KUMARAGURU COLLEGE OF TECHNOLOGY,

An autonomous Institution affiliated to Anna University, Chennai

COIMBATORE – 641 049.

B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

REGULATION 2024

III Semester (2024 Batch)

Department of Artificial Intelligence and Data Science

VISION

To embark as a school of innovation in the stream of data science for enabling global education, research and entrepreneurship.

MISSION

- Hone students to excel in the traits of data science technology and professionalism
- Empower students to develop solutions for mutated technological problems of the society
- Inculcate industrial and entrepreneurial culture for their professional furtherance

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of this program shall have:

1. A successful professional career in industry, government, and academia with capabilities to build innovative solutions using technology as a tool to solve real-world problems.
2. Research capabilities in advanced technologies and shall contribute to a new body of knowledge.
3. A learning mindset to continuously improve their knowledge, through on the job, formal and informal learning opportunities.
4. An ethical attitude and shall exhibit effective skills in communication, management, teamwork and leadership.
5. Engineering, problem-solving and critical thinking skills to create social, economical and sustainable impact.

PROGRAM OUTCOMES (POs)

Graduates of the Artificial Intelligence and Data Science Undergraduate Program should have the ability to:

PO1: Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop to the solution of complex engineering problems.

PO2: Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development.

PO3: Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required.

PO4: Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis & interpretation of data to provide valid conclusions.

PO5: Engineering Tool Usage: Create, select, and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems.

PO6: The Engineer and The World: Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture, and environment.

PO7: Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws.

PO8: Individual and Collaborative Teamwork: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

PO9: Communication: Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.

PO10: Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

PO11: Life-Long Learning: Recognize the need for and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

The Program Specific Outcomes of Artificial Intelligence and Data Science Undergraduate Program are:

PSO 1: Apply the principles of Artificial Intelligence and Data Science, to develop sustainable, data driven decisions for domain-specific applications using standard practices.

PSO 2: Demonstrate the ability to develop innovative solutions and address complex industry challenges utilizing emerging AI trends, tools, and technologies.

KUMARAGURU COLLEGE OF TECHNOLOGY

ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

REGULATION 2024

B.Tech. Artificial Intelligence and Data Science – Curriculum

2024 Batch Structure

Semester I

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HST103 / 24HST104	Effective Communication / Professional Communication	Theory	HS	2	0	0	0	2
	24HSJ102	Fluency Through Practice	Practical	HS	0	0	4	0	
2	24MAI114	Applied Linear Algebra and Calculus	Embedded	BS	3	0	2	0	4
3	24PHI101	Applied Physics for Computing	Embedded	BS	3	0	2	0	4
4	24CSI101	Logical Thinking and Problem Solving	Embedded	ES	3	0	2	0	4
5	24CSI102	Digital Logic Circuits	Embedded	ES	2	0	2	0	3
6	24HST101	Heritage of Tamils	Theory	HS	1	0	0	0	1
7	24INP102	Innovation Practicum - 1	Practical	ES	0	0	2	0	1
8	24HSP111	Holistic Wellness - 1	Practical	HS	0	0	2	0	1
9	24INO101	FCLF- General Stack-1	Practical	OE	0	0	2	0	1
10	24CSV001	Emerging Domains	Embedded	VA	2	0	0	0	0
								Total Credits	**21**
								Total Contact Hours/week	**30**

Semester II

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24HSP005	Mastering Conversations	Practical	HS	0	0	2	0	1
2	24MAI124	Multivariate Calculus and Forecasting	Embedded	BS	3	0	2	0	4
3	24CSI103	Computer Graphics	Embedded	BS	2	0	2	0	3
4	24CSI104	Data Structures and Algorithms	Embedded	ES	3	0	2	0	4
5	24CSI105	Embedded Computing Systems	Embedded	ES	2	0	2	0	3
6	24HST102	Tamils and Technology	Theory	HS	1	0	0	0	1
7	24INP103	Innovation Practicum- 2	Practical	ES	0	0	2	0	1
8	24HSP112	Holistic Wellness-2	Practical	HS	0	0	2	0	1
9	24INO102	FCLF- General Stack-2	Practical	OE	0	0	2	0	1
10	24INP101	Design Thinking	Practical	HS	0	0	2	0	1

11	24CSV002	Disruptive Technologies	Embedded	VA	2	0	0	0	0
								Total Credits	**20**
								Total Contact Hours/week	**31**
Semester III									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
1	24MAI234	Computational Probability and Statistics	Embedded	BS	3	0	2	0	4
2	24CSI008	Object Oriented Programming	Embedded	ES	3	0	2	0	4
3	24CSI009	Database Management Systems	Embedded	PC	3	0	2	0	4
4	24ADI001	Artificial Intelligence and Automation	Embedded	PC	3	0	2	0	4
5	24INP201	Innovation Practicum- 3	Practical	ES	0	0	2	0	1
6	24HSP006	Mastering Group Discussion and Presentation Skills	Practical	HS	0	0	2	0	1
7	24INOXYY	FCLF- General Stack-3	Practical	OE	0	0	2	0	1
8	24ADJ202	Social Internship	Project	PRJ	0	0	0	0	1
9	24ADT015	Finance, Economics and Marketing	Theory	HS	3	0	0	0	3
10	24ITP012	Aptitude and Reasoning – I	Practical	HS	0	0	2	0	1
11	24ADV001	Python Programming	Practical	VA	0	0	2	0	0
								Total Credits	**24**
								Total Contact Hours/week	**29**
Semester IV									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
1	24MAT244	Random Process and Optimization	Theory	BS	3	0	0	0	3
2	24CSI014	Design and Analysis of Algorithms	Embedded	PC	3	0	2	0	4
3	24CSI011	Computer Networks and Security	Embedded	PC	3	0	2	0	4
4	24CSP012	Java Programming	Practical	PC	0	0	4	0	2
5	24ADI003	Machine Learning	Embedded	PC	3	0	2	0	4
6	24ADI204	Data Science and Visualization	Embedded	PC	2	0	2	0	3
7	24INM202	Environmental Science and Sustainability	Embedded	HS	1	0	2	0	2
8	24HSP007	Building Professional Readiness	Practical	HS	0	0	2	0	1
9	24INP202	Innovation Practicum - 4	Practical	ES	0	0	2	0	1
10	24ITP013	Aptitude and Reasoning - II	Practical	HS	0	0	2	0	1
								Total Credits	**25**
								Total Contact Hours/week	**33**
Semester V									

S.No	Course code	Course Title	Course Mode	Course Type	L	T	P	J	C
1	24ADT305	Computer Systems Architecture and Management	Theory	PC	3	0	0	0	3
2	24CSI015	Full Stack Development	Embedded	PC	3	0	2	0	4
3	24ADI306	Deep Learning	Embedded	PC	3	0	2	0	4
4	24ADI307	Cloud Data Analytics	Embedded	PC	2	0	2	0	3
5	24ADI308	Data Engineering	Embedded	PC	2	0	2	0	3
6	24------	Professional Elective I	Embedded/ Theory	PE	*	0	*	*	3
7	24------	Professional Elective II	Embedded/ Theory	PE	*	0	*	*	3
9	24ADJ309	Technical Internship	Project	PRJ	0	0	0	0	2
								Total Credits	**25**
								Total Contact Hours/week	**27**
Semester VI									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
1	24ADI310	Computer Vision	Embedded	PC	2	0	0	2	3
2	24ADI311	Natural Language Processing	Embedded	PC	3	0	2	0	4
3	24CSI020	Agile Software Development	Embedded	PC	2	0	0	2	3
4	24------	Professional Elective III	Embedded/ Theory	PE	*	0	*	*	3
5	24------	Professional Elective IV	Embedded/ Theory	PE	*	0	*	*	3
6	24------	Professional Elective V	Embedded/ Theory	PE	*	0	*	*	3
7	24INM201	Universal Human Values-II	Theory	HS	1	0	0	0	1
8	24CSOXYY	OE2/ GE2	Theory	OE	3	0	0	0	3
9	24HSTXYY	Foreign Language	Theory	HS	2	0	0	0	2
10	24INMXYY	Constitution of India	Theory	HS	2	0	0	0	0
								Total Credits	**25**
								Total Contact Hours/week	**30**
Semester VII									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
1	24------	Professional Elective VI	Embedded/ Theory	PE	*	0	*	*	3
2	24CSOXYY	OE3/GE3	Theory	OE	3	0	0	0	3
3	24INM102	Indian Knowledge System in Science and Engineering	Theory	HS	1	0	0	0	1
4	24ADJ412	Project Phase-I	Project	PRJ	0	0	0	6	3

5	24ADJ413	Professional Internship (Optional)	Project	PRJ	0	0	0	0	0
Total Credits									**10**
Total Contact Hours/week									**13**
Semester VIII									
S.No	**Course code**	**Course Title**	**Course Mode**	**Course Type**	**L**	**T**	**P**	**J**	**C**
1	24CSJ423	Project Phase-II	Project	PRJ	0	0	0	24	12
Total Credits									**12**
Total Contact Hours/week									**24**
Grand Total Credits									**162**

SEMESTER III

24CSI008	OBJECT ORIENTED PROGRAMMING (Common to AD, CS, IT)	L	T	P	J	C
		3	0	2	0	4
ES		SDG	9			

Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)	NIL

Course Objectives:	The purpose of taking this course is to:
1	Understand the basic principles and features of object-oriented programming using C++.
2	Explore the use of classes, objects, constructors, destructors, and various forms of inheritance
3	Apply the concepts of function overloading, operator overloading, and polymorphism
4	Use pointers and virtual functions to implement dynamic behaviour in programs.
5	Implement exception handling and generic programming using C++.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	Explain the basic principles of OOP and structure of C++ programs.	U
CO2	Illustrate the use of classes, objects, and access control in program design.	U
CO3	Apply constructors, destructors, and various inheritance types in solving real-world problems.	Ap
CO4	Demonstrate function overloading, operator overloading, and polymorphism using pointers.	Ap
CO5	Implement exception handling and generic programming using C++ templates and Standard Template Library.	Ap

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2										3	
2	2			3								3	
3		2		3								3	
4	2			3								3	
5			3	3								3	

Course Content

PRINCIPLES OF OOP AND INTRODUCTION TO C++ Basic concepts of Object-Oriented Programming-Benefits and Applications of OOP-Structure of a C++ program-Tokens, Keywords, Identifiers, Basic Data Types-Input and Output in C++ -Type Conversion- Operators -Control Structures **Practical Component** Simple C++ programs to demonstrate control flow, arithmetic operations, and console I/O	**9 Hours** **6 Hours**
CLASSES AND OBJECTS Defining a Class, Creating Objects -Member Functions, Access Specifiers -Scope Resolution Operator, Nesting of Member Functions-Memory Allocation for Objects-Static Members, Array of Objects-Passing Objects as Arguments, Returning Objects **Practical Component** Programs on class and object creation, object arrays, and member access	**9 Hours** **6 Hours**
CONSTRUCTORS AND INHERITANCE Constructors- Default, Parameterized, Copy Constructor , Destructors -Inline Functions, Default Arguments- Inheritance: Types -Single, Multilevel, Multiple, Hierarchical- Friend Functions- Abstract Classes **Practical Component** Demonstrate all types of inheritance along with constructors using C++	**9 Hours** **6 Hours**
POLYMORPHISM AND POINTERS Function Overloading-Operator Overloading- Unary, Binary-Rules for Overloading-constructor overloading- Pointers to Objects, this Pointer-Virtual Functions, Runtime Polymorphism **Practical Component** Programs to demonstrate compile time and runtime polymorphism along with pointers	**9 Hours** **6 Hours**
EXCEPTION HANDLING ,FILES AND GENERIC PROGRAMMING Introduction to exceptions and error types-Syntax and semantics of try, catch, throw-Multiple catch blocks and generic catch-Nested try blocks and rethrowing exceptions Handling uncaught exceptions - File Streams and Their Types - Reading and Writing Data to Files-Function Templates- Class Templates-Standard Template Library. **Practical Component** Programs on handling exceptions using try-catch, throw, rethrow; implementing function and class templates using STL containers and algorithms like sort and find-File handling using ifstream, ofstream, fstream – Reading/writing text data,	**9 Hours** **6 Hours**

Theory	Tutorial	Practical	Project	Total
Hours:45	**Hours:0**	**Hours:30**	**Hours:0**	**Hours:75**

Learning Resources

Textbooks

1. E. Balagurusamy, Object Oriented Programming with C++, 8th Edition, McGraw Hill Education, 2021.
2. Robert Lafore, Object-Oriented Programming in C++, 4th Edition, Sams Publishing, 2002

Reference books/ Web Links

1. Bjarne Stroustrup, *The C++ Programming Language*, 4th Edition, Addison-Wesley, 2014.
2. Herbert Schildt, *C++: The Complete Reference*, 4th Edition, McGraw-Hill Education, 2008.
3. Joyce Farrell, *Object-Oriented Programming Using C++*, 4th Edition, Cengage Learning, 2008.

Online Resources

1. https://www.programiz.com/cpp-programming

2. https://www.geeksforgeeks.org/c-plus-plus/
3. https://cplusplus.com/doc/tutorial/
4. https://www.tutorialspoint.com/cplusplus/

Assessment (Embedded course)
SA-I, SA-II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by			
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert**	
-	-	Ms. R. Nivetha Department of Computer Science and Engineering	
Recommended by BoS on	09.05.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025

24CSI009	DATABASE MANAGEMENT SYSTEMS (Common to AD, CS, IT)	L	T	P	J	C
		3	0	2	0	4
PC		SDG	9			

Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)	NIL

Course Objectives:

The purpose of taking this course is to:

1	Acquire knowledge of fundamental database concepts, data models, and database system architecture.
2	Develop practical skills in designing relational databases using Entity-Relationship modelling and normalization techniques.
3	Gain competency in using Structured Query Language for data definition, data manipulation, and complex data retrieval.
4	Understand the principles of query processing, optimization, transaction management, and concurrency control in database systems.
5	Develop the ability to analyze database design choices and query strategies for performance, integrity, and compare relational databases with NoSQL alternatives.

Course Outcomes

After successful completion of this course, the students shall be able to		Bloom's Taxonomy Level (BTL)
CO1	Apply relational database concepts to define structures and manage data effectively.	Ap
CO2	Design and normalize relational database schemas using Entity-Relationship modelling and normalization techniques to ensure data integrity.	Ap
CO3	Implement relational operations and join strategies using relational algebra and SQL to retrieve and combine data efficiently.	Ap
CO4	Analyze transaction processing concepts, concurrency issues, and recovery techniques to ensure the consistency and correctness of database systems.	An
CO5	Apply CRUD operations in NoSQL databases to manage semi-structured and unstructured data effectively.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	2				3								2
2		2			3							3	

3	2		3										2
4		3		2								2	3
5		3	2									2	

Course Content	
INTRODUCTION TO DATABASES AND DATA MODELLING Evolution from File Systems to DBMS – Advantages of Using DBMS approach - Types of Data - Data Models - DB Architecture and users - Relational Model Concepts - Attributes, Tuples, Relations and Constraints -Differences between OLAP and OLTP- Introduction to SQL: DDL, DML, Data Types, Constraints and Aggregate Functions. **Practical Component** Creation of a database and writing SQL queries to retrieve information from the database - Exploring the use of WHERE, ORDER BY, and limit clauses in SQL - Implement Aggregate Functions.	**9 Hours** **6 Hours**
RELATIONAL MODELLING AND DATABASE DESIGN Logical Database Design: Different approaches in Logical design, ER Modeling, ER notations - Steps in ER modeling. Physical database design: Converting ER Model to Relational Database Design, Normalization -Functional Dependency, 1NF, 2NF, 3NF, Boyce-Codd Normal Form (BCNF) - Decomposition properties. **Practical Component** Implementation of ER Diagram and identifying its entities, relations, attributes and constraints – Converting the ER diagram into relational schema – Convert a relation to 1NF, 2NF, 3NF and BCNF.	**9 Hours** **6 Hours**
PHYSICAL DATABASE DESIGN AND QUERY PROCESSING Overview of File Organization – RAID concepts - Indexing: Single, Multilevel – Dynamic - B+-tree indexing – Hashing Techniques – Static and Dynamic Hashing – Relational Algebra – Translating SQL Queries into Relational Algebra – Joins – Query Optimization: Join Query Optimization – Query Optimization Rules – Tuple Relational Calculus. **Practical Component** Simulation of relational Algebra operations – Performing joins using Relational Algebra – Implementation of various SQL joins.	**9 Hours** **6 Hours**
TRANSACTION MANAGEMENT AND CONCURRENCY CONTROL Transaction Concepts - ACID Properties - Transaction States – Transaction control Commands - Serializability Concepts - Recovery Mechanisms: Undo/Redo, Shadow Paging, Log Based Recovery - Concurrency Control: Locking Protocols, Timestamp Protocols, Deadlock Handling. **Practical Component** Implement multiple transactions using SQL involving BEGIN, COMMIT & ROLLBACK – Write SQL Queries for Nested Transactions.	**9 Hours** **6 Hours**
NOSQL DATABASE MANAGEMENT Introduction to NoSQL Databases – Key Features and Principles of NoSQL – CAP Theorem – Classification of NoSQL Databases- Querying in NoSQL Systems: CRUD operations – NoSQL Query Language Overview	**9 Hours**

Practical Component: Creation of Database and Performing CRUD operations in NoSQL – Querying with NoSQL databases.	**6 Hours**

Theory	Tutorial	Practical	Project	Total
Hours: 45	**Hours: 0**	**Hours: 30**	**Hours: 0**	**Hours: 75**

Learning Resources

Textbooks

1. Silberschatz, Abraham, Henry F. Korth, and S. Sudarshan. Database System Concepts. 7th Edition, McGraw Hill, 2019.
2. Elmasri, Ramez, and Shamkant B. Navathe. Fundamentals of Database Systems. 7th Edition, Pearson, 2017.

Reference books/ Web Links

1. Ramakrishnan, Raghu, and Johannes Gehrke. Database Management Systems. 4th Edition, McGraw Hill, 2015.
2. Sadalage, Pramod J., and Martin Fowler. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence. Addison-Wesley Professional, 2012.

Online Resources

1. https://onlinecourses.nptel.ac.in/noc24_cs12/preview
2. https://online.stanford.edu/courses/soe-ydatabases0005-databases-relational-databases-and-sql
3. https://www.w3schools.com/sql/
4. https://mode.com/sql-tutorial/
5. https://www.scaler.com/topics/course/dbms/

Assessment (Embedded course)

SA-I, SA-II, Activity and Learning Task(s), Mini project, MCQ, End Semester Examination (ESE)
Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert
-	-	Mr. K. Manoj, Department of Computer Science and Engineering

Recommended by BoS on	09.05.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025

24ADI001	ARTIFICIAL INTELLIGENCE AND AUTOMATION	L	T	P	J	C
		3	0	2	0	4
PC	(Common to AD, CS, IT)	SDG	8,9			

Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)	NIL

Course Objectives:

The purpose of taking this course is to:

1	Understand the fundamentals of AI and its potential for decision making.
2	Introduce the concept of artificial intelligence, methods, techniques and applications
3	Gain practical experience through case studies and hands-on projects.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply the foundational concepts of AI, including intelligent agents, predicate logic, and knowledge representation techniques, to perform logical reasoning.	Ap
CO2	Analyze and implement classical and heuristic search algorithms to solve complex AI problems.	An
CO3	Apply probabilistic reasoning techniques to represent and infer knowledge under uncertainty in AI systems.	Ap
CO4	Analyze decision-making models to optimize AI-driven strategic and sequential decision-making under uncertainty.	An
CO5	Design and implement AI-driven automation systems and workflows using appropriate tools to streamline tasks and enhance operational efficiency across diverse domains.	Ap

Course Outcomes (CO)	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3										2	3	
2		3									2	3	
3	3				2						2	3	
4		3			2							3	
5			2		3							2	

Course Content

INTRODUCTION TO AI Fundamentals of AI - Definitions, Key concepts, Intelligent agents, Agents and Environment. Propositional Logic – Agents based on Propositional Logic – First order logic – Syntax and semantics – Knowledge Engineering in First Order Logic– Inference – Unification - Forward and backward chaining - Resolution. **Practical Component** Intelligent Agent Simulation - Propositional Logic and Knowledge-Based Agent - First Order Logic and Inference (Chaining and Resolution)	**9 Hours** **6 Hours**
PROBLEM SOLVING State space search; production systems, search space control; depth first search, breadth-first search. Heuristic Based Search: Hill climbing, best-first search, A*Algorithm and AO* algorithm, Min-max algorithms, game playing – Alpha beta pruning branch and bound, Problem Reduction, Constraint Satisfaction. **Practical Component** Implement AI search algorithms such as BFS, DFS, A* and AO* - Develop an AI for Tic-Tac-Toe or Chess using heuristic-based decision-making - Implement a Sudoku solver or a N-Queens problem solver using backtracking and constraint satisfaction techniques.	**9 Hours** **6 Hours**
REPRESENTING AND REASONING WITH UNCERTAIN KNOWLEDGE Handling uncertainty in AI, Probability theory and its connection to logic, Concepts of independence and conditional probability, Structure of Bayesian Networks, Bayesian rule and its applications, Markov Models and Hidden Markov Models (HMMs), Probabilistic graphical models and Inference algorithms. **Practical Component** Build and evaluate a Bayesian Network for a real-world problem - Implement Hidden Markov Models (HMM) for sequence prediction tasks	**9 Hours** **6 Hours**
DECISION-MAKING Importance of decision making in AI, Utility, preferences and Expected utility in decision-making under uncertainty, Decision Theory Basics, Markov Decision Processes (MDPs), Game theory and strategic decision-making in AI. **Practical Component** Implement a simple MDP for decision-making in a dynamic environment - Develop a game-theoretic model for AI-based strategic decision-making	**9 Hours** **6 Hours**
ARTIFICIAL INTELLIGENCE FOR AUTOMATION Understanding Automation, Applications of AI-driven Automation, Opportunities and challenges in AI automation. Automation in production systems-Automation principles and strategies-Basic elements of an automated system. Introduction to Robotic Process Automation- Benefits of RPA, Components of RPA-RPA Platforms-About Ui Path. **Practical Component** Downloading and installing UiPath Studio - Explore Robotic Process Automation (RPA) tools like UiPath or Automation anywhere - Create a basic automation to extract information from a document and store it in a spreadsheet.	**9 Hours** **6 Hours**

Theory	Tutorial	Practical	Project	Total
Hours:45	**Hours:0**	**Hours: 30**	**Hours:0**	**Hours:75**

Learning Resources
Textbooks
1. Stuart Russell, Peter Norvig, "Artificial Intelligence – A Modern Approach", 4th Edition, Pearson Education / Prentice Hall of India (2022). 2. Tom Taulli, "The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems", Apress Publications (2020).
Reference
1. Rich E., Knight K. and Nair B. S., Artificial Intelligence, Tata McGraw Hills, Fourth Edition (2024). 2. Alok Mani Tripathi, "Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool – UiPath", Packt Publishing (2018).
Online Resources (Weblinks)
1. https://onlinecourses.nptel.ac.in/noc22_cs56 2. https://www.coursera.org/specializations/roboticprocessautomation

Assessment (Embedded course)
SA-I,SA-II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE) Lab Workbook, Experimental Cycle tests, viva-voce

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
-	-	Dr Chandrakala D Professor/Department of Artificial Intelligence and Data Science

Recommended by BoS on	09.05.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025

24ADT015	FINANCE, ECONOMICS AND MARKETING (Common to AD, CS, IT)	L	T	P	J	C
		3	0	0	0	3
HS		SDG	8			
Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)	NIL			

Course Objectives:

The purpose of taking this course is to:

1	Understand core concepts of managerial economics and apply demand estimation techniques in business decision-making.
2	Gain foundational knowledge of cost and financial accounting for analyzing and preparing basic financial statements.
3	Develop skills in financial statement analysis and cash-flow management for strategic financial planning.
4	Apply marketing principles and research analytics to formulate integrated, data-driven growth strategies.

Course Outcomes

After successful completion of this course, the students shall be able to		Revised Bloom's Taxonomy Levels (RBT)
CO1	Apply core economic concepts (demand, supply, elasticity, utility) to managerial decision-making.	Ap
CO2	Record, summarise and interpret fundamental financial transactions in accordance with generally accepted accounting principles (GAAP/Ind-AS).	Ap
CO3	Analyse and evaluate corporate performance using the three key financial statements and cash-flow-based metrics (EBITDA, FCF, EVA).	An
CO4	Design customer-centred marketing strategies that integrate traditional and digital channels to create, communicate and capture value.	Ap
CO5	Employ data-driven market research and analytics to segment, target and position offerings and to forecast demand under uncertainty.	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3		2	2									
2		2											
3		2									2		

4		2									2		
5		2										3	3

Course Content	
MANAGERIAL ECONOMICS & DEMAND ESTIMATION Managerial goals vs. shareholder value; Law of demand & supply; elasticity (price, income, cross); marginal utility & consumer surplus; exceptions to the law of demand; quantitative & qualitative demand-forecasting techniques (time-series, causal models, Delphi, big-data tools); introduction to behavioural economics for managers.	**9 Hours**
COST & FINANCIAL ACCOUNTING FUNDAMENTALS Cost concepts—fixed, variable, stepped, sunk, opportunity, relevant; economies & diseconomies of scale; cost-volume-profit analysis; accounting principles & conventions, double-entry system, journal-ledger-trial balance; the accounting equation; preparation of basic Income Statement and Balance Sheet.	**9 Hours**
FINANCIAL STATEMENT ANALYSIS & CASH-FLOW MANAGEMENT Operating vs. financing & investing cash flows; preparation of the Statement of Cash Flows (IND-AS 7); working-capital management; ratio analysis—liquidity, leverage, profitability, efficiency; advanced cash-flow metrics (EBITDA, FCF, EVA); brief introduction to valuation multiples.	**9 Hours**
MARKETING PRINCIPLES IN THE DIGITAL ERA Evolution of marketing & the holistic marketing concept; Marketing vs. Selling; customer value & satisfaction; 7 Ps and extended service mix; product-life-cycle strategies; overview of digital marketing (SEO, SEM, social, content, influencer); omnichannel customer journeys.	**9 Hours**
MARKET RESEARCH, ANALYTICS & STRATEGIC INTEGRATION Marketing-information systems (MIS); environmental & competitor scanning (PESTLE & Porter 5-forces); STP—segmentation techniques, targeting criteria, positioning maps; basics of marketing analytics (A/B testing, RFM, CLV); integrating finance & marketing for growth strategy—profit-impact of marketing decisions, budgeting, ROI dashboards; capstone case discussion.	**9 Hours**

Theory	Tutorial	Practical	Project	Total
Hours:45	**Hours: 0**	**Hours: 0**	**Hours: 0**	**Hours:45**

Learning Resources

Textbooks

1. P. Geetika, P. Roy Chowdhury & P. Ghosh. Managerial Economics (3e), McGraw-Hill (2017).
2. V. G. Narayanan. An Easy Introduction to Financial Accounting: A Self-Study Guide (2020).
3. Philip Kotler, Kevin Lane Keller. Marketing Management (16e), Pearson (2022).

Reference

1. D. N. Gujarati & D. C. Porter. Essentials of Econometrics (4e), McGraw-Hill (2009).
2. C. Dougherty. Introduction to Econometrics (4e), OUP (2020).
3. Tapan K. Panda. Marketing Management: Text & Cases (3e), Excel Books (2023).
4. Mike Grigsby. Marketing Analytics: Strategic Models & Metrics, Kogan Page (2022).
5. Peter Atrill & Eddie McLaney. Financial Accounting for Decision Makers (9e), Pearson (2021).

Online (Weblinks)

1. https://fulfillment.shiprocket.in/blog/demand-estimation/
2. https://www.coursera.org/learn/uva-darden-financial-accounting
3. https://www.investopedia.com/articles/stocks/07/easycashflow.asp
4. https://handbook.flinders.edu.au/topics/2025/busn1022
5. https://insight7.io/marketing-research-and-insights-8-integration-techniques/

Assessment (Theory course)
SA-I, SA-II, Activity and Learning Task(s), MCQ, End Semester Examination (ESE)

Course Curated By		
Expert(s) from Industry	**Expert(s) from Higher Education Institutions**	**Internal Expert(s)**
-	-	Aman Kumar Dubey Assistant Professor & Program Head/MBA IEV

Recommended by BoS on	09.05.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025

24ITP012	APTITUDE AND REASONING -I (Common to AD, CS, IT)	L	T	P	J	C
		0	0	2	0	1
HS		SDG	9			

Pre-requisite courses	NIL	Data Book / Codes / Standards (If any)	NIL

Course Objectives:

The purpose of taking this course is to:

1	Equip with essential aptitude and reasoning skills commonly assessed in recruitment processes across various industries.
2	Develop proficiency in solving numerical problems related to arithmetic, percentages, ratios, time and work, and other job-relevant topics
3	Improve analytical thinking through practice with syllogisms, coding-decoding, blood relations, and logical sequences.
4	Train to answer questions accurately and efficiently under time constraints, as required in most job aptitude tests.

Course Outcomes:

After successful completion of this course, the students shall be able to		Bloom's Taxonomy Level (BTL)
CO1	Apply fundamental arithmetic concepts to solve real-life and exam-based problems.	Ap
CO2	Solve time-based problems with logical approaches.	Ap
CO3	Demonstrate the ability to simplify and solve number system-related problems.	Ap
CO4	Use deductive reasoning in topics like direction sense, blood relations, and coding-decoding problems.	An
CO5	Interpret and analyze data sets presented in tables, bar charts, pie charts, and line graphs.	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3										3	1	
2	3										3	1	
3	3										3		
4	3		2								3	2	
5	3					2					3	2	

Course Content	
RATIO AND PROPORTION, NUMBER SYSTEM Simple Equations, BODMAS rule, Basic proportional, Ratio and Proportions – Common factor multiplication types, Problems with Coins and Rupees, Problems with Income, Expenditure and Savings, Number System – Even and Odd Number Series, Numbers and its Digits, Arithmetic Operations on Number system	**3 Hours**
AVERAGES AND PERCENTAGES, PROFIT AND LOSS Basic percentage calculations, Percentage increase/decrease, Successive percentage changes, Averages - Weighted average, Moving averages, Application-based problems, Profit and Loss- Cost price, selling price, and marked price, Profit and loss percentage, Successive discounts	**3 Hours**
TIME AND WORK, PIPES AND CISTERNS Work Efficiency, Combined Work, Alternative Work, Efficiency and Time unknown Problems, Same Group of Members Working Together, Different Group of Members Working Together, Pipes and Cisterns – Filling Time Calculations, Tank Capacity Calculations	**3 Hours**
BLOOD RELATIONS, CODING AND DECODING Family tree problems, Coded and complex relationships, Puzzle-based questions, Coding and Decoding – Single Word Coding, Two Word Coding, Number Coding, Letter and Number Coding, Symbol Coding	**3 Hours**
SEATING ARRANGEMENTS, DIRECTION SENSE Linear Arrangements, Circular, Square and Rectangular (Facing centre and Facing Outward) Arrangements, Complex Arrangements, Cardinal directions, Angle and distance calculation, Shadow-based reasoning	**3 Hours**

Theory Hours:	Tutorial Hours:	Practical Hours:	Project Hours:	Total Hours:
0	15	0	0	15

Learning Resources
Textbooks
1. R.S. Agarwal, A Modern Approach to Logical Reasoning – comprehensive for verbal and non-verbal reasoning, S. Chand Publisher, (2022).
Reference books/ Web Links
1. Arun Sharma, How to Prepare for Quantitative Aptitude for the CAT, McGraw Hill, (2021).
Online Resources
1. https://crm.mastersacademy.in/

Assessment
MCQ

Course Curated by		
Expert(s) from Industry	**Expert(s) from Higher Education Institution**	**Internal Expert**

Mr. Vivekanand, CEO and Founder – Masters Academy	-	Dr. D. Sudharson, Department of Artificial Intelligence and Data Science	
Recommended by BoS on	09.05.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025

24ADV001	PYTHON PROGRAMMING (Common to AD, CS, IT)	L	T	P	J	C
		0	0	2	0	0
VA		SDG	9			

Pre-requisite courses	Nil	Data Book / Codes / Standards (If any)	Nil

Course Objectives:	The purpose of taking this course is to:
1	Learn the basic syntax, programming structures, and core data types of Python.
2	Work with functions, file operations, and error handling to build functional programs.
3	Explore object-oriented programming and use libraries like NumPy and Pandas for data handling.

Course Outcomes:	After successful completion of this course, the students shall be able to	Bloom's Taxonomy Level (BTL)
CO1	Construct basic Python programs using variables, data types, operators, and control flow statements.	Ap
CO2	Develop modular programs by defining functions and utilizing data structures like lists, tuples, and dictionaries for effective data management.	Ap
CO3	Apply object-oriented principles to create classes, objects, and implement inheritance to model real-world problems.	Ap
CO4	Implement file handling operations to read and write data from text and CSV files and incorporate exception handling for robust code.	Ap
CO5	Utilize NumPy and Pandas libraries to perform fundamental data manipulation, filtering, and cleaning tasks on datasets.	An

	Program Outcomes (PO) (Strong-3, Medium – 2, Weak-1)											Program Specific Outcomes (PSO)	
	1	2	3	4	5	6	7	8	9	10	11		
Course Outcomes (CO)	Engineering Knowledge	Problem Analysis	Design/Development of Solutions	Conduct Investigations of Complex Problems	Engineering Tool Usage	The Engineer and The World	Ethics	Individual and Collaborative Team work	Communication	Project Management and Finance	Life-Long Learning	PSO-1	PSO-2
1	3	2			3							3	
2	3	2	2		3	3						3	
3	3	2	3		3							3	
4	3	2	2		3							3	
5	3	2	2		3							3	

Course Content

PYTHON BASICS Python syntax, Variables, Data Types (int, float, string), Type Casting, I/O, Arithmetic & Logical Operators.Conditional Statements: if, if-else, if-elif-else. Iterative Statements: for loop, while loop, break, continue.	**6 Hours**
FUNCTIONS,STRINGS, LISTS AND DICTIONARIES Defining functions, arguments (positional, keyword), return values, Lambda functions. String handling: slicing, strip(), split().Lists: creation, indexing, methods (append, remove, sort). Tuples: characteristics, indexing, methods.Dictionaries: Key-value pairs, methods (get, keys, items, update).	**6 Hours**
OOPS CONCEPTS OOP concepts. Creating Classes and Objects, self parameter, __init__ method.Inheritance (Single, Multilevel), Method Overriding.	**6 Hours**
FILE HANDLING AND EXCEPTION HANDLING Reading and writing files, file modes (r, w, a), with statement. Working with text and CSV files. Understanding exceptions. try-except-finally, Raising custom exceptions.	**6 Hours**
PYTHON LIBRARIES Introduction to NumPy, Arrays, creation, and operations. Pandas Library: Series, DataFrames. Data Manipulation (filtering, sorting). Handling Missing Data.	**6 Hours**

Theory Hours:0	Tutorial Hours:0	Practical Hours: 30	Project Hours:0	Total Hours:30

Learning Resources

Textbooks

1. Eric Matthes, *Python Crash Course*, 3rd Edition, No Starch Press, 2023.
2. Paul J. Deitel and Harvey M. Deitel, *Python for Programmers*, 1st Edition, Pearson, 2019.

Reference

1. Al Sweigart, Automate the Boring Stuff with Python, 2nd Edition, No Starch Press, 2020.
2. Wes McKinney, Python for Data Analysis, 3rd Edition, O'Reilly Media, 2022.
3. The Python Standard Library Documentation: https://docs.python.org/3/library/

Online Resources (Weblinks)

1. https://onlinecourses.nptel.ac.in/noc24_cs83/preview
2. https://www.coursera.org/specializations/python

Assessment

MCQs, Continuous Lab Work & Evaluation, Auto-Graded Online Assignments (HackerRank, etc.)

Course Curated by

Expert(s) from Industry	Expert(s) from Higher Education Institution	Internal Expert(s)
-	-	Ms. Rupashini P R, Assistant Professor, Department of Artificial Intelligence and Data Science

Recommended by BoS on	09.05.2025		
Academic Council Approval	No: 28	**Date**	26.06.2025