241104	Problem Solving and Programming	1	Dr. Rajni Ranjan Singh	0.00	71.43	28.57	0.00	0.00



Centre for Artificial Intelligence

Course-wise Analysis of Curriculum Feedback by Students for

Artificial intelligence and Data Science

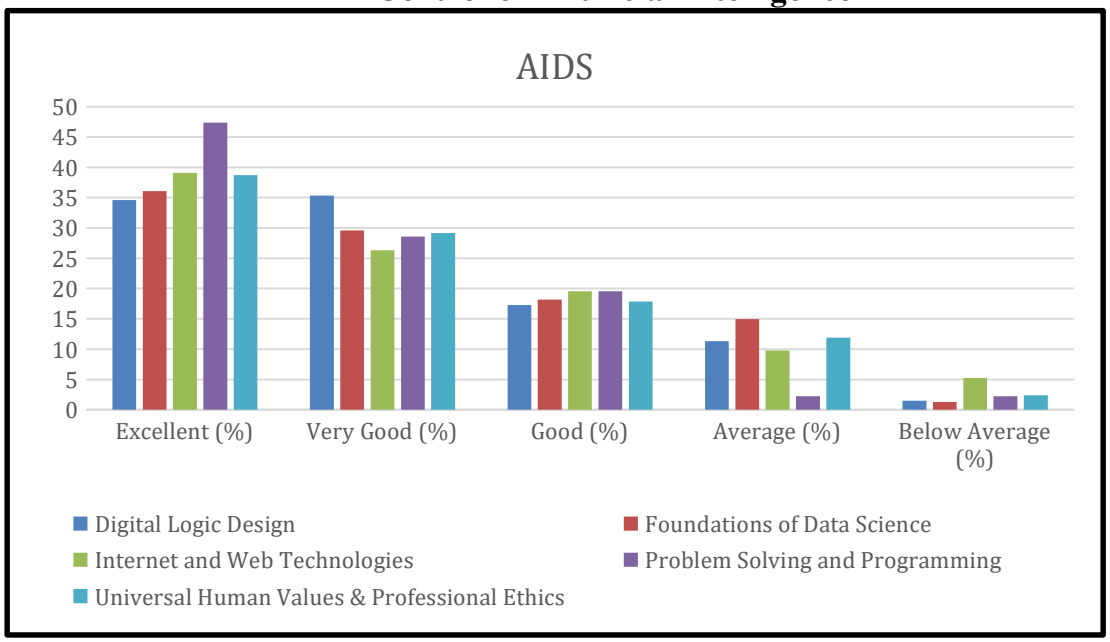
(Average value of responses (on a scale of 1 to 5) 5:Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)

AIDS Ist Semester							
Subject code/name(no. of student attempted feedback)	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations .**
Digital Logic Design (27241101)	3.94	3.84	4.05	3.94	3.84	3.68	4
Foundations of Data Science (27241102)	3.81	3.75	3.90	3.75	3.79	3.88	3.97
Internet and Web Technologies (27241103)	3.95	3.84	3.84	3.74	4.05	3.79	3.68
Problem Solving and Programming (27241104)	4.18	4.15	4.13	4.02	4.21	4.23	4.21
Universal Human Values & Professional Ethics (27241111)	4.08	4.08	4	3.83	3.87	3.70	3.70

Centre for Artificial Intelligence

AIDS I[st] Semester								
Parameter(Average Grading)				Excellent (%)	Very Good (%)	Good (%)	Average (%)	Below Average (%)
Subject Code	Subject Name	Semester	Faculty Name					
(27241101)	Digital Logic Design	I	Dr. Hardev Singh Pal	34.59	35.34	17.29	11.28	1.50
(27241102)	Foundations of Data Science	I	Dr. Abhishek Bhatt	36.04	29.55	18.18	14.94	1.30
(27241103)	Internet and Web Technologies	I	Dr. Arun Kumar	39.10	26.32	19.55	9.77	5.26
(27241104)	Problem Solving and Programming	I	Dr. Mir Shahnawaz Ahmad	47.37	28.57	19.55	2.26	2.26
(27241111)	Universal Human Values & Professional Ethics	I	Mrs. Geetika Hazra	38.69	29.16	17.85	11.90	2.38

Centre for Artificial Intelligence



Course-wise Analysis of Curriculum Feedback by Students for Artificial intelligence and Machine Learning

(Average value of responses (on a scale of 1 to 5) 5:Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)

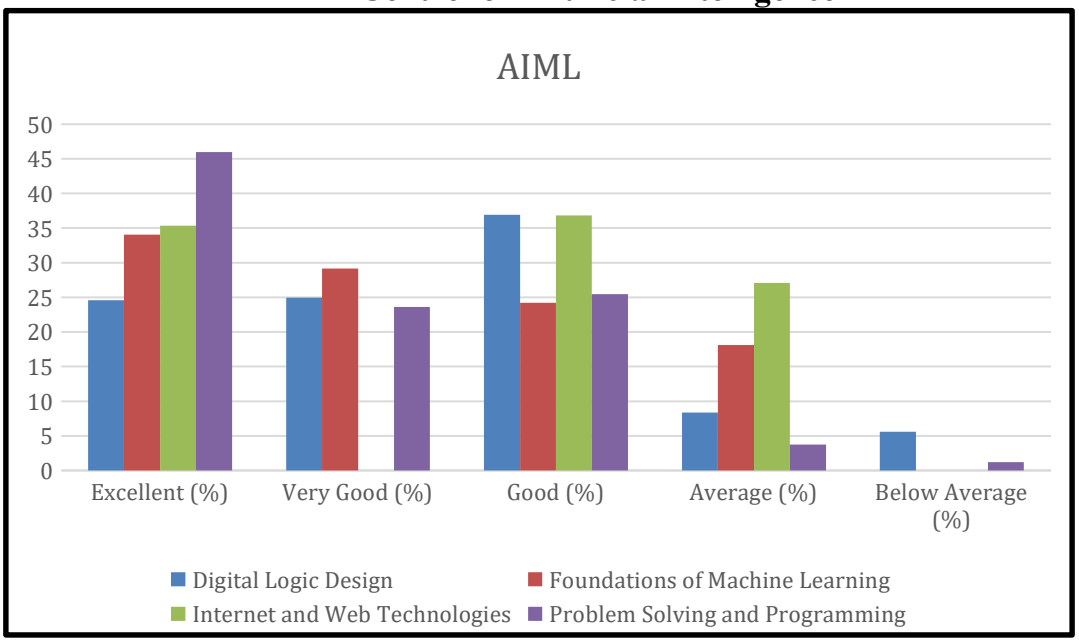
Centre for Artificial Intelligence

AIML I[st] Semester							
Subject code/name(no. of student attempted feedback)	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations.**
Digital Logic Design (28241101)	3.60	3.56	3.47	3.39	3.52	3.51	3.52
Foundations of Machine Learning (28241102)	3.84	3.81	4	3.81	3.88	3.73	3.76
Internet and Web Technologies (28241103)	3.47	3.37	3.58	3.37	3.53	3.32	3.44
Problem Solving and Programming (28241104)	4	4	4.26	3.95	4.17	4.08	4.17

Centre for Artificial Intelligence

AIML Ist Semester								
Parameter(Average Grading)				Excellent (%)	Very Good (%)	Good (%)	Average (%)	Below Average (%)
Subject Code	Subject Name	Semester	Faculty Name					
(28241101)	Digital Logic Design	I	Dr. Abhishek Bhatt	24.57	24.93	36.93	8.40	5.60
(28241102)	Foundations of Machine Learning	I	Dr. Bhagat S. Raghuwanshi	34.07	29.12	24.18	18.13	0.00
(28241103)	Internet and Web Technologies	I	Dr. Arun Kumar	35.34	0.00	36.84	27.07	0.00
(28241104)	Problem Solving and Programming	I	Dr. Shipra Shukla	45.96	23.60	25.47	3.73	1.24

Centre for Artificial Intelligence



Course-wise Analysis of Curriculum Feedback by Students for Artificial intelligence and Robotics

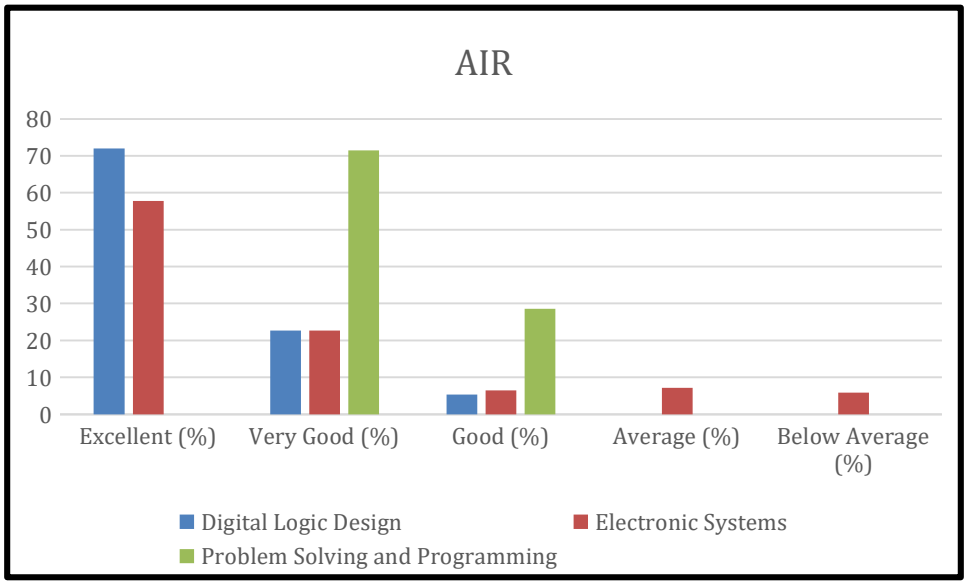
(Average value of responses (on a scale of 1 to 5) 5:Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)

Centre for Artificial Intelligence

AIR Ist Semester							
Subject code/name (no. of student attempted feedback)	**1 .The course is well designed**	**2. The units are balanced**	**3. The learning material was available to you**	**4. The content was clear and easy to understand**	**5.The course was relevant and updated for present needs**	**6.The course meets your career expectations**	**7. The course will be useful to meet your higher studies/future aspirations .**
Digital Logic Design (24241101)	4.75	4.62	4.75	4.62	4.66	4.58	4.66
Electronic Systems (24241103)	4.27	4.13	4.09	4.13	4.31	4.18	4.22
Problem Solving and Programming (24241104)	3.5	3.75	3.75	3.75	3.75	3.75	3.75

Centre for Artificial Intelligence

AIR I[st] Semester								
Parameter(Average Grading)				Excellent (%)	Very Good (%)	Good (%)	Average (%)	Below Average (%)
Subject Code	Subject Name	Semester	Faculty Name					
(24241101)	Digital Logic Design	I	Dr. Tej Singh	72.02	22.62	5.36	0.00	0.00
(24241103)	Electronic Systems	I	Dr. Pawan Dubey	57.79	22.73	6.49	7.14	5.84
(24241104)	Problem Solving and Programming	I	Dr. Rajni Ranjan Singh	0.00	71.43	28.57	0.00	0.00



Course Curriculum feedback by faculty (July-Dec.-2024)

Analysis and Action Taken on Faculty Feedback of Course Curriculum: July-Dec 2024

Based on the feedback data received from **10** faculty members (1st semester of AI, AIML, AIDS and AIR) for the academic session July-Dec 2024, following was analysed:

As per the suggestions/feedback responses of faculty members, it clearly shows that most of the faculty members are satisfied with the course content, curriculum/syllabus and other related parameters. The curriculum is capable of inculcating lifelong learning abilities in students. Syllabus is updated as per the recent trends and also with respect to industry demand.

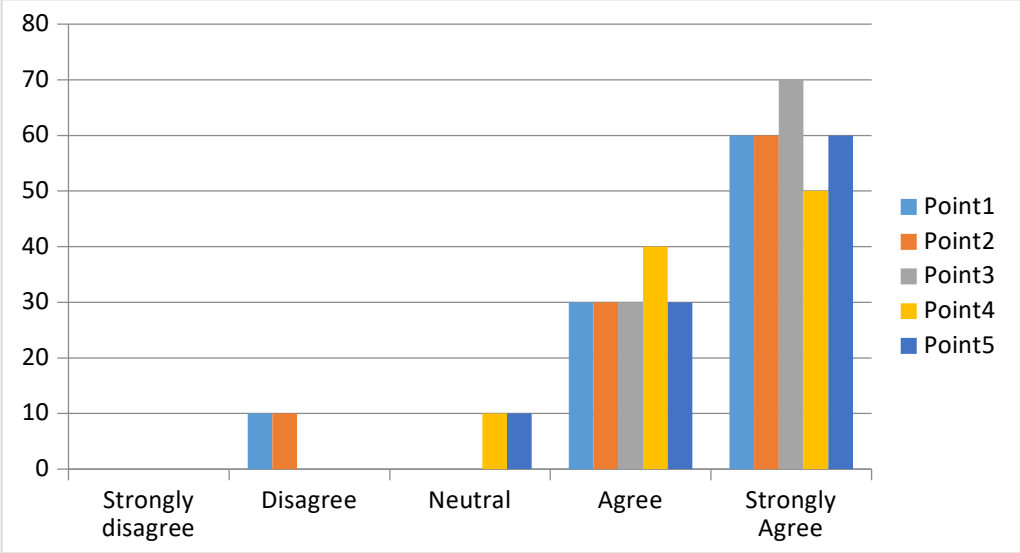
Analysis Report

S.No.	Faculty Name	Subject Name / Subject Code	1.The availability of books & E-learning material in the institute is good. (Please give your opinion)	2. The Courses and content are up to date. Please suggest if you feel any new course(s) need to be introduced to meet current needs & technological changes?	3. The course curriculum/syllabi are helpful in meeting the higher studies/ placement requirements according to present global trends. (Please give suggestions if any)	4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present. [If you feel some changes (new content to be added or outdated content to be removed) are needed, please suggest]	5. The curriculum is capable of inculcating life-long learning abilities in students. (Any suggestions, please give below)
1	Dr. Neeraj Mishra	Foundations of Artificial Intelligence and Robotics (24241102)	4	5	5	4	5
2	Dr. Hardev Singh Pal	Digital Logic Design (27241101)	5	4	5	4	5
3	Dr. Abhishek Bhatt	Foundations of Data Science (27241102)	5	5	5	5	5
4	Dr. Mir Shahnawaz Ahmad	Problem Solving and Programming (27241104)	5	5	5	5	5

5	Dr. Abhishek Bhatt	Digital Logic Design (28241101)	5	5	5	5	5
6	Dr. Bhagat Singh Raghuwanshi	Foundations of Machine Learning (28241102)	4	4	4	3	3
7	Dr Shipra Shukla	Problem Solving and Programming (28241104)	4	5	5	5	4
8	Dr. Neelam Arya	Foundations of Artificial Intelligence and Robotics (31241102)	2	4	4	4	4
9	Dr. Shubha Mishra	Internet and Web Technologies (31241103)	5	2	5	5	4
10	Arun Kumar	Internet and Web Technologies (31241103)	5	5	4	4	5
11	Dr. Neeraj Mishra	Foundations of Artificial Intelligence and Robotics (24241102)	4	5	5	4	5
Course Satisfaction Index (CSI) (on scale of 5) (5:Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)							

	Response in %

Curriculum Evaluation Point	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree
1.The availability of books & E- learning material in the institute is good. (Please give your opinion) *[Point-1]*	0	10	0	30	60
2. The Courses and content are up to date. Please suggest if you feel any new course(s) need to be introduced to meet current needs & technological changes *[Point-2]*	0	10	0	30	60
3. The course curriculum/syllabi are helpful in meeting the higher studies/placement requirements according to present global trends. (Please give suggestions if any) *[Point-3]*	0	0	0	30	70
4. The course / contents in your domain/area are well designed and frequently updated, hence need no changes at present.[If you feel some changes (new content to be added or outdated content to be removed) are needed, please suggest] *[Point-4]*	0	0	10	40	50
5. The curriculum is capable of inculcating life-long learning abilities in students. (Any suggestions, please give below) *[Point-5]*	0	0	10	30	60



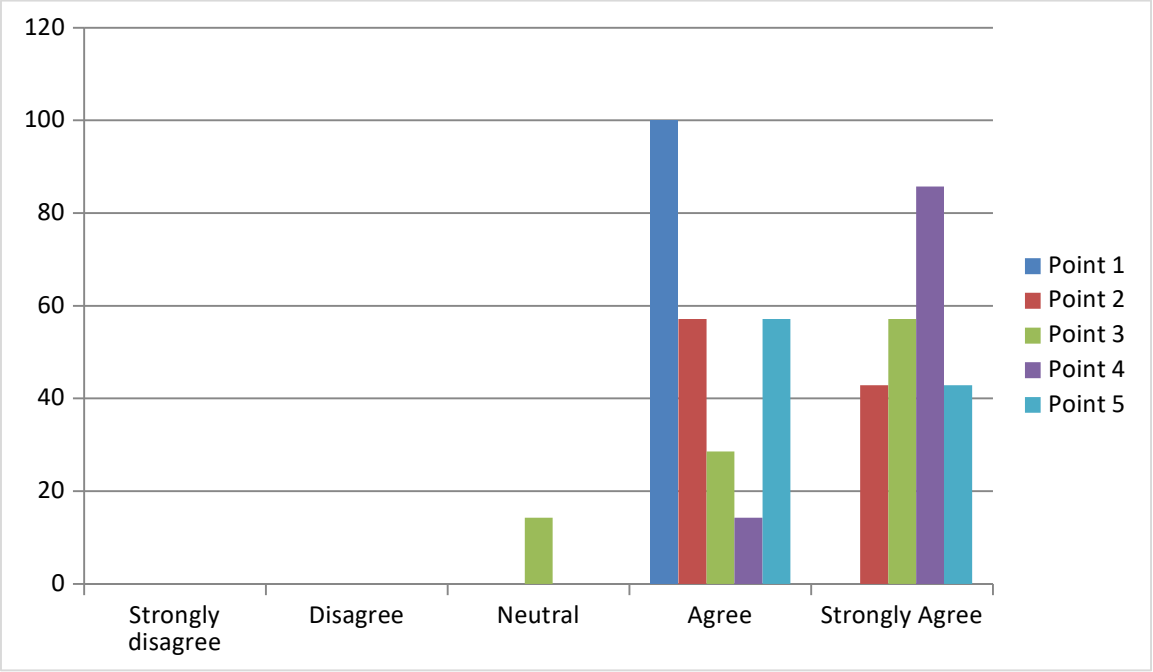
Course Curriculum feedback by Employer (July 2024-June-2025)

Action Taken:
As per the suggestions/feedback responses of employers, it clearly shows that most of the employers are satisfied with the course content, curriculum/syllabus and other related parameters. The curriculum is capable of inculcating technical knowledge, ability to explore new areas, ethical behaviour and social responsibility and team spirit. Syllabus is updated as per the recent trends and also with respect to industry demand.

Analysis Report

S.No.	1. Technical knowledge and contribution is at a good level	2. Ability to learn new areas, engage in professional development and adopt to technology changes	3. Deserves to be promoted/ has potential for elevation to higher level	4. Shows ethical behavior and social responsibility	Demonstrates ability to work well on a team
1	4	5	4	5	5
2	4	4	3	5	4
3	4	4	5	5	4
4	4	5	5	5	5
5	4	4	5	5	4
6	4	5	5	5	5
7	4	4	4	4	4
Employer Satisfaction Index (ESI) (on scale of 5) (5:Strongly Agree, 4:Agree, 3:Neutral, 2:Disagree, 1:Strongly disagree)					

	Response in %				
Employer Satisfaction Index	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**
1. Technical knowledge and contribution is at a good level *[Point-1]*	0	0	0	100	0
2. Ability to learn new areas, engage in professional development and adopt to technology changes *[Point-2]*	0	0	0	57.14	42.86
3. Deserves to be promoted/ has potential for elevation to higher level *[Point-3]*	0	0	14.29	28.57	57.14
4. Shows ethical behavior and social responsibility *[Point-4]*	0	0	0	14.29	85.71
5. Demonstrates ability to work well on a team *[Point-5]*	0	0	0	57.14	42.86

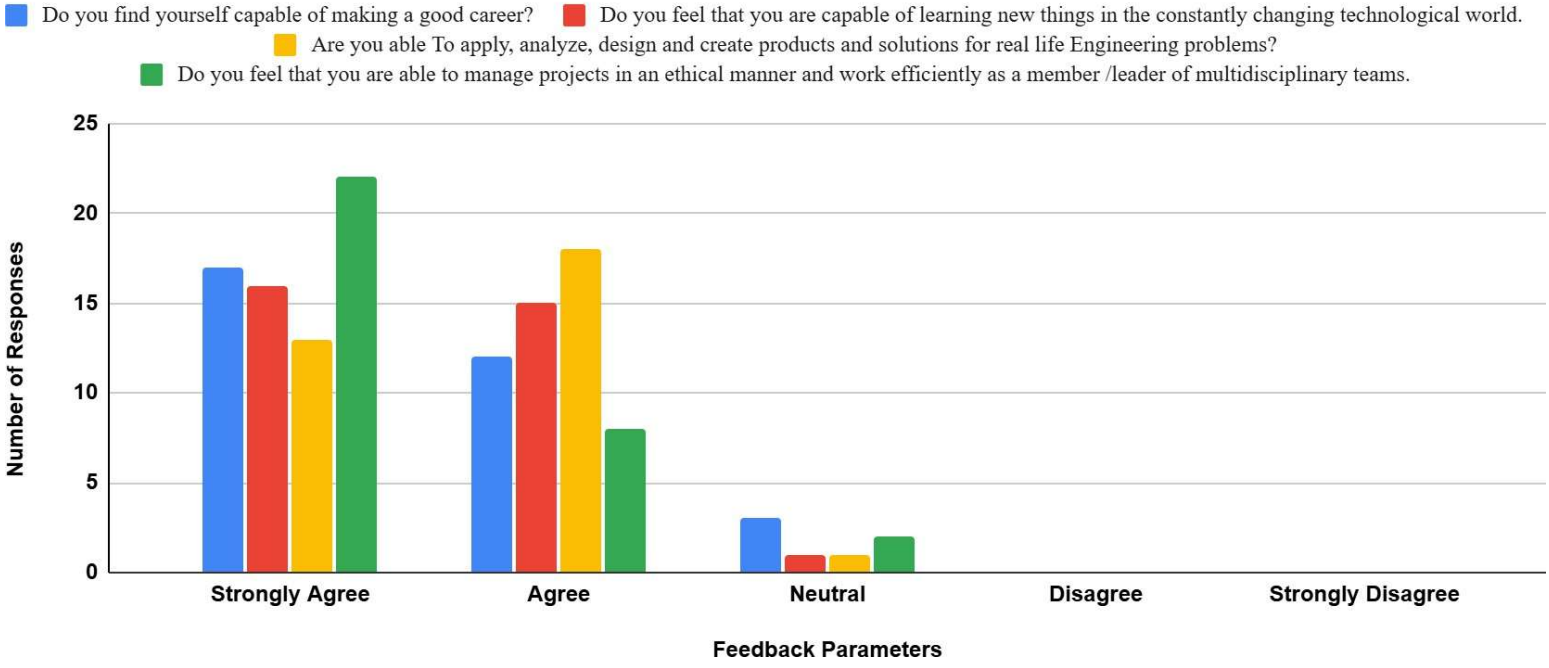


Employer Satisfaction Survey

Feedback on Course & Curriculum

S.N.	1. Your employee (our alumni) demonstrates good knowledge of recent industrial trends and developments in the field	2.The course being offered at MITS and the contents delivered here are up to date	3. Please suggest an area/name catering to your specific requirement
1	Yes	Yes	GenAI, LLMs
2	Yes	Yes	Need some improvement on programming basics
3	Yes	Yes	-
4	Yes	Yes	Automation
5	Yes	Yes	-
6	Yes	Yes	Hands on practical for Cloud Computing & Artificial Intelligence
7	Yes	Yes	-

Alumni Feedback (IT-AIR Batch 2020-21) [Sample Size: 32]



ANNEXURE-IX

Scheme Structure
of
B. Tech. (III Semester) in
Artificial Intelligence/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning
[under the MITS-DU]
(Batch admitted in academic session 2024 – 25)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Centre for Artificial Intelligence
Scheme of Evaluation
B. Tech. III Semester *(Artificial Intelligence (AI))*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	31242101	BSC	Probability and Random Processes	20	20	30	30	-	-	100	3	1	-	4	Face to Face	PP	2 Hrs
2.	31242102	DC	Design & Analysis of Algorithms	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	31242103	DC	Knowledge Representation and Reasoning	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	31242104	DC	Computer Networks	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	31242105	DC	Operating Systems	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	31242106	DLC	Problem Solving through Python Programming	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	31242107	DLC	Design & Analysis of Algorithms Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	31242108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	31242109	PBL	Macro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	31242110	SLP	Self-learning/Presentation[$$$] (SWAYAM/NPTEL/MOOC)	-	-	-	-	40	-	40	-	-	2	1	Mentoring	SO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**350**	**90**	**940**	**11**	**06**	**10**	**22**	-	-	-
12.	31242111	MAC	Cyber Security	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	31242112	MWS	Mandatory Workshop on Mastering Competitive Success at Department Level											GRADE	Interactive	MCQ	-
Skill Internship Program (Institute Level) (Qualifier): Minimum 30 hours duration: To be Credited in IV Semester																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]Macro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

[$$$]Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	1	0	4	0	0	0	2	1	1	1	1	0	1	1	1

Mode of Learning						Mode of Examination					Total Credits
Face to Face	Interactive	Blended	Mentoring	Experiential	Experimental	PP	AO	MCQ	OB	SO	
17	1	0	1	1	2	4	2	12	0	4	22
78	4	0	4	4	10	18	9	55	0	18	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Centre for Artificial Intelligence
Scheme of Evaluation
B. Tech. III Semester *(Information Technology (Artificial Intelligence and Robotics))*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	24242101	BSC	Probability and Random Processes	20	20	30	30	-	-	100	3	1	-	4	Face to Face	PP	2 Hrs
2.	24242102	DC	Design & Analysis of Algorithms	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	24242103	DC	Control System	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	24242104	DC	Computer Networks	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	24242105	DC	Operating Systems	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	24242106	DLC	Problem Solving through Python Programming	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	24242107	DLC	Design & Analysis of Algorithms Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	24242108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	24242109	PBL	Macro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	24242110	SLP	Self-learning/Presentation[$$$] (SWAYAM/NPTEL/MOOC)	-	-	-	-	40	-	40	-	-	2	1	Mentoring	SO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				100	100	150	150	350	90	940	11	06	10	22	-	-	-
12.	24242111	MAC	Cyber Security	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	24242112	MWS	Mandatory Workshop on Mastering Competitive Success at Department Level											GRADE	Interactive	MCQ	-
Skill Internship Program (Institute Level) (Qualifier): Minimum 30 hours duration: To be Credited in IV Semester																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]Macro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

[$$$]Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	1	0	4	0	0	0	2	1	1	1	1	0	1	1	1

Mode of Learning						Mode of Examination					Total Credits
Face to Face	Interactive	Blended	Mentoring	Experiential	Experimental	PP	AO	MCQ	OB	SO	
17	1	0	1	1	2	7	2	9	0	4	22
78	4	0	4	4	10	32	9	41	0	18	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Centre for Artificial Intelligence
Scheme of Evaluation
B. Tech. III Semester *(Artificial Intelligence (AI) and Data Science)*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	27242101	BSC	Probability and Random Processes	20	20	30	30	-	-	100	3	1	-	4	Face to Face	PP	2 Hrs
2.	27242102	DC	Design & Analysis of Algorithms	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	27242103	DC	Database Management System	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	27242104	DC	Computer Networks	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	27242105	DC	Operating Systems	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	27242106	DLC	Problem Solving through Python Programming	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	27242107	DLC	Design & Analysis of Algorithms Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	27242108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	27242109	PBL	Macro Project-I[#] [Database Management System Lab]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	27242110	SLP	Self-learning/Presentation[$$$] (SWAYAM/NPTEL/MOOC)	-	-	-	-	40	-	40	-	-	2	1	Mentoring	SO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				100	100	150	150	350	90	940	11	06	10	22	-	-	-
12.	27242111	MAC	Cyber Security	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	27242112	MWS	Mandatory Workshop on Mastering Competitive Success at Department Level											GRADE	Interactive	MCQ	-
Skill Internship Program (Institute Level) (Qualifier): Minimum 30 hours duration: To be Credited in IV Semester																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]Macro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

[$$$]Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	1	0	4	0	0	0	2	1	1	1	1	0	1	1	1

Mode of Learning						Mode of Examination					Total Credits
Face to Face	Interactive	Blended	Mentoring	Experiential	Experimental	PP	AO	MCQ	OB	SO	
17	1	0	1	1	2	4	2	12	0	4	22
78	4	0	4	4	10	18	9	55	0	18	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Centre for Artificial Intelligence
Scheme of Evaluation
B. Tech. III Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2024-25)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation		L	T	P				
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional									
1.	28242101	BSC	Probability and Random Processes	20	20	30	30	-	-	100	3	1	-	4	Face to Face	PP	2 Hrs
2.	28242102	DC	Design & Analysis of Algorithms	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
3.	28242103	DC	Database Management System	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	28242104	DC	Computer Networks	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	28242105	DC	Operating Systems	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
6.	28242106	DLC	Problem Solving through Python Programming	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	28242107	DLC	Design & Analysis of Algorithms Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	28242108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	28242109	PBL	Macro Project-I[#] [Database Management System Lab]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	28242110	SLP	Self-learning/Presentation[$$$] (SWAYAM/NPTEL/MOOC)	-	-	-	-	40	-	40	-	-	2	1	Mentoring	SO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**350**	**90**	**940**	**11**	**06**	**10**	**22**	-	-	-
12.	28242111	MAC	Cyber Security	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	28242112	MWS	Mandatory Workshop on Mastering Competitive Success at Department Level											GRADE	Interactive	MCQ	-
Skill Internship Program (Institute Level) (Qualifier): Minimum 30 hours duration: To be Credited in IV Semester																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#] Macro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

[$$$] Compulsory registration for one online course using SWAYAM/NPTEL/ MOOC, evaluation through attendance and presentation.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
0	1	0	4	0	0	0	2	1	1	1	1	0	1	1	1

Mode of Learning						Mode of Examination					Total Credits
Face to Face	Interactive	Blended	Mentoring	Experiential	Experimental	PP	AO	MCQ	OB	SO	
17	1	0	1	1	2	4	2	12	0	4	22
78	4	0	4	4	10	18	9	55	0	18	Credits %

ANNEXURE-X

Scheme Structure of B. Tech. (I Semester) in Artificial Intelligence/ Information Technology (Artificial Intelligence and Robotics)/ Artificial Intelligence (AI) and Data Science/ Artificial Intelligence (AI) and Machine Learning [under the MITS-DU]

(Batch admitted in academic session 2025 – 26)

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Centre for Artificial Intelligence

Scheme of Evaluation
B. Tech. I Semester *(Artificial Intelligence (AI))*

(for batch admitted in academic session 2025-26)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	31251101	DC	Digital Logic Design	20	20	30	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	31251102	DC	Foundations of Artificial Intelligence	20	20	30	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
3.	31251103	DC	Internet and Web Technologies	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	31251104	DC	Problem Solving and Programming	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	31251105	BSC	Linear Algebra	20	20	30	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
6.	31251106	DLC	Problem Solving and Programming Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	31251107	DLC	Internet and Web Technologies Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	31251108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	31251109	PBL	Micro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	31251110	HSMC	Language Lab	-	-	-	-	70	30	100	-	-	2	1	Blended	AO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**380**	**120**	**1000**	**12**	**03**	**10**	**20**	-	-	-
12.	31251111	MAC	Universal Human Values & Professional Ethics (UHVPE)	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	31251112	MWS	Mandatory Workshop on Report Writing at Department Level											GRADE	Interactive	MCQ	-
14.	31251113	MWS	Mandatory Workshop on Indian Constitution and Cultural Values at Department Level											GRADE	Interactive	MCQ	-
Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																	
Skill Internship Program (Soft Skill): Minimum 45 hours duration: To be Credited in II Semester.																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]Micro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
1	1	0	4	0	0	0	2	1	1	0	0	0	1	1	2

Mode of Learning					Mode of Examination					Total Credits
Face to Face	Interactive	Blended	Experiential	Experimental	PP	AO	MCQ	OB	SO	
15	1	1	1	2	3	3	11	0	3	20
75	5	5	5	10	15	15	55	0	15	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(Deemed University)
(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. I Semester *(Information Technology (Artificial Intelligence and Robotics))*

(for batch admitted in academic session 2025-26)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	24251101	DC	Digital Logic Design	20	20	30	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	24251102	DC	Foundations of Artificial Intelligence and Robotics	20	20	30	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
3.	24251103	DC	Electronic Systems	20	20	30	30	-	-	100	2	1	-	3	Face to Face	PP	2 Hrs
4.	24251104	DC	Problem Solving and Programming	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	24251105	BSC	Linear Algebra	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	24251106	DLC	Problem Solving and Programming Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	24251107	DLC	Electronic Systems Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	24251108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	24251109	PBL	Micro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	24251110	HSMC	Language Lab	-	-	-	-	70	30	100	-	-	2	1	Blended	AO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**380**	**120**	**1000**	**12**	**03**	**10**	**20**	-	-	-
12.	24251111	MAC	Universal Human Values & Professional Ethics (UHVPE)	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	24251112	MWS	Mandatory Workshop on Report Writing at Department Level											GRADE	Interactive	MCQ	-
14.	24251113	MWS	Mandatory Workshop on Indian Constitution and Cultural Values at Department Level											GRADE	Interactive	MCQ	-
Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																	
Skill Internship Program (Soft Skill): Minimum 45 hours duration: To be Credited in II Semester.																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]Micro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
1	1	0	4	0	0	0	2	1	1	0	0	0	1	1	2

Mode of Learning					Mode of Examination					Total Credits
Face to Face	Interactive	Blended	Experiential	Experimental	PP	AO	MCQ	OB	SO	
15	1	1	1	2	6	3	8	0	3	20
75	5	5	5	10	30	15	40	0	15	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(Deemed University)

(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. I Semester *(Artificial Intelligence (AI) and Data Science)*

(for batch admitted in academic session 2025-26)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	27251101	DC	Digital Logic Design	20	20	30	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	27251102	DC	Foundations of Data Science	20	20	30	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
3.	27251103	DC	Internet and Web Technologies	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	27251104	DC	Problem Solving and Programming	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	27251105	BSC	Linear Algebra	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	27251106	DLC	Problem Solving and Programming Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	27251107	DLC	Internet and Web Technologies Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	27251108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	27251109	PBL	Micro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	27251110	HSMC	Language Lab	-	-	-	-	70	30	100	-	-	2	1	Blended	AO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**380**	**120**	**1000**	**12**	**03**	**10**	**20**	-	-	-
12.	27251111	MAC	Universal Human Values & Professional Ethics (UHVPE)	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	27251112	MWS	Mandatory Workshop on Report Writing at Department Level											GRADE	Interactive	MCQ	-
14.	27251113	MWS	Mandatory Workshop on Indian Constitution and Cultural Values at Department Level											GRADE	Interactive	MCQ	-
Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																	
Skill Internship Program (Soft Skill): Minimum 45 hours duration: To be Credited in II Semester.																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]Micro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
1	1	0	4	0	0	0	2	1	1	0	0	0	1	1	2

Mode of Learning					Mode of Examination					Total Credits
Face to Face	Interactive	Blended	Experiential	Experimental	PP	AO	MCQ	OB	SO	
15	1	1	1	2	3	3	11	0	3	20
75	5	5	5	10	15	15	55	0	15	Credits %

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

(Deemed University)

(Declared Under Distinct Category by Ministry of Education, Government of India)

NAAC Accredited with A++ Grade

Centre for Artificial Intelligence

Scheme of Evaluation

B. Tech. I Semester *(Artificial Intelligence (AI) and Machine Learning)*

(for batch admitted in academic session 2025-26)

S. No.	Course Code	Category Code	Course Name	Maximum Marks Allotted						Total Marks	Contact Hours per week			Total Credits	Mode of Learning	Mode of Major Evaluation	Duration of Major Evaluation
				Theory Block				Practical Block									
				Continuous Evaluation			Major Evaluation	Continuous Evaluation	Major Evaluation								
				Minor Evaluation I	Minor Evaluation II	Quiz/ Assignment		Lab Work & Sessional			L	T	P				
1.	28251101	DC	Digital Logic Design	20	20	30	30	-	-	100	3	-	-	3	Face to Face	MCQ	2 Hrs
2.	28251102	DC	Foundations of Machine Learning	20	20	30	30	-	-	100	2	-	-	2	Face to Face	MCQ	2 Hrs
3.	28251103	DC	Internet and Web Technologies	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
4.	28251104	DC	Problem Solving and Programming	20	20	30	30	-	-	100	2	1	-	3	Face to Face	MCQ	2 Hrs
5.	28251105	BSC	Linear Algebra	20	20	30	30	-	-	100	3	-	-	3	Face to Face	PP	2 Hrs
6.	28251106	DLC	Problem Solving and Programming Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
7.	28251107	DLC	Internet and Web Technologies Lab	-	-	-	-	70	30	100	-	-	2	1	Experimental	AO	-
8.	28251108	SP	Semester Proficiency[$]	-	-	-	-	50	-	50	-	-	2	1	Face to Face	SO	-
9.	28251109	PBL	Micro Project-I[#]	-	-	-	-	70	30	100	-	-	2	1	Experiential	SO	-
10.	28251110	HSMC	Language Lab	-	-	-	-	70	30	100	-	-	2	1	Blended	AO	-
11.	NECXXXXX	NEC	Novel Engaging Course (Activity Based Learning)	-	-	-	-	50	-	50	-	1	-	1	Interactive	SO	-
Total				**100**	**100**	**150**	**150**	**380**	**120**	**1000**	**12**	**03**	**10**	**20**	-	-	-
12.	28251111	MAC	Universal Human Values & Professional Ethics (UHVPE)	20	20	30	30	-	-	100	2	-	-	GRADE	Blended	MCQ	1.5 Hrs
13.	28251112	MWS	Mandatory Workshop on Report Writing at Department Level											GRADE	Interactive	MCQ	-
14.	28251113	MWS	Mandatory Workshop on Indian Constitution and Cultural Values at Department Level											GRADE	Interactive	MCQ	-
Induction programme of three weeks (MC): Physical activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations.																	
Skill Internship Program (Soft Skill): Minimum 45 hours duration: To be Credited in II Semester.																	

[$]Semester Proficiency– includes the weightage towards ability/ skill/ competency /knowledge level /expertise attained etc. in the semester courses

MCQ: Multiple Choice Question **AO:** Assignment + Oral **PP:** Pen Paper **SO:** Submission + Oral **OB:** Open Book

[#]Micro Project-I will be presented and evaluated through an interdisciplinary project evaluation committee.

HSMC	BSC	ESC	DC	DE	SPC	OC	DLC	NEC	SP	SIP	SLP	PDC	PBL	MAC	MWS
1	1	0	4	0	0	0	2	1	1	0	0	0	1	1	2

Mode of Learning					Mode of Examination					Total Credits
Face to Face	Interactive	Blended	Experiential	Experimental	PP	AO	MCQ	OB	SO	
15	1	1	1	2	3	3	11	0	3	20
75	5	5	5	10	15	15	55	0	15	Credits %