



॥ तमसो मा ज्योतिर्गमय ॥

VISION

To provide equal opportunities for value based global education for creating an Enlightened Society

MISSION

To establish and facilitate educational institutions in the region for providing affordable value based global education to all who aspire to study and to create opportunities to educators, social workers and philanthropists to serve society



SARVAJANIK
UNIVERSITY

INCLUSIVE | INTEGRATED | INNOVATIVE

creating an enlightened society...

UNIVERSITY OFFICE

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CURRICULUM FOR

“MASTER OF SCIENCE (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)”

M.Sc. (Artificial
Intelligence and Data
Science)

SEM – 1

SEM – 2

w.e.f. Academic Year 2026-27

Constituent Institute:
**Shree Ramkrishna Institute of
Computer Education and Applied
Sciences (SRKI)**



Course Curriculum

MASTER OF SCIENCE (ARTIFICIAL INTELLIGENCE AND DATA SCIENCE)

Sem-1 and 2

The Course Curriculum of Master of Science (Artificial Intelligence and Data Science) was proposed and drafted by **Academic and Curriculum Committee of Computer Science** under the Faculty of Computer Science and Applications in the meeting held on **11-09-2026** and recommended to '**BOARD OF STUDIES**' for approval.

Mr. Jayesh Pushtiwala

Chairman, Academic

& Curriculum Committee

Science

Place of the meeting

Sarvajani University Office

Sign

The proposed Course Curriculum was approved by **Board of Studies; Computer Science** under the Faculty of Computer Science and Applications in the meeting held on **14-09-2026** and was recommended to the '**FACULTY**' for approval.

Dr. Shripal Shah

Chairman,

Board of Studies- Computer Science

Place of the meeting

Sarvajani University Office

Sign

The Course Curriculum approved by the **Faculty of Computer Science and Applications** in the meeting held on **14-09-2026** and was recommended to '**ACADEMIC COUNCIL**' for approval.

Dr. Shripal Shah

Chairman & Dean,

**Faculty of Computer Science and
Applications**

Place of the meeting

Sarvajani University Office

Sign

The Course Curriculum approved by the '**Academic Council of Sarvajani University**' in the meeting held on **16-09-2026**.

Mr. Ashish Desai

Member Secretary,

Academic Council

& I/c. Registrar,

Sarvajani University

Place of the meeting

Sarvajani University Office

Sign

The approved curriculum of Master of Science (Artificial Intelligence and Data Science) Sem-1 and 2 is with effect from the Academic year 2026-27

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FACULTY OF COMPUTER SCIENCE AND APPLICATIONS
M.Sc. (Artificial Intelligence and Data Science)
Semester - I and Semester - II



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Faculty of Computer Science and Applications

**M.Sc. (Artificial Intelligence
and Data Science)**

DETAILED CURRICULUM
(W.E.F. 2026-27)

SARVAJANIK UNIVERSITY
FACULTY OF COMPUTER SCIENCE AND APPLICATIONS
M.Sc. (Artificial Intelligence and Data Science)
Semester - I and Semester - II

Semester wise course group wise Teaching Scheme (AY: 2026-27)

	Group	Subject Code	TITLE OF SUBJECT	CRED IT	TH (Hrs)	PR (Hrs)	Total credit
SEM-1 (AIDS)	DSC	MSCS31108	Problem Solving in AI	4	4	-	4
	DSC	MSCS31103	Fundamental of Data Science (TH)	3	3	-	3
	DSC	MSCS31104	Fundamental of Data Science (PR)	1	-	2	1
	DSC	MSCS31105	Emerging Database Technologies (TH)	3	3	-	3
	DSC	MSCS31106	Emerging Database Technologies (PR)	1	-	2	1
	DSC	MSCS31107	Software Engineering Lab-I / Internship / OJT	4	-	8	4
	DSE	MSCS32101	Cyber Security and Forensic - I	4	4	-	4
		MSCS32102	Distributed and parallel Computing	4	4	-	4
		MSCS32104	Web Programming-I (TH)	3	2	-	3
		MSCS32105	Web Programming-I (PR)	1		2	1
	SEC	MSCS33101	System Integration and Deployment	2	2	-	2
			Total Credit				22
			Total Hours (15 weeks)		225	210	

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	Group	Subject Code	TITLE OF SUBJECT	CRED IT	TH (Hrs)	PR (Hrs)	Total (CR)
SEM-2 (AIDS)	DSC	MSCS31208	Generative AI(TH)	3	3	-	3
	DSC	MSCS31209	Generative AI (PR)	1	-	2	1
	DSC	MSCS31203	Advanced Cloud Programming (TH)	3	3	-	3
	DSC	MSCS31204	Advanced Cloud Programming (PR)	1	-	2	1
	DSC	MSCS31210	Machine Learning (TH)	3	3	-	3
	DSC	MSCS31211	Machine Learning (PR)	1	-	2	1
	DSC	MSCS31207	Software Engineering Lab-II / Internship / OJT	4	-	8	4
	DSE	MSCS32201	Cyber Security and Forensic - II	4	4		4
		MSCS32204	Web Programming-II (TH)	3	3		3
		MSCS32205	Web Programming-II (PR)	1		2	1
	SEC	MSCS33201	AI-Driven Development	2	2	-	2
			Total Credit				22
			Total Hours (15 weeks)		225	210	

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Evaluation Scheme for M.Sc. (Information Technology) / M.Sc. (Artificial Intelligence and Data Science) Semester – I and Semester - II							
Semester	Course Category	Continuous and Comprehensive Evaluation (CCE)			Total CCE	Semester End Examination (SEE)	Grand Total
		CCE	Assignment	Attendance			
I	Discipline Specific Core-1	30	15	5	50	50	100
	Discipline Specific Core-2	30	15	5	50	50	100
	Discipline Specific Core-3	30	15	5	50	50	100
	Discipline Specific Core-4	30	15	5	50	50	100
	Discipline Specific Elective-1	30	15	5	50	50	100
	Skill Enhancement Courses-1	15	5	5	25	25	50
II	Discipline Specific Core-5	30	10	10	50	50	100
	Discipline Specific Core-6	30	10	10	50	50	100
	Discipline Specific Core-7	30	10	10	50	50	100
	Discipline Specific Core-8	30	10	10	50	50	100
	Discipline Specific Elective-2	30	10	10	50	50	100
	Skill Enhancement Courses-2	15	5	5	25	25	50

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Faculty of Computer Science and Applications

M.Sc.
(Artificial Intelligence and Data Science)

SEMESTER- 1

DETAILED CURRICULUM
(W.E.F. 2026-27)

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Semester - I and Semester - II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Computer Science and Applications		Program	M.Sc. (Artificial Intelligence and Data Science)		
Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSC31108	Course Name	DSC: Problem Solving in AI			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
4	4	0	-	50	50	100

Purpose of Course	To identify problems, formulate state spaces, problem solving strategies and familiar with knowledge inference, handling uncertain knowledge. Also familiar with various decision-making framework, AI Ethics, Advanced AI and various emerging applications of AI
Course Objective	● To enable the student to understand techniques of capturing and generating knowledge. ● To enable the student to understand knowledge representation methodologies and Handling Uncertain Knowledge. ● To enable the student to understand Knowledge integration techniques in AI ● To enable the student to understand Emerging Applications of AI ● To enable the student to understand overview of AI Ethics and Advanced AI
Pre-requisite	Awareness about basic math, programming skills, and data handling.
Course Outcome	identify problems, formulate state spaces, problem solving strategies and familiar with knowledge inference, handling uncertain knowledge. Also familiar with various decision-making framework, AI Ethics, Advanced AI and various emerging applications of AI
Course Content	Unit 1: Introduction to AI 1.1 Fundamentals of AI: Definitions, history, key concepts 1.2 Decision-making frameworks: Rationality, bounded rationality, intuition 1.3 The role of AI in decision making: Opportunities and challenges 1.4 Sensors, Actuators, Agent Program 1.5 Learning Agents Unit 2: Problem Solving Strategies 2.1 Search based Problem Solving

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	2.2 Constraint Satisfaction Problems (CSP) 2.3 Optimization and Search Approaches: Linear Programming, Genetic Algorithms, and Simulated Annealing 2.4 Game-Playing and Adversarial Search Unit 3: Knowledge Inference 3.1 Role of Knowledge and Reasoning - Logical Agent 3.2 Knowledge Base, Models, and Knowledge-Based Agents; 3.3 Propositional Logic Knowledge Representation Language - Syntax and Semantics 3.4 Logical Reasoning: Entailment and Inference (soundness, completeness) Unit 4: Handling Uncertain Knowledge 4.1 Understanding Uncertain Domains 4.2 Representing and Reasoning with Uncertain Knowledge 4.3 Probability, connection to logic, independence, Bayes rule, 4.4 Bayesian networks and probabilistic inference 4.5 Fuzzy Logic and Approximate Reasoning 4.6 Overview of Advanced Uncertainty Frameworks - Dempster-Shafer Theory, Belief Network Unit 5: Knowledge integration techniques in AI 5.1 Ontologies, Semantic Networks 5.2 Knowledge Graphs 5.3 Conceptual Graphs 5.4 New Techniques - RAG, Neuro Symbolic AI 5.5 Continuous Learning (Incremental Knowledge), Ensemble Methods Unit 6: Decision Making Frameworks and Theories 6.1 Model-Based and Algorithmic Frameworks 6.2 Human-in-the-Loop (HITL) Frameworks 6.3 Agentic AI & Rules-Based Frameworks 6.4 Governance & Ethical Frameworks 6.5 Basics of utility theory, decision theory, sequential decision problems, Unit 7: Emerging Applications of AI 7.1 AI in healthcare: Diagnosis, treatment, and medical imaging, 7.2 AI in finance: Fraud detection, algorithmic trading, and risk assessment, 7.3 AI in transportation: Autonomous vehicles and traffic optimization, 7.4 AI in customer service and chatbots, AI in education 7.5 Personalized learning and intelligent tutoring systems Unit 8 : AI Ethics and Advanced AI 8.1 Fairness in AI
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	8.2 Explainability in AI 8.3 Strategic AI 8.4 Knowledge Mining and Responsible AI
Text and Reference Literature	1. A First Course in Artificial Intelligence by Deepak Khemani, McGrawHill, ISBN :978-1-25-902998-1 2. Introduction to Artificial Intelligence and Expert System by Dan W. Patterson, PHI, ISBN : 978-93-325-5194-7 3. Artificial Intelligence –A Modern Approach (2nd Edition 2004) by Stuart J. Russell and Peter Norvig, Pearson Education, ISBN: 978-81-775-8367-0 4. Introduction to Artificial Intelligence by Rajendra Akerkar, PHI, ISBN : 978- 81-203-2864-8 5. Artificial Intelligence -Structures and Strategies for Complex Problem Solving (4thEdition 2004) by George F. Luger, Pearson Education 6. Foundation of Artificial Intelligence and Expert Systems by V.S. Janakiraman, K.Sarukesi, P. Gopalakrishnan, Mc Millan (2002) 7. “Artificial Intelligence For Dummies (2nd Edition)”, Luca Massaron, John Mueller

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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Computer Science and Applications		Program	M.Sc. (Artificial Intelligence and Data Science)		
Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSCS31103	Course Name	DSC: Fundamentals of Data Science (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
3	3	0	-	50	50	100

Purpose of Course	The purpose of the course is to make students capable of implementing Concepts, methods and to related to data science
Course Objective	◆ To learn about fundamentals of data science ◆ To study various case studies of and implementation about data science.
Pre-requisite	Basic Concepts of Python Programming and Data Mining
Course Outcome	After completion of this course, the student will be capable to develop models and implement predictive analytics on social media platforms
Course Content	Unit 1 Introduction to Data Science and Data-Analytics 1.1 Problems, Data Opportunities and Solutions 1.2 Data Science, Engineering, and Data-Driven Decision Making 1.3 Data Processing and “Big Data” 1.4 Data-Analytic Thinking 1.5 Data Mining and Data Science 1.6 Overview of the data science process 1.7 Business Perspective of Data Science Project Unit 2 Data in Data Science 2.1Defining Data Science 2.2Facets of Data 2.2.1. Structured data 2.2.2. Unstructured data

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	2.2.3. Natural language 2.2.4. Machine-generated data 2.2.5. Graph-based or network data 2.2.6. Audio, image, and video 2.3 Understanding Data 2.3.1 Types of Data Sources 2.3.2 Data Sampling 2.3.3 Types of Data Elements 2.3.4 Data quality checks Unit 3 Data Pre-processing 3.1 Data Extraction- text, excel, csv 3.2 Cleansing, integrating, and transforming data, Cleansing data 3.3 Missing values, outlier detection and treatment 3.4 Combining data from different data sources 3.5 Transforming data Unit 4 Exploratory Data Analysis 4.1 Defining Descriptive Statistics for Numeric Data 4.2 Analyzing Categorical Data 4.3 Co-relation Analysis 4.4 Modifying Data Distribution Unit 5 Data Visualization and Analytics 5.1 Application of Visual Analytics 5.2 Understanding graphs 5.2.1 Heat Maps 5.2.2 Time Series Plots 5.2.3 Box Plots 5.2.4 Network Graphs 5.2.5 Spatial Data Mapping Unit 6 Data Modelling 6.1 Introduction to Predictive Models 6.2 Types of Predictive Models 6.2.1 Classification Model 6.2.2 Regression Model 6.2.3 Time Series Model 6.2.4 Cluster Model 6.3 Modeling Process 6.4 Real-world application
Text and Reference Literature	1. Introducing Data Science - Big data, machine learning, and more, using Python tools 2. Analytics in a Big Data World - Bart Baesens, Wiley Publications 3. Python Data Science FOR Dummies - John Paul Mueller, Luca Massaron - Wiley Publication 4. Data Science for Business, Tom Fawcett, Foster Provost, O'Reilly Publication 5. Python Data Science Handbook, Jake VanderPlas, O'Reilly Publication

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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Computer Science and Applications		Program	M.Sc. (Artificial Intelligence and Data Science)		
Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSCS31104	Course Name	DSC: Fundamentals of Data Science (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
1	0	0	2	25	25	50

Purpose of Course	To provide students with a fundamental understanding of data science concepts, techniques, and their applications in data-driven problem solving.
Course Objective	To introduce the fundamental concepts of data science, develop analytical skills, and enable students to apply basic data science techniques using appropriate tools.
Pre-requisite	Basic knowledge of Python Programming.
Course Outcome	After successful completion of this course, the student will be able to understand the fundamental concepts of data science, analyze and interpret data, and apply basic data science techniques to solve real-world problems.
Course Content	The course covers the fundamentals of data science, including the data science process, data types, data preprocessing, exploratory data analysis, data visualization, and introductory predictive modelling techniques with practical applications.
Practical	List of practical will be prepared at the beginning of each semester
Reference Books	As per paper DSC – Fundamental of Data Science (Th)

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Semester - I and Semester - II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Computer Science and Applications		Program	M.Sc. (Artificial Intelligence and Data Science)		
Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSCS31105	Course Name	DSC: Emerging Database Technologies (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
3	3	0	-	50	50	100

Purpose of Course	The purpose of the course is to give students practical, up-to-date exposure to the databases used in modern web application development and AI/data applications — spanning relational, document, key-value, and vector databases — along with the ORMs/ODMs developers use in production.
Course Objective	To provide fundamental, hands-on knowledge of modern databases: designing schemas, storing and querying data, connecting databases to applications through ORMs/ODMs, using cloud/managed database services, and understanding how AI applications use vector databases.
Pre-requisite	Basic understanding of database concepts and elementary programming (JavaScript/Node.js familiarity is helpful but not mandatory).
Course Outcome	After completing this course, a learner will be able to: - Choose the right type of database (relational, document, key-value, or vector) for a given requirement. - Perform CRUD operations on PostgreSQL, MongoDB, Redis, and a vector database. - Connect databases to a web application using Sequelize (ORM) and Mongoose (ODM). - Use cloud/managed database services where appropriate (MongoDB Atlas, Redis Cloud). - Build a simple AI application (Retrieval-Augmented Generation) backed by a vector database.

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Course Content	Unit 1: Database Foundations & the Modern Database Landscape 1.1 Types of Database Systems: Relational and Non-relational (NoSQL) 1.2 Why NoSQL Emerged: Scalability, flexible data models, and modern web applications 1.3 CAP Theorem: Consistency, Availability, and Partition Tolerance 1.4 ACID vs. BASE: Strong consistency and eventual consistency 1.5 Choosing the Right Database 1.6 Modern Database Landscape: Local databases, MongoDB Atlas, Redis Cloud, and Firebase 1.7 Emerging Database Technologies: Neo4j, InfluxDB, and Elasticsearch 1.8 Common Data Formats: JSON, key-value, documents, and vectors Unit 2: Modern Relational Databases with PostgreSQL 2.1 Introduction to PostgreSQL: Open-source architecture, powerful features, and web-ready capabilities 2.2 SQL Refresher: CREATE, INSERT, SELECT, JOIN, WHERE, and GROUP BY 2.3 Keys and Relationships: Primary key, foreign key, one-to-many, and many-to-many relationships 2.4 PostgreSQL Features: JSON and JSONB data types 2.5 PostgreSQL Installation and Setup: Installing PostgreSQL, using psql and pgAdmin, and connecting to a local database 2.6 Sequelize ORM (Node.js): ORM concepts, models, migrations, associations (hasMany and belongsTo), and CRUD operations Unit 3: Document Databases with MongoDB 3.1 The Document Data Model: Collections, documents, BSON, and JSON 3.2 Advantages of Document Databases: Flexible schema, nested data, and rapid Prototyping 3.3 MongoDB Atlas: Working with the free cloud tier 3.4 CRUD Operations: Insert, find with filters, update, and delete 3.5 Indexing: Improving query performance 3.6 Data Modeling: Embedding and referencing 3.7 Mongoose ODM (Node.js): Schemas, models, validation, and CRUD Operations Unit 4: Key-Value Stores and Caching with Redis 4.1 Introduction to Key-Value Stores 4.2 Redis In-Memory Architecture 4.3 Redis Data Types: Strings, hashes, lists, and sets 4.4 Essential Redis Commands: SET, GET, EXPIRE, and DEL 4.5 Applications of Redis: Caching, session storage, rate limiting, and counters 4.6 Redis as a Cache Layer 4.7 Redis Cloud: Basic deployment and usage
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	Unit 5: AI-Era Databases – Vector Databases 5.1 AI and Semantic Search 5.2 Vectors and Embeddings: Representation of text and images as numerical Vectors 5.3 Embeddings in Practice 5.4 Distance Metrics: Cosine similarity, Euclidean distance, and dot product 5.5 Vector Indexing: Brute-force search, Approximate Nearest Neighbour (ANN), and HNSW (awareness only) Unit 6: Working with Vector Databases 6.1 Hands-on with Chroma: Creating collections, storing embeddings, similarity search, and metadata filtering 6.2 Mini Project – Chat with Your PDF (RAG): Loading a PDF, chunking, embedding, storing in Chroma, retrieval, and response generation
Text and Reference Literature	1. PostgreSQL: Up and Running — Regina Obe & Leo Hsu, O'Reilly 2. MongoDB: The Definitive Guide — Bradshaw, Brazil & Chodorow, O'Reilly 3. NoSQL for Mere Mortals® — Dan Sullivan, O'Reilly 4. Official documentation: PostgreSQL, MongoDB Atlas, Redis, Sequelize, Mongoose, Chroma

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Semester - I and Semester - II

Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Computer Science and Applications		Program	M.Sc. (Artificial Intelligence and Data Science)		
Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSCS31106	Course Name	DSC: Emerging Database Technologies (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
1	0	0	2	25	25	50

Purpose of Course	The purpose of this course is to provide practical knowledge of advanced database technologies, enabling students to design, analyze, visualize, and implement data-driven solutions using modern database and analytics techniques.
Course Objective	To introduce relational, NoSQL, in-memory, and vector databases, and enable students to understand their architecture, features, and practical applications in modern software development.
Pre-requisite	Basic knowledge of Database Management Systems (DBMS) and SQL.
Course Outcome	After successful completion of this course, the student will be able to understand modern database technologies, select appropriate database solutions for different applications, and implement basic operations using relational, NoSQL, and vector databases.
Course Content	The course covers the fundamentals of modern database technologies, including relational and NoSQL databases, document and key-value stores, PostgreSQL, MongoDB, Redis, vector databases, and their applications in scalable systems and AI-driven solutions.
Practical	List of practical will be prepared at the beginning of each semester
Reference Books	As per paper DSC – Emerging Database Technologies (TH)

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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Computer Science and Applications		Program	M.Sc. (Artificial Intelligence and Data Science)		
Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSCS31107	Course Name	DSC: Software Engineering Lab – I / Internship / OJT			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
4	0	0	8	50	50	100

Purpose of Course	To provide hands-on experience in analysing real-world problems and systematically developing appropriate computing solutions through requirement analysis, modelling, design, development, testing, integration, and deployment/evaluation. The course enables students to apply suitable software engineering, data, artificial intelligence, security, and system/architecture concepts according to the nature of the selected problem.
Course Objective	- To analyse real-world problems and identify their requirements, scope, constraints, and objectives. - To select and justify appropriate models, methodologies, frameworks, architectures, and tools for a given problem. - To design requirements, data, interfaces, system components, and behavioural models using appropriate modelling techniques. - To develop and configure basic and detailed solutions using suitable programming languages, software platforms, tools, and frameworks. - To apply appropriate testing, validation, evaluation, and performance assessment techniques to the developed solution. - To integrate, package, and deploy/implement the developed solution and evaluate its system-level functionality.
Pre-requisite	Students should have basic knowledge of programming fundamentals and problem-solving techniques. fundamentals of database and data management, basic software engineering and system development concepts, basic knowledge of computer networks and operating systems,

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	fundamental concepts of data analysis, artificial intelligence, or security, as applicable to the selected problem. Familiarity with basic development and modelling tools.
Course Outcome	After successful completion of the course, students will be able to: - Analyse a real-world problem and identify its requirements, scope, constraints, and objectives. - Select and justify suitable models, methodologies, frameworks, architectures, and techniques for solving a given problem. - Design requirements, data, interfaces, system components, and behavioural models using appropriate tools and techniques. - Develop and configure appropriate software solutions, computational models, AI models, security solutions, or system architectures based on the identified requirements. - Perform unit testing, model validation, system evaluation, integration testing, and other appropriate testing techniques. - Integrate, implement, and evaluate the developed solution based on relevant functional, performance, usability, accuracy, security, or other quality requirements.
Course Content	Practical 1: Problem Statement and Process Selection (4 hrs) Aim: To analyze a real-world problem statement and select a suitable model with proper justification. Description: a) Define a requirement/ problem (e.g., Online Library Management System, Mover Recommendation System, Security detection and protection, cloud or network system &/or architecture etc.). b) Document the scope, operational constraints, and objectives. Choose appropriate models (SDLC models, ML Models, Security models, frameworks, architectures etc) and justify why a specific approach fits the chosen problem. Practical 2: Requirement Specification (8 hrs) Aim: To prepare a complete Requirement document for the chosen problem. Description: a) Prepare detailed requirement list, gaps, model limitations and prepare a complete requirement document (Data Flow Diagrams, ER Diagrams, Use Case Diagrams, Class Diagrams, comparative study of existing frameworks, models and methods/techniques etc.) using appropriate software tools. Practical 3: Data Design and Interface Design (8 hrs) Aim: To design data and Human interaction appropriate to problem and requirements. Description: a) Design Database (tables, relationships, constraints, keys etc.) /Data source (dataset, attributes, features, EDA etc.) using appropriate software tools. b) Design interface (Inputs, Outputs, Dashboards, Data Visualizations, interaction panels etc.) using appropriate Software Tools. Practical 4: Designing Interaction and Behavioural Models (8 hrs) Aim: To design various models indicating system component interactions and behaviour appropriate for the problem and requirements. Description: Design various system diagrams (like Sequence Diagram, Activity Diagram, StateChart Diagram, Deployment Diagrams, System Flowchart etc.) / component interactions in models/framework/system/architecture using appropriate software Tools.

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Practical 5: Basic Solution design &/or development Software Coding of core functionality/ Model Development/System/Architecture Design) (20-24 hrs)

Aim: Design &/or Development &; testing (of Core functionalities/Admin Modules or Training, evaluation &; configuration of Core AI / Security model or system &/or architecture design etc.) of the basic/initial solution appropriate for the problem and requirements.

Description:

- a) Design &/or Development (of Core functionalities/Admin Modules or Training, evaluation &; configuration of Core AI / Security model or system &/or architecture design etc.) of the required solution appropriate for the problem and requirements using appropriate software platforms, tools, programming &/or scripting language etc.
- b) Perform Unit Testing/model validation/architecture evaluation etc. of the basic/initial solution.

Practical 6: Detailed Solution design &/or development Software Coding of core functionality/ Model Development/System/Architecture Design) (40-45 hrs)

Aim: Design &/or Development &; testing/evaluation (of Core functionalities/Admin Modules or Training, evaluation &; configuration of Core AI / Security model or system &/or architecture design etc.) of the detailed solution appropriate for the problem and requirements.

Description:

- a) Design &/or Development & testing (of Detailed functionalities/Admin Modules or Training, evaluation &; configuration of detailed AI / Security model or system &/or architecture design etc.) of the required solution appropriate for the problem and requirements. using appropriate software platforms, tools, programming &/or scripting language etc.
- b) Perform Unit Testing/model validation/architecture evaluation etc. of the detailed solutions.

Practical 7: Integration and Detailed Testing/evaluation (8-12 hrs.)

Aim: To integrate already designed &/or developed components (e.g. software modules, models, framework, system, architecture etc.) and perform integration testing / evaluation.

Description:

- a) Integrate already designed &/or developed components (e.g. software modules, models, framework, system, architecture etc.).
- b) Perform Integration Testing of already designed &/or developed components (e.g. software modules, models, framework, system, architecture etc.).

Practical 8: Packaging, Deployment and system level testing (8-12 hrs.)

Aim: To deploy/host/upload/ implement the developed solution (software/ webapp /mobile app, model, framework, architecture, system etc) and test the deployment.

Description:

- a) To deploy/host/upload/ implement the developed solution (software/ webapp /mobile app, model, framework, architecture, system etc) in user/client/ customer environment.
- b) Perform system and User - acceptance testings/ evaluation (like security testing, load testing, stress testing, usability testing, accuracy, precision etc.)

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Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSCS32101	Course Name	DSE: Cyber Security and Forensic - I			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
4	4	0	-	50	50	100

Purpose of Course	Conceptualize the students with the theoretical concepts of Cyber Security
Course Objective	Familiarization with different objectives of cyber security components like identity theft, different hacking techniques used for different purposes. Different mobile and cloud security components are also covered.
Pre-requisite	Basic knowledge of Information security, computer network and operating systems.
Course Outcome	1. Get familiar with different terminologies of cyber security 2. Get aware with different techniques of identity theft 3. Gaining detail knowledge to support activities associated with mobile and cloud security
Course Content	Unit 1: Introduction 1.1 Introduction & defining the cyber security challenges 1.2 Ethical hacking 1.3 Frauds in IT, Banking, Mobile network, telecommunications 1.4 Frauds in Software development and management 1.5 Types of Areas in Cyber Security Unit 2: Basics of cyber security 2.1 Pathway of Cyber Security 2.2 Classification of cyber crime 2.3 Provision of IT Act -2000 and it's amendment 2.4 Careers in cyber security Unit 3: Identity theft 3.1 Phishing 3.1.1 Phishing

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	3.1.2 Methods and techniques of phishing 3.1.3 Types of phishing scam 3.1.4 Phishing counter measures 3.1.5 Mishling, smishing and vishing 3.2 Identity theft 3.2.1 Assumption of Identity 3.2.2 Credit Identity theft 3.2.3 Virtual Identity theft 3.2.4 Criminal Record Identity theft/fraud 3.3 Physical Method of Identity theft 3.3.1 Mail theft 3.3.2 Dumpster diving 3.3.3 Theft of computer 3.3.4 Bag operations 3.3.5 Child Identity theft 3.3.6 Insiders 3.3.7 Fraudulent or fictitious companies 3.3.8 Card skimming, ATM manipulation and fraudulent machines 3.4 Theft of Intellectual Property 3.4.1 Software piracy 3.4.2 Film and music piracy Unit 4: Different attack 4.1 Password cracking 4.1.1 Online and offline attack 4.1.2 Brute force attack 4.1.3 Strong, weak and random password 4.1.4 Dictionary attack 4.2 Key logger and spywares 4.2.1 Hardware and software loggers 4.2.2 Anti key logger 4.2.3 Spywares Unit 5. Different attack techniques 5.1 DOS and DDOS attacks 5.1.1 Classification of DOS attacks 5.1.2 Types / levels of DOS attacks 5.1.3 Tools used to launch DOS attacks 5.1.4 DDOS attacks 5.1.5 Protect from DOS Attacks 5.2 SQL Injection 5.2.1 Steps for SQL Injection 5.2.2 How to prevent from SQL Injection attacks 5.2.3 Tools used for SQL server penetration. 5.2.4 Buffer overflow - types and minimize the attack.
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	5.3 Botnets and Zombie armies 5.4 Cyber terrorism and organized crime Unit 6: Introduction to Computer forensics 6.1 Computer forensic 6.2 Computer forensic applications 6.3 Forensic services 6.4 Types of forensic technology 6.5 Benefits of professional forensic methodology Unit 7: Electronic evidence collection 7.1 Alternative methods for accessing data 7.2 Collecting digital evidence data 7.3 Digital evidence processing and investigation 7.4 Evidence preservation Unit 8: Electronic evidence processing 8.1 Evidence data analysis 8.2 Evidence data documentation 8.3 Database forensic 8.4 Web attack forensic 8.5 Evidence presentation
Text and Reference Literature	1. Cyber security, Nina Godbole, Sunit Belapure, Wiley 2. Computer Forensics – Computer Crime scene investigation by John RVacca, Firewallmedia publication 3. Computer forensics and cybercrime – an introduction 3rd edition, Marjie T. Britz, Pearson 4. Build your own security lab, Michael Gregg, Wiley India 5. Introduction to computer security by Matt Bishop 6. Cryptography and network security by William Stalling

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Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSCS32102	Course Name	DSE: Distributed and Parallel Computing			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
4	4	0	-	50	50	100

Purpose of Course	To provide students with the fundamental concepts, architectures, and programming techniques of distributed and parallel computing systems.
Course Objective	- Understand the principles and architecture of distributed and parallel systems. - Learn resource management, communication, synchronization, and security mechanisms. - Explore programming models and applications of distributed and parallel computing. - Apply distributed and parallel computing concepts to solve real-world problems.
Pre-requisite	NIL
Course Outcome	At the end of the course, students will be able to understand the concepts of distributed and parallel computing
Course Content	Unit 1: Introduction to Distributed Systems 1.1 Various Systems and Services – Email and Messaging Services, The World Wide Web (WWW), Social Networking Services, News Services, Remote Login and File Transfer, Multimedia Transfer

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	1.2 Distributed Computation – Distributed Computation Model, Distributed Transaction Processing and E-Commerce, Distributed Real-Time Processing 1.3 Issues in Distributed Systems – Naming, Sharing, Availability and Reliability, Replication, Privacy and Security, Communication, Concurrency and Synchronization, Time and Coordination, Fault Tolerance and Recovery, Scalability Unit 2: Software and Network Architecture for Distributed Systems 2.1 Software Architecture 2.1.1 Cooperating Processes and Process Groups – Group Membership and Message Delivery 2.1.2 Client–Server and Peer-to-Peer Communication 2.1.3 Component Models, Components and Frameworks 2.1.4 Web Services 2.2 Network Architecture 2.2.1 Functions of Layers in the OSI Reference Model 2.2.2 Interconnection Networks for Computer Clusters – Time-Shared or Common Bus, Crossbar Switch, Multistage Networks, Nearest Neighbour Mesh, Cube Network Unit 3: Managing Distributed Resources 3.1 Resource Naming and Addressing – Name Servers, Domain Name System (DNS) and Directory Services 3.2 Resource Sharing – Sharing Primary Memory, Distributed Shared Memory (DSM), Page-Based DSM, Logical DSM 3.3 Managing Resource Availability and Reliability – Concerns in LAN and WAN, Processor and Memory Upgrades, Software Design 3.4 Resource Replication – Replicas as Members of a Group, Reliability of Message Delivery, Message Ordering 3.5 Managing Privacy and Security – Cryptography, Kerberos and Other Security Mechanisms Unit 4: Accessing Distributed Resources 4.1 Communication over Distributed Resources – Remote Procedure Call (RPC),] Message Passing, Sockets and Streams 4.2 Concurrency while Accessing Distributed Resources – Distributed Deadlock and Replica Control 4.3 Coordination of Distributed Resources – Logical and Physical Clocks
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	4.4 Fault Tolerance and Recovery – Lost Messages, Failed Nodes, Network Partitioning 4.5 Transaction Management – Concurrent Transactions, Atomic Transactions, Nested Transactions, BASE Methodology Unit 5: Major Application Areas and Examples 5.1 Distributed File Systems – File Servers, File Sharing in Peer-to-Peer Systems, Network File System (NFS), Coda File System and Google File System (GFS) 5.2 Distributed Database Systems – Need and Problems/Issues, Parameters for Distribution of Database, DDBMS Structure, Queries and Updates in DDBMS, DDBMS Support in Microsoft SQL Server and Oracle 5.3 Distributed Operating Systems – Network Operating Systems and Distributed Operating Systems, DOS Goals and Design Issues, DOS Examples – Apache Server and ZooKeeper, Amoeba, Mach and Windows NT Family 5.4 Distributed Computation Systems and Grid Computing 5.4.1 Concerns Related to Network Platform, Algorithm Design and Implementation, Choice of Programming Languages, Standards and Tools 5.4.2 Grid Computing Examples – XSEDE, OptIPuter and TransLight/Global Lambda Integrated Facility 5.5 Internet-Driven System Examples – Apache Dynamo and DynamoDB, Apache Cassandra, Google BigTable, BitTorrent, Accessing Replicas in Distributed Systems 5.6 Other Distributed Systems 5.6.1 Distributed Real-Time Systems 5.6.2 Distributed Multimedia Systems Unit 6: Parallel Processing Architectures 6.1 Need and Concept of Parallel Processing, Application Areas of Parallel Processing, Distributed Memory and Shared Memory Processing, Various Dependencies and Algorithm Development for Parallel Processing 6.2 Parallelism in Sequential Machines – Multiplicity of Functional Units,
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	Pipelining within the CPU, Overlapped CPU and I/O Operations, Hierarchical Memory Systems, Multiprogramming and Time Sharing 6.3 Abstract Model of Parallel Computers – PRAM (Parallel Random Access Machine) 6.4 Multiprocessor Architecture, Pipelining and Array Processors, Interconnection Networks Unit 7: Parallel Programming Issues 7.1 Parallel Programming Models and Software Tools 7.2 Data Dependency – Types of Dependencies, Loop Dependence and Array Dependence 7.3 Program Transformations – Induction Variables, Forward Dependency, Backward Dependency, Breaking out of a Loop, Loop Splitting and Loop Interchange 7.4 Overview of Shared Memory Programming and Thread-Based Implementation 7.5 MapReduce Model of Parallelism Unit 8: Distributed Computing 8.1 Message Passing Model for Synchronous and Asynchronous Message Passing 8.2 Parallel Virtual Machine (PVM) – PVM Terminology, Architecture of PVM, Programming Model of PVM and Dynamic Process Groups 8.3 Remote Procedure Call (RPC) and Java RMI – Parameter Passing and Interface, Locating the Server, RPC Failures and Semantics, Security, Disadvantages of RPC, Java RMI Example – Remote Interface, Server, Client, Running the Code, Garbage Collection and Security 8.4 Distributed Computing Environment (DCE) – DCE Architecture, DCE Configuration, DCE Directory Services, Distributed File Service (DFS), DCE Security Service and DCE Time Service
Text and Reference Literature	Distributed Systems: Concepts and Design, George Coulouris , JeanDollimore,Tim Kindberg , Gordon Blair , Pearson, ISBN-10 : 01321430112. Distributed Computing: Principles, Algorithms, and Systems, byAjayD. Kshemkalyani , Mukesh Singhal, Cambridge University Press, ISBN-13: 978-0521189842 3. Distributed Systems Architecture, Authors: Arno Puder Kay Römer FrankPilhofer ISBN: 9780080454702, Imprint: Morgan Kaufmann

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	4. Introduction to Parallel Processing, M.Sasikumar, Dinesh Shikhare, P. RaviPrakash, PHI Publication, ISBN-13 : 978-8120350311 5. Fundamentals of Parallel Processing, Harry Jordan, Gita Alaghband, Pearson, ISBN-13 : 978-0139011580
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Year	2026-27		Version	3		
Semester	1		Effective From	June 2026		
Course Code	MSCS32104	Course Name	DSE: Web Programming -1 (TH)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
3	3	0	-	50	50	100

Purpose of Course	The purpose of the course is to equip students to develop professional web applications using the latest tools and technologies.
Course Objective	To provide an in-depth knowledge of the most recent server-side programming technology
Pre-requisite	Basic understanding of Web, HTTP, HTML, JavaScript, and Basic Web Programming
Course Outcome	After completion of this course, the student will be capable of developing web applications with MVC concept and web APIs
Course Content	Unit 1: MVC Architecture 1.1 Introduction to MVC Framework 1.2 Building an MVC page 1.3 Web Page Routing 1.4 Controller, Model, and View 1.5 Data Access and Modeling 1.6 CRUD operation in MVC 1.7 Entity framework – ORM model

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	Unit 2: Database Concepts 2.1 Working with external Database 2.2 Introduction to LINQ 2.3 Lambda Expression 2.4 Query Expression 2.5 Data Access with LINQ 2.5.1 Introduction of LINQ 2.5.2 LINQ to Dataset 2.5.3 LINQ to SQL Unit 3: Web Application Security 3.1 Authentication 3.1.1 Forms Authentication 3.1.2 Windows Authentication 3.2 Authorization 3.3 Role-Based Security 3.4 SQL injection Unit 4: Working with E-mail 4.1 Introduction 4.2 SmtpClient Class 4.2.1 SmtpClient Class properties 4.3 MailMessage Class 4.4 Attachment Class Unit 5 Web Services 5.1 Basic of Web Services 5.2 Discovering Web Services Using UDDI 5.3 Creating a Web Service 5.4 Web Service Consumers 5.5 Web Service using RESTful, Web Service SOAP Unit 6: Working with Web API 6.1 Introduction to Web API 6.2 Web API Controller 6.3 Web API Routing 6.4 Implementing Http Get Request, Http Put Request, Http Post Request, and Http Delete Request
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Text and Reference Literature	1. Professional ASP.NET MVC 5 by Jon Galloway, Wrox, 2014 2. Pro ASP.NET MVC 5 Platform by Adam Freeman, Apress 3. Professional C# 7 and .NET Core 2.0 by Christian Nagel, Wrox / Wiley, 2018 4. C# 7 and .NET Core Cookbook by Dirk Strauss, O'Reilly / Packt Publishing Limited, 2017 5. Learning ASP.NET Core 2.0 by Jason De Oliveira and Michel Bruchet, Packt Publishing Ltd, 2017 6. Mastering ASP.NET Core 2.0 by Ricardo Peres, Packt Publishing Limited, 2017
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Semester	1		Effective From	June 2026		
Course Code	MSCS32105	Course Name	DSE: Web Programming -1 (PR)			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
1	0	0	2	25	25	50

Purpose of Course	The purpose of the course is to make students capable of developing professional web applications using latest tools and technologies.
Course Objective	To provide an in-depth knowledge of most recent server-side programming technology
Pre-requisite	Basic understanding of Web, HTTP, HTML, JavaScript, Basic Web Programming
Course Outcome	After completion of this course, the student will be capable of developing.
Course Content	The students will be required to carry out practical on ASP.NET with MVC and WebAPI concepts.
Practical	List of practical will be prepared at the beginning of each semester
Reference Books	As per paper DSE– Web Programming-1

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Semester	1		Effective From	June 2026		
Course Code	MSCS33101	Course Name	SEC: System Integration and Deployment			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous and Comprehensive Evaluation (CCE)	Semester end examinations (SEE)	Total
2	2	0	0	25	25	50

Purpose of Course	The purpose of the course is to introduce students to version control, collaborative software development, system integration, and deployment using Git, GitHub, and modern CI/CD practices
Course Objective	- Understand the concepts of version control and Git. - Use Git and GitHub for source code management and collaboration. - Implement basic Continuous Integration (CI) and Continuous Deployment (CD) workflows.
Pre-requisite	Basic programming skills in any language and Familiarity with command-line operations
Course Out come	After completion of this course, the student will be capable of Deploy and maintain software applications using modern DevOps practices.
Course Content	Unit 1: Introduction to Version Control 1.1 What is Version Control System (VCS)? 1.2 Benefits of version control 1.3 Centralized vs Distributed VCS Unit 2: Git Fundamentals, Branching and Merging 2.1 Introduction to Git 2.2 Installing and configuring Git 2.3 Git architecture and workflow 2.4 Creating repositories

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	2.5 Working directory, staging area, and repository 2.6 Basic commands: git init, git clone, git status, git add, git commit, git log 2.7 Creating and switching branches - Branch management, merging branches, resolving merge conflicts, best practices for branching strategies Unit 3: GitHub Basics 3.1 Introduction to GitHub 3.2 Creating a GitHub account 3.3 Creating repositories on GitHub 3.4 Connecting local repositories to GitHub 3.5 Pushing and pulling changes 3.6 Forking repositories Unit 4: System Integration & Deployment 4.1 Integration 4.1.1 Continuous Integration (CI) concepts 4.1.2 GitHub Actions overview 4.1.3 Creating CI workflows 4.1.4 Automated testing 4.1.5 Build automation 4.2 Deployment 4.2.1 Continuous Deployment (CD) concepts 4.2.2 Deployment pipelines 4.2.3 Environment management (Development, Testing, Production) 4.2.4 GitHub Actions for deployment 4.2.5 Monitoring and rollback strategies
Text and Reference Literature	1. Pro Git (2nd Edition), by Scott Chacon & Ben Straub 2. Version Control with Git (3rd Edition), Jon Loeliger & Matthew McCullough 3. Learning Git, by Anna Skoulikari 4. Continuous Delivery: Reliable Software Releases through Build, Test, and Deployment Automation, by Jez Humble & David Farley