



**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS),
SIVAKASI – 626 123.**

(Affiliated to Madurai Kamaraj University, Re-accredited with A+ Grade by NAAC,
College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

**DEPARTMENT OF DATA SCIENCE
UG DEGREE PROGRAMME IN DATA SCIENCE**

PROGRAMME EDUCATIONAL OBJECTIVES

The Graduates will be prepared to

PEO1.	be competent software professionals, take up progressive careers in industry and pursue higher studies.
PEO2.	be proficient in developing innovative solutions to complex real life problems using existing and novel technologies and become ethical and responsible towards themselves, coworkers, society and nation.
PEO3.	adapt to new technologies and constantly upgrade their skills to be a successful Entrepreneur.

PROGRAMME LEARNING OUTCOMES

By the Completion B.Sc(DS) programme, the learners will be able to

PLO1.	Apply the knowledge of Arts, Science and Humanities to address fundamental and complex questions appropriate to their programmes.
PLO2.	Make use of appropriate knowledge and skills to identify, formulate, analyze and solve problems in order to reach substantiated conclusions
PLO3.	Critically analyze research processes, products and practices with a view of strategic use of data in their field.
PLO4.	Demonstrate skills in oral and written communication and make use of ICT in various learning ambience.
PLO5.	Interact productively with people from diverse backgrounds as both leaders/mentors and team members with integrity and professionalism.
PLO6.	Defend the society against gender and environmental issues with moral and ethical awareness.
PLO7.	Formulate their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge.

Core Course	
Course Code: 24GQC11	Course Title: PYTHON PROGRAMMING
On successful completion of the course, the learners should be able to	
CLO1[K2]	discuss the Python components, control statements, functions, strings, data structures and file handling.
CLO2[K3]	demonstrate the control Statements and data structures of Python
CLO3 K4]	illustrate the OOPs concepts and methods in Python
CLO4[K5]	choose the appropriate methods for handling files and justify the usage of data structures
CLO5[K6]	create simple Python programs using control statements, functions and strings.

Core Course	
Course Code: 24GQC1L	Course Title: PYTHON PROGRAMMING LAB
On successful completion of the course, the learners should be able to	
CLO1[K2]	express in own words about the concepts and logic used in Python programs.
CLO2[K3]	develop Python programs for scientific and general applications.
CLO3 K4]	debug the Python programs and correct the syntax and logical errors.
CLO4[K5]	check output for special cases and validate the input and output with appropriate messages
CLO5[K6]	make modifications in the program logic to improve the efficiency of Python programs

Generic Elective Course	
Course Code: 24GQEG11	Course Title: MATHEMATICAL STATISTICS
On successful completion of the course, the learners should be able to	
CLO1[K2]	illustrate the concepts of statistics method to compute averages for statistics data.
CLO2[K3]	identify probability value of real-life situation problem by using probability and distribution concepts.
CLO3 K4]	analyze casual relation between two variables by using correlation and regression methods
CLO4[K5]	illustrate significance difference between null and alternative hypothesis for statistical data.
CLO5[K6]	recognize the trends between two statistical data by using time series method and solution of forecasting problems

Foundation Course	
Course Code: 24GQFC1L	Course Title: PROBLEM SOLVING USING C LAB
On successful completion of the course, the learners should be able to	
CLO1[K2]	discuss the key concepts and logics used in C Programs.
CLO2[K3]	develop programs using control statements and loop statements.
CLO3 K4]	dissect the complex programs using functions and structures
CLO4[K5]	evaluate the program using pointers and files.
CLO5[K6]	build programs to solve various problems.

Core Course	
Course Code: 24GQC21	Course Title: PRINCIPLES OF DATA SCIENCE
On successful completion of the course, the learners should be able to	
CLO1[K2]	represent the basic concepts and methods of data science and the tools and database connectivity for Data science.
CLO2[K3]	make use of Data Science tools in Python and R.
CLO3 K4]	examine the data science tools, methods, database connectivity and data visualization.
CLO4[K5]	interpret the methods to create GUI programs for Data science.
CLO5[K6]	develop real world applications using Python and R for Data science.

Core Course	
Course Code: 24GQC2L	Course Title: DATA SCIENCE PROGRAMMING LAB
On successful completion of the course, the learners should be able to	
CLO1[K2]	explain the fundamentals of Data science programming.
CLO2[K3]	identify the methods and functions to handle data sets using R and Python.
CLO3 K4]	illustrate the usage of data frames in handling data sets using Pandas.
CLO4[K5]	explore the purpose of visualization using R and Python.
CLO5[K6]	develop simple GUI programs for Data science algorithms and database connectivity.

GENERIC ELECTIVE COURSE

Course Code: 24GQEG21

Course Title: OPTIMIZATION TECHNIQUES

On successful completion of the course, the learners should be able to

CLO1[K2]	explain the key concepts and applications of various optimization techniques.
CLO2[K3]	identify the appropriate optimization technique for a given problem.
CLO3 K4]	analyze the network analysis, dynamic programming and decision analysis to enhance effectiveness.
CLO4[K5]	interpret the deterministic Dynamic programming problem using the appropriate optimization technique.
CLO5[K6]	create the models for networking and decision making

Core Course

Course Code: 24GQC31

Course Title: RELATIONAL DBMS

On successful completion of the course, the learners should be able to

CLO1[K2]	explain the RDBMS concepts, SQL languages and PL/SQL features.
CLO2[K3]	construct E-R models, SQL queries and PL/SQL procedures.
CLO3 K4]	distinguish and compare different data models and normal forms used to represent a database and various SQL queries for managing the database.
CLO4[K5]	criticize a database design and improve the design by normalization.
CLO5[K6]	create PL/SQL blocks, Functions, Procedures, Exceptions and Triggers

Core Course

Course Code: 24GQC3L

**Course Title: RDBMS LAB
USING ORACLE**

On successful completion of the course, the learners should be able to

CLO1[K2]	describe the creation and manipulation of database using ORACLE.
CLO2[K3]	construct SQL queries and PL/SQL procedures.
CLO3 K4]	analyze various functions available in DML & DDL commands
CLO4[K5]	evaluate queries in SQL to retrieve any type of information from a data base
CLO5[K6]	build PL/SQL programs using triggers, cursors and exception handling.

GENERIC ELECTIVE COURSE

Course Code: 24GQEG31

Course Title: LINEAR ALGEBRA

On successful completion of the course, the learners should be able to

CLO1[K2]	explain the Matrix methods to solve the system of linear equations.
CLO2[K3]	apply the infinite series and vector calculus.
CLO3 K4]	examine the extreme values of functions of two variables and vector integral calculus.
CLO4[K5]	assess the matrix methods, infinite series, partial differentiation and vector calculus.
CLO5[K6]	solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.

SKILL ENHANCEMENT COURSE

Course Code: 24GQDS31

Course Title: DATA STRUCTURES

On successful completion of the course, the learners should be able to

CLO1[K2]	explain the abstract data types of linear and non-linear data structures.
CLO2[K3]	implement various operations on linear and non-linear data structures
CLO3 K4]	analyze the efficiency of various data structures.
CLO4[K5]	interpret evaluation of expressions and choose the appropriate data structure to solve the problem
CLO5[K6]	devise algorithms for tree traversals, graph operations and sorting techniques.

SKILL ENHANCEMENT COURSE

Course Code: 24GQES3L

Course Title: PHP PROGRAMMING LAB

On successful completion of the course, the learners should be able to

CLO1[K2]	define the basic concepts of PHP programming.
CLO2[K3]	use arrays, operators, control structures and functions to develop PHP program.
CLO3 K4]	analyze flow control, string functions and file concepts in PHP application.
CLO4[K5]	justify and assess the importance of controls in web pages.
CLO5[K6]	design and develop dynamic, database-driven web applications using PHP.

CORE COURSE

Course Code: 24GQC41

**Course Title: OBJECT
ORIENTED PROGRAMMING IN
JAVA**

On successful completion of the course, the learners should be able to

CLO1[K2]	describe the fundamentals of java components, inheritance, packages, threads, I/O streams, networking and AWT controls.
CLO2[K3]	build programs using thread, packages, exception handling, Applet and AWT.
CLO3 K4]	compare and analyze the features of thread, inheritance, Collections and networking.
CLO4[K5]	demonstrate the concepts of Event handling and String handling in java.
CLO5[K6]	construct classes for a given problem using appropriate encapsulation and design principles.

CORE COURSE

Course Code: 24GQC4L

Course Title: JAVA PROGRAMMING LAB

On successful completion of the course, the learners should be able to

CLO1[K2]	describe the basic features of java programming.
CLO2[K3]	make use of java features to develop scientific and general applications.
CLO3 K4]	analyze the problems in terms of java concepts like packages, threading and exception handling.
CLO4[K5]	evaluate the java applets to get real time processing.
CLO5[K6]	construct java core programs and applet programs in an efficient way.

GENERIC ELECTIVE COURSE

Course Code: 24GQEG41

**Course Title: THEORY OF
PROBABILITY**

On successful completion of the course, the learners should be able to

CLO1[K2]	discuss the basic concepts of probability, random variables, estimation theory and theory of attributes.
CLO2[K3]	develop effective solutions for two-dimensional random variables and non-parametric test.
CLO3 K4]	distinguish the knowledge of testing the hypothesis for small and large samples which plays an important role in real life problems.
CLO4[K5]	criticize Non parametric tests and estimation theory.
CLO5[K6]	design the association of attributes to obtain a quantitative measure of association between two attributes.

GENERIC ELECTIVE COURSE

Course Code: 24GQC51

Course Title: AI & MACHINE LEARNING

On successful completion of the course, the learners should be able to

CLO1[K2]	describe the AI techniques, machine learning algorithms and deep learning terminologies.
CLO2[K3]	develop an application using appropriate supervised and unsupervised learning algorithms for performing regression, clustering and classification
CLO3 K4]	analyze the usage of machine learning and deep learning in solving complex problem.
CLO4[K5]	evaluate the AI techniques and choose the appropriate machine learning and deep learning algorithm to solve any given problem.
CLO5[K6]	propose solutions to problems using AI and machine learning algorithms.

CORE COURSE	
Course Code: 24GQC52	Course Title: DATA MINING AND WAREHOUSING
On successful completion of the course, the learners should be able to	
CLO1[K2]	explain the basic concepts of data mining and data warehousing along with Association, Correlation, Classification and Clustering.
CLO2[K3]	apply the methods of Classification, Cluster analysis and Pattern mining.
CLO3 K4]	analyze the principles of Association, Correlations, Classification, Clustering methods and Data warehousing.
CLO4[K5]	evaluate the analytical idea on Classification and Prediction methods and Data preprocessing.
CLO5[K6]	develop the frequent Itemset Mining and Decision Tree Induction

CORE COURSE	
Course Code: 24GQC5L	Course Title: MACHINE LEARNING LAB
On successful completion of the course, the learners should be able to	
CLO1[K2]	describe the procedures for machine learning algorithms.
CLO2[K3]	apply appropriate datasets to the Machine Learning algorithms.
CLO3 K4]	classify various machine learning tools.
CLO4[K5]	evaluate the graphical outcomes of learning algorithms with specific datasets.
CLO5[K6]	build Python programs for various machine learning algorithms.

CORE COURSE

Course Code: 24GQC5P

**Course Title: PROJECT WITH
VIVA-VOCE**

On successful completion of the course, the learners should be able to

CLO1[K2]	define the knowledge, skills, experience and ethical values to become lifelong learners.
CLO2[K3]	build computerized and analytical solutions to real life problems using appropriate methods.
CLO3 K4]	examine the algorithms with the problems to find the solutions.
CLO4[K5]	assess the structured programming techniques for business to meet the global demand.
CLO5[K6]	develop computer based object-oriented programming paradigms.

DISCIPLINE SPECIFIC ELECTIVE COURSE

Course Code: 24GQDE51

**Course Title: SOFTWARE
ENGINEERING**

On successful completion of the course, the learners should be able to

CLO1[K2]]: illustrate the software engineering life cycle models, project management techniques, requirement analysis, designing, coding, testing and maintenance of software.
CLO2[K3]	make use of software project management techniques, design techniques and notations to design efficient software.
CLO3 K4]	distinguish and compare different software life cycle models, design notations and testing strategies
CLO4[K5]	evaluate the source code metrics, programmer months and development time using estimation techniques.
CLO5[K6]	construct the software design using various design techniques and estimate the project cost.

DISCIPLINE SPECIFIC ELECTIVE COURSE

Course Code: 24GQDE52

**Course Title: NATURAL LANGUAGE
PROCESSING**

On successful completion of the course, the learners should be able to

CLO1[K2]	understand the concepts behind the language understanding system, regular expressions, semantics, machine translation, chatbots and speech recognition.
CLO2[K3]	perform text classification, sentiment analysis, machine translation and speech recognition
CLO3 K4]	analyze the Language models, semantics, information retrieval techniques and chatbot logics.
CLO4[K5]	evaluate the retrieval-based question answering and automatic speech recognition.
CLO5[K6]	build methodologies for word tokenization of regular expressions, I classification and vector semantics.

DISCIPLINE SPECIFIC ELECTIVE COURSE

Course Code: 24GQDE53

**Course Title : DATA COMMUNICATION
AND NETWORKS**

On successful completion of the course, the learners should be able to

CLO1[K2]	express the working principles of each layers of network model
CLO2[K3]	utilize the error detection techniques and identify the class hierarchy of network addresses.
CLO3 K4]	analyze the services and features of various protocol layers in data networks.
CLO4[K5]	assess the various protocols used in each layer to transfer the data.
CLO5[K6]	predict the methodologies behind the routing protocols and congestion

DISCIPLINE SPECIFIC ELECTIVE COURSE

Course Code: 24GQDE54

Course Title: DISTRIBUTED COMPUTING

On successful completion of the course, the learners should be able to

CLO1[K2]	express the architectures, algorithms, programming models and authentication protocols used in distributed systems.
CLO2[K3]	identify the issues in deadlock, rollback recovery and various algorithms in distributed systems.
CLO3 K4]	analyze the distributed computation models, group communication, deadlock detection, rollback recovery and authentications in distributed systems.
CLO4[K5]	justify the usages of various algorithms in distributed systems.
CLO5[K6]	propose the recovery strategy and authentication mechanism in case of loss or theft.

CORE COURSE

Course Code: 24GQIN51

Course Title: INTERNSHIP

On successful completion of the course, the learners should be able to

CLO1[K2]	relate the theoretical knowledge with work place practices.
CLO2[K3]	apply the practices and procedures observed in real time working environment.
CLO3 K4]	analyze the workflow and communication flow prevailing in the institution/industry.
CLO4[K5]	assess interests and abilities in their field of study.
CLO5[K6]	propose strategies, policies and guidelines for enhancing efficiency of industrial/ institutional operations.

CORE COURSE	
Course Code: 24GQC61	Course Title: IoT AND CLOUD TECHNOLOGIES
On successful completion of the course, the learners should be able to	
CLO1[K2]	describe the basics of IoT and Cloud Computing features, services and security issues.
CLO2[K3]	identify the appropriate services of a Cloud for application development.
CLO3 K4]	analyze the IoT technologies, cloud services, the security and legal issues in Cloud computing.
CLO4[K5]	choose the appropriate Cloud types and services for project management.
CLO5[K6]	propose the suitable IoT and cloud services for various applications

CORE COURSE	
Course Code: 24GQC62	Course Title: DATA VISUALIZATION
On successful completion of the course, the learners should be able to	
CLO1[K2]	describe the Big data analytics and its frameworks and various data visualization tools.
CLO2[K3]	identify problems where Data analytic frameworks are applicable.
CLO3 K4]	analyze the Big data analytic frameworks and data visualization tools.
CLO4[K5]	assess the design flow of Tableau and dashboard usages of PowerBI.
CLO5[K6]	build visualizations using various bigdata frameworks and visualization tools

CORE COURSE

Course Code: 24GQC6L

**Course Title: MOBILE APPLICATION
DEVELOPMENT LAB**

On successful completion of the course, the learners should be able to

CLO1[K2]	describe the working environment of Android IDE.
CLO2[K3]	build Applications using various controls and dialog boxes.
CLO3 K4]	analyze the layouts, methods and interfaces in APK file.
CLO4[K5]	interpret the intent and content providers in Application development.
CLO5[K6]	create effortless menus and simple Applications using sqlite.

DISCIPLINE SPECIFIC ELECTIVE COURSE

Course Code: 24GQDE61

Course Title: CRYPTOGRAPHY

On successful completion of the course, the learners should be able to

CLO1[K2]	explain the basics of security along with Symmetric, Asymmetric and Cryptographic Algorithm techniques and security practices.
CLO2[K3]	apply the different cryptographic operations to secure the data.
CLO3 K4]	analyze the cipher techniques and the security practices in various computing environment.
CLO4[K5]	choose the appropriate Symmetric /Asymmetric Ciphers to perform cryptographic operations.
CLO5[K6]	build various Security practices to simulate different applications.

DISCIPLINE SPECIFIC ELECTIVE COURSE

Course Code: 24GQDE62

Course Title: INFORMATION SECURITY

On successful completion of the course, the learners should be able to

CLO1[K2]	represent the security issues and the remedial techniques in program, OS and network.
CLO2[K3]	identify the cryptographic techniques for authentication.
CLO3 K4]	examine the program security and network security vulnerabilities and handling mechanisms.
CLO4[K5]	justify the program security, OS security and network security policies.
CLO5[K6]	design the authentication keys to protect the data.

DISCIPLINE SPECIFIC ELECTIVE COURSE

Course Code: 24GQDE6L1

Course Title: DATA VISUALIZATION LAB

On successful completion of the course, the learners should be able to

CLO1[K2]	reproduce the importance of data visualization for business intelligence and decision making.
CLO2[K3]	make use of various data visualization approaches to convey trends in data over time using tableau and PowerBI.
CLO3 K4]	examine the categories of visualization and application areas.
CLO4[K5]	decide the effective data visuals to perform real time data analysis.
CLO5[K6]	create effective visualizations using tableau, PowerBI and Google Charts to analyze the data.

DISCIPLINE SPECIFIC ELECTIVE COURSE

Course Code: 24GQDE6L2

Course Title: BIG DATA ANALYTICS LAB

On successful completion of the course, the learners should be able to

CLO1[K2]	understand the working principles of various Big data frameworks.
CLO2[K3]	apply MapReduce programs and data processing tools to solve real time issues.
CLO3 K4]	critically analyze huge data set using Hadoop, PySpark and HIVE.
CLO4[K5]	explore MapReduce support for debugging.
CLO5[K6]	design a suitable data process for Bigdata analytics using the suitable framework.

NON MAJOR ELECTIVE COURSE

Course Code: 24GQNE11

Course Title: INTRODUCTION TO DATA SCIENCE

On successful completion of the course, the learners should be able to

CLO1[K2]	elaborate the fundamentals of Data science, Data Visualization and the recent trends in Data science.
CLO2[K3]	make use of Data visualization tools in Big data.
CLO3 K4]	illustrate the data science process, trends and purpose of Retinal variables in data visualization.
CLO4[K5]	choose suitable data science model applicable for the problem.
CLO5[K6]	develop the data visualization using appropriate tool.

NON MAJOR ELECTIVE COURSE

Course Code: 24GQNE21

Course Title: AI TOOLS MADE EASY

On successful completion of the course, the learners should be able to

CLO1[K2]	elaborate the working principles of AI and AI models.
CLO2[K3]	identify the methodology used behind ChatGPT, Dall-E and Gemini.
CLO3 K4]	classify the types of AI and AI tools along with its features.
CLO4[K5]	justify the impact of Dall-E and relevant AI tools.
CLO5[K6]	predict the impact of AI tools on creativity, writing and productivity.

SKILL ENHANCEMENT COURSE

Course Code: 24GJO41

Course Title: DATA VISUALIZATION WITH POWER BI

On successful completion of the course, the learners should be able to

CLO1[K2]	explain the Power BI reports, data refresh, database connectivity and data model creation.
CLO2[K3]	develop the report using PowerBI dashboard.
CLO3 K4]	examine the PowerBI desktop features and dashboard.
CLO4[K5]	justify the usage of PowerBI desktop in creating data visualization.
CLO5[K6]	create interactive reports with visual analytics

SKILL ENHANCEMENT COURSE

Course Code: 24GJO41L

**Course Title: DATA VISUALIZATION WITH
POWER BI LAB**

On successful completion of the course, the learners should be able to

CLO1[K2]	discuss the process of cleaning, transforming and loading data in PowerBI.
CLO2[K3]	design data models in Power BI.
CLO3 K4]	illustrate the creation of chart, matrix and pivot table.
CLO4[K5]	predict the reports and adding texts, images and shapes in Power BI.
CLO5[K6]	create various reports and charts in PowerBI.