



॥ 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 (Artificial Intelligence and Data Science) (M.Sc. AIDS)”

w.e.f. Academic Year 2025-26

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



Course Curriculum
M.Sc. (Artificial Intelligence and Data Science)

The Course Curriculum of Master of Science (Information Technology) was proposed and drafted by **Academic and Curriculum Committee of Computer Science** under the Faculty of Science in the meeting held on 09-05-2025 and recommended to '**BOARD OF STUDIES**' for approval.

Prof. 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; Science** under the Faculty of Science in the meeting held on 16-05-2025 and was recommended to the '**FACULTY**' for approval.

Prof. Chaulami Desai
Chairman,
Board of Studies- Science

Place of the meeting
Sarvajani University Office


Sign

The Course Curriculum approved by the **Faculty of Science** in the meeting held on 16-05-2025 and was recommended to '**ACADEMIC COUNCIL**' for approval.

Prof. Chaulami Desai
Chairman &
Dean, Faculty of
Science

Place of the meeting
Sarvajani University Office


Sign

The Course Curriculum approved by the '**Academic Council of Sarvajani University**' in the meeting held on 28-05-2025.

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) is with effect from the Academic year 2025-26 and to be reviewed before 2027-28*



SRKI

Master of Science Artificial Intelligence and Data Science



Faculty of Science

Shree Ramkrishna Institute of Computer
Education and Applied Sciences, Surat

M.Sc. Artificial Intelligence and Data Science

SEMESTER- 1



SRKI

Master of Science Artificial Intelligence and Data Science

Name of Program	Master of Science Artificial Intelligence and Data Science
Abbreviation	M.Sc. AIDS
Duration	2 Years
Objective of Program	The objective of the program is to impart knowledge of fundamentals and/or latest theories, concepts, methods, techniques and tools related to various areas of Advanced Computer Science. Applications and Information Technology and specifically in the area of Data Science, cloud based, Web based Application Development, Machine Learning, Deep Learning and Intelligent Systems.
Program Outcome	At the successful completion of the program, students will be able to start their career in the field of Artificial Intelligence, Data Science and Research Domains of Computer Science.
Program Structure	

Exam Scheme for M.Sc Artificial Intelligence and Data Science

Semester - I

Sr. No	Subject Code	Group	Subjects	Credit				Internal			External	Total	
				Hrs	Lecture	Practical	Total	CCE/Internal Practical Test and Viva Voce	Attendance	Assignment/Practical continuous evaluation			CCA
1	MSCS11101	DSC-1	Fundamentals of Data Science	4	4		4	40	10	20	70	30	100
2	MSCS11103	DSC-2	Fundamentals of AI	4	4		4	40	10	20	70	30	100
3	MSCS12101	DSE-1	Cyber Security and Forensics-1	4	4		4	40	10	20	70	30	100
	MSCS12102		Web Engineering										
	MSCS12103		Distributed and Parallel Computing										
	MSCS12104		Foundation of Advanced Computing										
	MSCS12106		Web Programming-1										
4	MSCS13101	SEC-1	Advanced Database Technologies	4	4		4	40	10	20	70	30	100
5	MSCS16106		Practical and Project-1	16	-	8	8	60	20	60	140	60	200
		Total		32	16		24						600





SRKI

Master of Science Artificial Intelligence and Data Science

NOTE: Following subjects are listed as elective subjects of semester.

ELECTIVE SUBJECTS

1	Cyber Security and Forensic - 1
2	Web Programming-1
3	Web Engineering
4	Distributed and Parallel Computing
5	Foundation of Advanced Computing





Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science	Program		Master of Science Artificial Intelligence and Data Science		
Year	2025-26	Version		1.0		
Semester	1	Effective From		April, 2025		
Course Code	MSCS11101	Course Name	Fundamentals of Data Science			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	4	0	0	70	30	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	<ul style="list-style-type: none"> ◆ 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 Out come	After completion of this course, the student will be capable to develop models and implement predictive analytics on social media platforms
Course Content	<p>Unit 1 Introduction to Data Science and Data-Analytics</p> <p>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</p> <p>Unit 2 Data in Data Science</p> <p>2.1 Defining Data Science 2.2 Facets of Data 2.2.1. Structured data 2.2.2. Unstructured data 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</p>





	<p>2.3.2 Data Sampling 2.3.3 Types of Data Elements 2.3.4 Data quality checks</p> <p>Unit 3 Data Extraction 3.1 Working with real data 3.3.1 Reading from text file 3.3.2 Reading from CSV file 3.3.3 Reading from Excel and Other Files 3.3.4 Third Party Data Integration</p> <p>Unit 4 Data Pre-processing 4.1 Cleansing, integrating, and transforming data, Cleansing data 4.2 Missing values, outlier detection and treatment 4.3 Combining data from different data sources 4.4. Transforming data</p> <p>Unit 5 Data Modelling 5.1 Overview of Descriptive and Predictive Analytics Models 5.1.1 Linear and Logistic Regression 5.1.2 Association Rule Mining 5.1.3 Decision Trees 5.1.4 Support Vector Machine 5.2. Build the models 5.2.1. Model and variable selection 5.2.3. Model execution 5.3 Model Evaluation 5.4 Converting model into applications</p> <p>Unit 6 Exploratory Data Analysis 6.1 Defining Descriptive Statistics for Numeric Data 6.2 Analyzing Categorical Data 6.3 Co-relation Analysis 6.4 Modifying Data Distribution</p> <p>Unit 7 Data Visualization and Analytics 7.1 Application of Visual Analytics 7.2 Understanding graphs 7.2.1 Heat Maps 7.2.2 Time Series Plots 7.2.3 Box Plots 7.2.4 Network Graphs 7.2.5 Spatial Data Mapping</p> <p>Unit 8 Application and Case Studies 8.1 Applications for machine learning in data science 8.2 Introduction to Predictive Analytics and case study 8.3 Introduction to Descriptive Analytics and case study 8.4 Social Network Analytics and case study 8.5 Introduction to Web Analytics and case study</p>
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Text and Reference Literature	<ol style="list-style-type: none">1. Introducing Data Science - Big data, machine learning, and more, using Python tools2. Analytics in a Big Data World - Bart Baesens, Wiley Publications3. Python Data Science FOR Dummies - John Paul Mueller, Luca Massaron - Wiley Publication4. Data Science for Business, Tom Fawcett, Foster Provost , O'relly Publication5. Python Data Science Handbook, Jake VanderPlas, O'relly Publication
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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science	Program	Master of Science Artificial Intelligence and Data Science			
Year	2025-26	Version	1.0			
Semester	1	Effective From	April, 2025			
Course Code	MSCS11103	Course Name	Fundamentals of AI			
Teaching Scheme			Examination Scheme			
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	4	0	0	70	30	100

Purpose of Course	The purpose of the course is to make students capable of implementing concepts , methods and tool related to machine learning
Course Objective	<ul style="list-style-type: none"> ◆ To learn about fundamentals of artificial intelligence ◆ To learn and implement different types of AI concepts.
Pre-requisite	Fundamental concepts of Logic and Reasoning and Data Structures
Course Out come	After completion of this course, the student will be capable to develop models and implement predictive analytics on social media platforms
Course Content	<p>Unit 1 Introduction to AI</p> <p>1.1 Intelligence</p> <p>1.1.1 Types of Intelligence, Human Vs. Machine Intelligence,</p> <p>1.1.2 Composition of intelligence - Reasoning, Learning, Problem Solving, Perception, Linguistic Intelligence</p> <p>1.2 Artificial Intelligence</p> <p>1.2.1 Philosophy and goals,</p> <p>1.2.2 AI Technique, Task Classification of AI, Applications of AI</p> <p>1.3 AI Agents & Environments -Human agent, robotic agent and software agent, ideal rational agent, structure of intelligent agents, Simple Turing test environment, environment properties</p> <p>1.4 AI-Issues : Threat to privacy, threat to human dignity, threat to Safety</p> <p>Unit 2 Problem Solving By Search</p> <p>2.1 Problem Formulation and State Space Representation of 8-Puzzle, 8-Queens, missionaries and cannibals problem, Traveling Salesman Problem, Robot Navigation Problem, Water Jug Problem</p> <p>2.2 Search techniques for Solution Search</p>





	<p>2.2.1 Uninformed search strategies, Informed search strategies, 2.2.2 Game Playing Algorithms</p> <p>Unit 3 Planning</p> <p>3.1 Planning Problem - Air cargo Transport, spare tire problem, the blocks world</p> <p>3.2 Planning with state space search, Goal stack planning, Plan Space Planning</p> <p>Unit 4 Knowledge Representation</p> <p>4.1 Knowledge-Based agents, systems & Machine Intelligence 4.2 Overview of Logical and Procedural Representation Schemes and Inference 4.3 Structured Representation Schemes - Semantic Network, Description Logic, Ontology, Conceptual Graphs</p> <p>Unit 5 Knowledge based Reasoning</p> <p>5.1 Procedural Versus Declarative Knowledge 5.2 Logic Programming 5.3 Forward and Backward Chaining 5.4 Reasoning systems for Categories 5.5 Case base Reasoning</p> <p>Unit 6 Intelligent Agents</p> <p>6.1 AI Intelligent Agents 6.2 Structure of Intelligent Agents 6.3 Agents and Environment 6.4 Types of Agents 6.5 Agent Topology and Agent Architecture</p> <p>Unit 7 Real Life Application Areas of AI</p> <p>7.1 Expert Systems - Characteristics, Importance, Applications, Examples, Rule based system architecture 7.2 Artificial Neural Network - 7.3 Machine Learning- Classification, Regression, Clustering 7.4 Robotics-Sensors and Effectors, Applications, Robotic Perception, Movement Planning 7.5 Natural Language Processing</p> <p>Unit 8 Advanced AI</p> <p>8.1 Conversational AI - Bots and REST APIs 8.2 Knowledge Mining 8.3 Autonomous AI 8.4 Responsible AI</p>
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Text and Reference Literature	<ol style="list-style-type: none"> 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 3. Artificial Intelligence -Structures and Strategies for Complex Problem Solving (4thEdition 2004) by George F. Luger, Pearson Education 4. Foundation of Artificial Intelligence and Expert Systems by V.S. Janakiraman, K.Sarukesi, P. Gopalakrishnan, Mc Millan (2002) 6. Artificial Intelligence: The Basics (Paperback) by Kevin Warwick,Publisher:Routledge 7. The Essence of Artificial Intelligence (Paperback) by Alison Cawsey Publisher:Prentice Hall 8. “Artificial Intelligence” -By Elaine Rich And Kevin Knight (2nd Edition) TataMcgraw Hill
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Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	Master of Science Artificial Intelligence and Data Science		
Year	2025-26		Version	1.0		
Semester	1		Effective From	April, 2025		
Course Code	MSCS13101	Course Name	Advanced Database Technologies			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	4	0	0	70	30	100

Purpose of Course	The purpose of course is to make students use the four types of NoSQL Databases (Document-oriented, Key-Value Pairs, Column-oriented and Graph).
Course Objective	To provide Fundamental knowledge of the detailed architecture, define objects, load data, query data and performance tune NoSQL databases.
Pre-requisite	Basic understanding of Database Concepts.
Course Out come	After completing this course, a learner will be able to identify what type of NoSQL database to implement based on business requirements, can able to apply NoSQL data modeling from application specific queries
Course Content	<p>Unit 1 Database Basics</p> <ul style="list-style-type: none"> 1.1 Type of Database Systems 1.2 Relational Database Design 1.3 E-commerce Application 1.4 Early Database Management Systems 1.5 Flat File Data Management Systems 1.6 Organization of Flat File Data Management Systems 1.7 Hierarchical Data Model Systems <p>Unit 2 Variety of NoSQL Databases</p> <ul style="list-style-type: none"> 2.1 Data Management with Distributed Databases 2.2 Store Data Persistently, Maintain Data Consistency, Ensure Data Availability 2.3 Balancing Response Times, Consistency, and Durability 2.4 Consistency, Availability, and Partitioning: The CAP Theorem <ul style="list-style-type: none"> 2.4.1. ACID and BASE 2.4.2 ACID: Atomicity, Consistency, Isolation, and Durability 2.5 BASE: Basically Available, Soft State, Eventually Consistent <p>Unit 3 Types of NoSQL Databases</p> <ul style="list-style-type: none"> 3.1 Key-Value Pair Database





	<p>3.2 Document Database 3.3 Column Family Databases 3.4 Graph Databases 3.5 Time-series Database</p> <p>Unit 4 MongoDB 4.1 The Document Data Model 4.2 Documents and Collections 4.3 Mongo Shell and IDEs</p> <p>Unit 5 MongoDB Databases 5.1 Working Database – create, drop 5.2 Working with collections – create, drop 5.3 Working with Document – Adding batch of document, find document, modify document, find selected fields, removing document 5.4 Indexing 5.5 Writing to Shards 5.6 MongoDB as a File System</p> <p>Unit 6 Cassandra 6.1 The Column-Family Data Model 6.2 Databases and Tables 6.3 Columns, Types, and Keys 6.4 Cassandra’s Architecture</p> <p>Unit 7 Cassandra with Databases 7.1 Cypher Query Language (CQL) 7.2 CQL Types 7.3 Writing and reading Data 7.3.1 Writing – write path, writing files to disk, transactions 7.3.2 Reading – read path, range queries, ordering, filtering, paging, deleting</p> <p>Unit 8 Neo4j GraphDB 8.1 The Graph Databases – navigational db, relational db, NoSQL db 8.2 Neo4j building blocks 8.3 Key value stores 8.4 Cypher Query Language – Nodes, relationships 8.5 Write clause – Set, Delete, 8.6 Read clause – Match clause, Where clause 8.7 The Neo4j REST API</p>
Text and Reference Literature	<ol style="list-style-type: none"> 1. Designing Data-Intensive Applications By Martin Kleppmann-O’Reilly 2. NoSQL for Mere Mortals® By Dan Sullivan-O’Reilly 3. Pro MongoDB™ Development By Deepak Vohra 4. MongoDB in Action By Kyle Banker 5. Cassandra: The Definitive Guide By Eben Hewitt 6. Nosql Web Development With Apache Cassandra by Deepak Vohra 7. Learning Neo4j By Rik Van Bruggen





Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	Master of Science Artificial Intelligence and Data Science		
Year	2025-26		Version	1.0		
Semester	1		Effective From	April, 2025		
Course Code	MSCS12101	Course Name	Cyber Security and Forensics-1			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	4	0	0	70	30	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.
Prerequisite	Basic knowledge of Information security, computer network and operating systems.
Course Outcome	<ol style="list-style-type: none"> 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	Basic terminology associated with cyber security, basics of cyber security, techniques associated with identity theft, Different techniques used by attacker to capture important and confidential information. Moreover techniques associated with mobile security and cloud based security components are covered along with selected case studies.
	<p>Unit 1 Introduction</p> <ol style="list-style-type: none"> 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 <p>Unit 2 Basics of Cyber Security</p> <ol style="list-style-type: none"> 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



	<p>Unit 3 Identity theft</p> <p>3.1 Phishing</p> <p>3.1.1 Phishing</p> <p>3.1.2 Methods and techniques of phishing</p> <p>3.1.3 Types of phishing scam</p> <p>3.1.4 Phishing counter measures</p> <p>3.1.5 Mishing, smishing and vishing</p> <p>3.2 Identity theft</p> <p>3.2.1 Assumption of Identity</p> <p>3.2.2 Credit Identity theft</p> <p>3.2.3 Virtual Identity theft</p> <p>3.2.4 Criminal Record Identity theft/fraud</p> <p>3.3 Physical Method of Identity theft</p> <p>3.3.1 Mail theft</p> <p>3.3.2 Dumpster diving</p> <p>3.3.3 Theft of computer</p> <p>3.3.4 Bag operations</p> <p>3.3.5 Child Identity theft</p> <p>3.3.6 Insiders</p> <p>3.3.7 Fraudulent or fictitious companies</p> <p>3.3.8 Card skimming , ATM manipulation and fraudulent machines</p> <p>3.4 Theft of Intellectual Property</p> <p>3.4.1 Software piracy</p> <p>3.4.2 Film and music piracy</p> <p>Unit 4 Different attacks</p> <p>4.1 Password cracking</p> <p>4.1.1 Online and offline attack</p> <p>4.1.2 Brute force attack</p> <p>4.1.3 Strong, weak and random password</p> <p>4.1.4 Dictionary attack</p> <p>4.2 Key logger and spywares</p> <p>4.2.1 Hardware and software loggers</p> <p>4.2.2 Anti key logger</p> <p>4.2.3 Spywares</p> <p>Unit 5 Different attack techniques</p> <p>5.1 DOS and DDOS attacks</p> <p>5.1.1 Classification of DOS attacks</p> <p>5.1.2 Types / levels of DOS attacks</p> <p>5.1.3 Tools used to launch DOS attacks</p> <p>5.1.4 DDOS attacks</p> <p>5.1.5 Protect from DOS Attacks</p> <p>5.2 SQL Injection</p> <p>5.2.1 Steps for SQL Injection</p>
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	<p>5.2.2 How to prevent from SQL Injection attacks</p> <p>5.2.3 Tools used for SQL server penetration.</p> <p>5.2.4 Buffer overflow - types and minimize the attack.</p> <p>5.3 Botnets and Zombie armies</p> <p>5.4 Cyber terrorism and organized crime</p> <p>Unit 6 Introduction to Computer forensics</p> <p>6.1 Computer forensic</p> <p>6.2 Computer forensic applications</p> <p>6.3 Forensic services</p> <p>6.4 Types of forensic technology</p> <p>6.5 Benefits of professional forensic methodology</p> <p>Unit 7 Electronic evidence collection</p> <p>7.1 Alternative methods for accessing data</p> <p>7.2 Collecting digital evidence data</p> <p>7.3 Digital evidence processing and investigation</p> <p>7.4 Evidence preservation</p> <p>Unit 8 Electronic evidence processing</p> <p>8.1 Evidence data analysis</p> <p>8.2 Evidence data documentation</p> <p>8.3 Database forensic</p> <p>8.4 Web attack forensic</p> <p>Evidence presentation</p>
Text and Reference Literature	<ol style="list-style-type: none"> 1. Cyber security, Nina Godbole, Sunit Belapure, Wiley 2. Computer Forensics – Computer Crime scene investigation by John R Vacca, Firewall media publication 3. Computer forensics and cyber crime – 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 Cryptography and network security by William Stalling





Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	Master of Science Artificial Intelligence and Data Science.		
Year	2025-26		Version	1.0		
Semester	1		Effective From	April, 2025		
Course Code	MSCS12106	Course Name	Web Programming -1			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	4	0	0	70	30	100

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 Out come	After completion of this course, the student will be capable of developing.
Course Content	<p>Unit 1 Web technologies - Basic Concepts</p> <p>1.1 Client – Server Architecture 1.2 Manage Cross-page posting 1.3 Web Page State Management Concepts 1.3.1 Session 1.3.2 Query String 1.3.3 Cookie</p> <p>Unit 2 MVC Architecture</p> <p>2.1 Introduction to MVC Framework 2.2 Building an MVC page 2.3 Web Page Routing 2.4 Controller, Model, and View 2.5 Data Access and Modeling 2.6 CRUD operation in MVC 2.7 Entity framework – ORM model</p> <p>Unit 3 Database Concepts</p> <p>3.1 Working with external Database 3.2 Introduction to LINQ 3.3 Lambda Expression 3.4 Query Expression</p>





	<p>3.5 Data Access with LINQ</p> <p>3.5.1 Introduction of LINQ</p> <p>3.5.2 LINQ to Dataset</p> <p>3.5.3 LINQ to SQL</p> <p>Unit 4 Web Application Security</p> <p>4.1 Authentication</p> <p>4.1.1 Forms Authentication</p> <p>4.1.2 Windows Authentication</p> <p>4.2 Authorization</p> <p>4.3 Role-Based Security</p> <p>4.4 SQL injection</p> <p>Unit 5 Working with E-mail</p> <p>5.1 Introduction</p> <p>5.2 Smtplib Class</p> <p>5.2.1 Smtplib Class properties</p> <p>5.3 MailMessage Class</p> <p>5.4 Attachment Class</p> <p>Unit 6 Web Services</p> <p>6.1 Basic of Web Services</p> <p>6.2 Discovering Web Services Using UDDI</p> <p>6.3 Creating a Web Service</p> <p>6.4 Web Service Consumers</p> <p>6.5 Web Service using RESTful, Web Service SOAP</p> <p>Unit 7 Working with Web API</p> <p>7.1 Introduction to Web API</p> <p>7.2 Web API Controller</p> <p>7.3 Web API Routing</p> <p>7.4 Implementing Http Get Request</p> <p>7.5 Implementing Http Put Request</p> <p>7.6 Implementing Http Post Request</p> <p>7.7 Implementing Http Delete Request</p> <p>Unit 8: CICD using Github</p> <p>8.1 Overview of Continuous integration</p> <p>8.2 Github Actions</p> <p>8.3 Github Action Components</p> <p>8.3.1 Workflow files</p> <p>8.3.2 CI with workflow templates</p> <p>8.3.3 Viewing job activity</p>
Text and Reference Literature	<ol style="list-style-type: none"> 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





Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	Master of Science Artificial Intelligence and Data Science		
Year	2025-26		Version	1.0		
Semester	1		Effective From	April, 2025		
Course Code	MSCS12102	Course Name	Web Engineering			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	4	0	0	70	30	100

Purpose of Course	The purpose of the course is to make students capable of understanding and implementing Web engineering concepts, approaches and methodologies.
Course Objective	To provide a comprehensive knowledge of and Practical Environment for Web Engineering methodologies and approaches
Pre-requisite	Basic Concept of Software Engineering.
Course Out come	After completion of this course, the student will be capable of : a) Identifying Specific requirements pertaining to Web Applications in context b) Designing Web Applications following sound principle and methods c) Testing Web Applications and managing the changes in it.
Course Content	<p>Unit 1 Web-Based Systems and Web Engineering Process</p> <p>1.1 The Web & WebApps, Attributes of WebApps and Categories 1.2 Web Engineering and WebE Framework 1.3 Principles for WebE Framework 1.4 The Components of Web Engineering 1.5 Relationship between Software Engineering and WebE 1.6 WebE Process & Agile Methodology, WebE Methods 1.7 Web Engineering Best Practices</p> <p>Unit 2 Communication Activity Problem Formulation Tasks Requirement Elicitation</p> <p>2.1 Stakeholders and User categories 2.2 Tasks before and During Elicitation Session 2.3 Identifying Content and Functional Requirements 2.4 Isolating Constraints and Performance Issues 2.5 Creating Usage Scenarios and usecases 2.6 Identifying WebApp Increments 2.7 Requirement Negotiation</p>





	<p>7.4 Testing Strategy & Test Planning, 7.3 User Interface Testing 7.4 Usability Testing 7.5 Compatibility Testing 7.6 Component-Level Testing 7.7 Navigation Testing- Test Navigation Syntax and Semantics 7.8 Configuration Testing 7.9 Security and Performance Testing 7.10 Load Testing and Stress Testing of WebApps 7.11 Change Management 7.12 Content Management</p> <p>Unit 8 Current Trends and Future directions in Web Engineering Current Trend in Web Engineering Tools and Technologies</p> <p>8.1 General Issues in Web Engineering 8.2 Implementation Tools and Technologies , Application Frameworks 8.3 Content Management Systems and Version Control Technologies Search Capability in WebApps 8.4 Development Tools and Technologies 8.4.1 Tools for Modeling Activity 8.4.2 Tools for Testing WebApps 8.4.3 Tools for Management of the WebE Process 8.5 Future Directions 8.5.1 The Changing Nature of the Web and WebApps - Delivery of Web-Based Content and Functionality change 8.5.2 How to Accommodate the Changes? 8.5.3 Web as a Platform for Application Software and OS 8.5.4 Effects of “Semantic Web” 8.5.5 Evolving Web Technologies, Web 2.0 and Web 3.0</p>
Text and Reference Literature	<ol style="list-style-type: none"> 1) Web Engineering: A Practitioner’s Approach – Pressman and Lowe, Tata McGraw-Hill Publication 2) Software Engineering : A Practitioner’s Approach- 6e by Roger S. Pressman, , Tata McGraw-Hill publication. 3) Web Engineering-Rajiv Chopra, PHI publication. 4) Web Site Engineering: Beyond Web Page Design 1st Edition, - Thomas A. Powell , David L. Jones and Dominique C. Cutts 5) Web Engineering: The Discipline of Systematic Development of Web Applications by Gerti Kappel (Editor), Birgit Pröll (Co-Editor), Siegfried Reich Werner Retschitzegger, Wiley Publication 6) Web Engineering: Modelling and Implementing Web Applications Editors: Rossi, G., Pastor, O., Schwabe, D., Olsina, L. (Eds.) – Springer 7) Web Engineering-by Carson Thomas , Larsen and Keller Education, Engineering Web Applications By Casteleyn, S., Daniel, F., Dolog, P., Matera, M., Springer Publication



Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	Master of Science Artificial Intelligence and Data Science		
Year	2025-26		Version	1.0		
Semester	1		Effective From	April, 2025		
Course Code	MSCS12103	Course Name	Distributed and Parallel Computing			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	4	0	0	70	30	100

Purpose of Course	The purpose of the course is to make students capable of understanding the concepts of advance computing systems like distributed and parallel computing.
Course Objective	To provide a comprehensive knowledge of distributed and parallel computing methodologies and approaches.
Pre-requisite	NIL
Course Out come	At the end of the course, student will have understanding about the concepts of distributed and parallel computing.
Course Content	<p>Unit 1. Introduction to Distributed systems</p> <p>1.1 Various systems and services - Email and Messaging Services, The World wide Web, Social Networking Service, News, Remote Login and File Transfer, Multimedia Transfer</p> <p>1.2 Distributed Computation Model, Distributed Transaction processing and Ecommerce, Distributed Real-time Processing</p> <p>1.3 Issues- Naming, Sharing, Availability and Reliability, Replication, Privacy and Security, Communication, Concurrency and Synchronization, Time and Coordination, Fault Tolerance and Recovery, Scalability</p> <p>Unit 2 Software and Network Architecture for Distributed Systems</p> <p>2.1 Software Architecture</p> <p>2.1.1 Cooperating Processes and Process Groups-Group membership and Message Delivery.</p> <p>2.1.2 Client-Server and Peer-to-Peer Communication</p> <p>2.1.3 Component Models, Components and Frameworks</p> <p>2.1.4 Web Services</p> <p>2.2 Network Architecture</p> <p>2.2.1 Functions of layers in OSI Reference Model</p>



	<p>2.2.2 Inter connection Networks for Computer Clusters- Time Shared or Common Bus, Crossbar Switch, Multistage Networks, Nearest Neighbour Mesh, Cube Network</p> <p>Unit 3 Managing Distributed Resources</p> <p>3.1 Resource Naming and Addressing-Name Servers, DNS and Directory Services</p> <p>3.2 Resource Sharing – Sharing primary memory, Distributed Shared memory, Page based DSM, Logical DSM</p> <p>3.3 Managing Resource Availability and Reliability- concerns in LAN and WAN, Processor and Memory Upgrades and Software Design</p> <p>3.4 Resource Replication – Replicas as Members of a Group, Reliability of Message Delivery, Message Ordering</p> <p>3.4 Managing Privacy and Security-Cryptography, Kerberos and Others</p> <p>Unit 4 Accessing Distributed Resources</p> <p>4.1 Communication over distributed resources- RPC, Message Passing, Sockets and Streams</p> <p>4.2 Concurrency while accessing Distributed Resources-Distributed Deadlock and Replica Control</p> <p>4.3 Coordination of Distributed Resources-Logical and Physical Clocks</p> <p>4.4 Fault Tolerance and Recovery – Lost messages, Failed Nodes, Partitioning</p> <p>4.5 Transaction management- Concurrent Transactions, Atomic Transactions, Nested Transaction, The BASE methodology</p> <p>Unit 5 Major Application areas and Examples</p> <p>5.1 Distributed File Systems- File Servers, File sharing in P2P, NFS, Coda File System and Google File System</p> <p>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</p> <p>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, Windows NT Family</p> <p>5.4 Distributed Computation Systems and Grid Computing-</p> <p>5.4.1 Concerns related to Network platform, algorithm design and implementation and Choice of languages, Standards and Tools</p> <p>5.4.2 Grid Computing examples -XSEDE, The OptIPuter, TransLight/Global Lambda Integrated Facility</p> <p>5.5 Internet Driven System examples- Apache Dynamo and DynamoDB, Apache Cassandra, Google’s BigTable, BitTorrent, Accessing Replicas in a Distributed Systems</p> <p>5.6 Other Distributed Systems</p> <p>5.6.1 Distributed Realtime Systems</p> <p>5.6.2 Distributed Multimedia Systems</p> <p>Unit 6 Parallel Processing Architectures</p> <p>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</p> <p>6.2 Parallelism in Sequential Machines- Multiplicity of Functional Units, Pipelining within the CPU, Overlapped CPU and I/O Operations, Hierarchical</p>
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	<p>Memory Systems, Multiprogramming and Timesharing 6.3 Abstract Model of Parallel Computer – P-RAM 6.4 Multiprocessor Architecture, Pipelining and Array Processors, Interconnection Networks</p> <p>Unit 7 Parallel Programming Issues 7.1 Parallel Programming Models and Software Tools 7.2 Data Dependency- Types of Dependencies, Loop and Array Dependence 7.3 Program Transformations- Induction variables, Forward Dependency, Backward Dependences, Breaking out of a Loop, Loop Spitting, Loop interchange. 7.4 Overview of Shared Memory Programming and Thread Based Implementation 7.5 Map-Reduce Model of Parallelism</p> <p>Unit 8 Distributed Computing 8.1 Message Passing Model for synchronous and asynchronous message passing 8.2 PVM-PVM terminology, Architecture of PVM, Programming Model of PVM, Dynamic Process Groups 8.3 RPC-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, Security Distributed Computing Environment-DCE Architecture, DCE Configuration, DCE Directory Services, Distributed File Service, DCE Security Service, DCE Time Service</p>
Reference Book	<ol style="list-style-type: none"> 1. Distributed Systems: Concepts and Design, George Coulouris , Jean Dollimore , Tim Kindberg , Gordon Blair , Pearson, ISBN-10 : 0132143011 2. Distributed Computing: Principles, Algorithms, and Systems, by Ajay D. Kshemkalyani , Mukesh Singhal, Cambridge University Press, ISBN-13 : 978-0521189842 3. Distributed Systems Architecture, Authors: Arno Puder Kay Römer Frank Pilhofer ISBN: 9780080454702, Imprint: Morgan Kaufmann 4. Introduction to Parallel Processing, M.Sasikumar, Dinesh Shikhare, P. Ravi Prakash, PHI Publication, ISBN-13 : 978-8120350311 5. Fundamentals of Parallel Processing, Harry Jordan, Gita Alaghband, Pearson,ISBN-13 : 978-0139011580





Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science	Program	Master of Science Artificial Intelligence and Data Science			
Year	2025-26	Version	1.0			
Semester	1	Effective From	April, 2025			
Course Code	MSCS12104	Course Name	Foundations of Advanced Computing			
Teaching Scheme			Examination Scheme			
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
4	4	0	0	70	30	100

Purpose of Course	The purpose of the course is to lay foundation of statistics, mathematics and python programming for data science, machine learning, data analytics etc.
Course Objective	<ul style="list-style-type: none"> ◆ To learn about basic statistics and mathematics needed for data science, machine learning, data analytics etc. ◆ To learn python programming with advanced libraries
Pre-requisite	Concepts of Mathematics and Computer Programming
Course Out come	After completion of this course, the student will be able to use mathematical and statistical concepts for basic data science operations.
Course Content	<p>Unit 1 Introduction to Statistics</p> <p>1.1 Role of Statistics in Computing 1.2 Grouped Data and Mean 1.3 The median and the mode 1.4 Relationship between Mean, Mode, Median 1.5 Data Distribution using Frequency 1.5 Root mean square, Quartiles, Deciles and Percentiles 1.6 Standard Deviation and Variance 1.7 Software and Measures of Central Tendency 1.8 Overview of Calculus - Differentiation and Integration, Predictions and Cost Functions</p> <p>Unit 2 Co-Relation Theory and Linear Equations</p> <p>2.1 Correlation 2.1.1 Relationship between variables 2.2.2 Correlation Analysis 2.2 Types of Correlation 2.3 Co-efficient of Correlation® and its Interpretation 2.4 Curve Fitting and Equations 2.5 Non Linear Relationship</p>



	<p>2.6 Regression 2.7 Regression Analysis 2.8 Accuracy Measures and Error - RMSE, MSE, MAE</p> <p>Unit 3 Probability Theory 3.1 Probability and Conditional Probability 3.2 Events 3.3 Probability Distributions 3.4 Sampling Theory 3.5 Binomial Distributions</p> <p>Unit 4 Matrices, Graphs and Tree 4.1 Matrices as Vectors, Dimension and Rank 4.2 Transpose, Multiplication, Dot Product, Inverse 4.3 Matrices Implementation in Computational Problem Solving 4.4 Graph Definitions, Theory and Elementary Results 4.5 Adjacency Matrix and Path Matrix 4.6 Tree Definitions, Binary Tree 4.7 Tree Traversal and Searching</p> <p>Unit 5 Language, Grammars and Machines 5.1 Languages and Grammars 5.2 Regular Expression and Regular Languages 5.3 Finite State Automata, Finite State Machines</p> <p>Unit 6 Python Programming Concepts 6.1. Python's core philosophy 6.2. Jupyter Notebook, Jupyter Lab, basic elements of Python, Objects, Expression and numerical types, Variables and Assignments, IDLE, Branching Programs, String Input, Iteration, Indentation 6.3. Operations on Structured Types-Tuples, Sequence, Lists, Range, Dictionaries 6.4 Functions, Exception and Modules- Difference between Function and Method, Defining Function, Calling Function, Exception handling</p> <p>Unit 7 Python Libraries : Numpy and SciPy 7.1 Arrays and Vectorized Computation using NumPy 7.2 NumPy ndarray: A Multidimensional Array Object 7.2.1 Universal Functions: Fast Element-wise Array Functions 7.2.2 Data Processing and File I/O with Arrays 7.3 Scientific Computing and technical computing using SciPy 7.3.1. File Input /Output : scipy.io 7.3.2 Special Functions : scipy.special 7.3.3 Linear Algebra operations: scipy.linalg 7.3.4 Optimize and Fit : scipy.optimize 7.3.5 Statistic and Random Numbers: scipy.stats</p> <p>Unit 8 Python Libraries : Pandas and Matplotlib 8.1 Introduction to pandas Data Structures 8.2 Operations on Data 8.2.1 Reading and Writing Data in Text Format</p>
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	<p>8.2.2 Summarizing and Computing Descriptive Statistics</p> <p>8.2.3 Handling Missing Data, Combining and Merging Data Sets, Reshaping and Pivoting, Data Transformation, String Manipulation</p> <p>8.3 Plotting and Visualization</p> <p>8.3.1 Fundamentals of Matplotlib API</p> <p>8.3.2 Plotting Functions in Pandas</p>
Text and Reference Literature	<ol style="list-style-type: none"> 1. Discrete Mathematics - Sujit Chavan, Nandani Sakhare, Himalaya Publishing House 2. Computer Oriented Statistical Techniques - Dinesh Gabhane, Madhuri S. Banker, Himalaya Publishing House 3. Linear Algebra using Python - Archana Jadhav, Nandini Sakhare, Himalaya Publishing House 4. Python Data Science FOR Dummies - John Paul Mueller, Luca Massaron - Wiley Publication 5. Davy Cielen, Arno D. B. Meysman, and Mohamed Ali, Manning Publication 6. Data Science for Business, Tom Fawcett, Foster Provost , O'relly Publication 7. Python Data Science Handbook, Jake VanderPlas, O'relly Publication 8. Core Python Programming, Nageshwar Rao, dreamtech press





Name of College: Shree Ramkrishna Institute of Computer Education and Applied Sciences						
Faculty	Science		Program	Master of Science Artificial Intelligence and Data Science		
Year	2025-26		Version	1.0		
Semester	1		Effective From	April, 2025		
Course Code	MSCS16106	Course Name	Practical and Project- 1			
Teaching Scheme				Examination Scheme		
Credits	Lecture (L)	Tutorial (T)	Practical (P)	Continuous Assessments (CA)	Term end examinations (TEE)	Total
8	0	0	16	70	30	100

Purpose of Course	The purpose of the course is to make students capable of implementing concepts, methods, tools and techniques studied in courses of semester 1.
Course Objective	The objective of these course is to enable students to learn practical implementation of DSC-1, DSC-2, SEC-1 and DSE-1 or implement inhouse or industrial projects.
Pr-requisite	As per theory papers of semester -1
Course Out come	After completion of this course, the student will be capable of performing practical application of subjects given in semester -1.
Course Content	The students will be required to carry out practical on DSC-1, DSC-2, SEC-1 and DSE-1 using the methods and tools discussed there in. A Journal must be prepared for the practical and project work done.
Reference Book	As per paper DSC-1, DSC-2, SEC-1 and DSE-1.
Teaching Methodology	Lab and Project Work

