



**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 COMPUTER SCIENCE
UG DEGREE PROGRAMME IN COMPUTER SCIENCE**

PROGRAMME EDUCATIONAL OBJECTIVES

The Graduates will

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| 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 of the B.Sc Degree Programme in Computer Science, the learners will be able to

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| 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. |

COURSE LEARNING OUTCOME

| Core Course | |
|--|--|
| Course Code: 23GSC11 | Course Title: PYTHON PROGRAMMING |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basics of python, functions, data structures and files |
| CLO2[K3] | develop simple programs using control statements, data structures in python |
| CLO3[K4] | analyze the functions, strings and modules and compare the various data structures |
| CLO4[K5] | choose the appropriate methods for handling files and justify the usage of data structures |
| CLO5[K6] | build python scripts using functions and files |

| Core Course | |
|--|--|
| Course Code: 23GSC1L | 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] | write 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: 23GSEG11

Course Title: DIGITAL LOGIC
FUNDAMENTALS

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

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| CLO1[K2] | classify various gates, binary codes and illustrate laws and theorems of Boolean Algebra |
| CLO2[K3] | convert numbers from one radix to another, apply binary addition, subtraction, 2's complement addition, subtraction and build logic circuits with optimal design |
| CLO3[K4] | analyze the working of flip-flops, register and memory |
| CLO4[K5] | evaluate the usage of multiplexer, decoder, flip flop, register, counters and memory |
| CLO5[K6] | design a digital circuit using the knowledge acquired from combinational logic, sequential logic and K-map |

Non Major Elective

Course Code: 23GSNE11

Course Title: INTERNET SERVICES

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

| | |
|----------|---|
| CLO1[K2] | explain the fundamentals of Internet and applications |
| CLO2[K3] | identify the parts of browser and structure of internet connections |
| CLO3[K4] | classify the internet connections, service provider and websites references |
| CLO4[K5] | interpret the applications of internet |
| CLO5[K6] | construct templates for e-services |

Non Major Elective

Course Code: 23GSNE12

Course Title: ADVANCED EXCEL

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

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|----------|---|
| CLO1[K2] | describe the basics of excel |
| CLO2[K3] | apply Excel tools and formulas to transform and structure your data |
| CLO3[K4] | analyze a spreadsheet charts, tools and macros in excel |
| CLO4[K5] | evaluate data using sorting, filtering and pivot tables |
| CLO5[K6] | create pivot table, charts, and data validation in Excel |

Foundation Course

Course Code: 23GSFC1L

Course Title: STRUCTURED
PROGRAMMING LAB

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

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|----------|--|
| CLO1[K2] | explain the key concepts and logic used in C programs |
| CLO2[K3] | write C programs for scientific and general applications |
| CLO3[K4] | debug the C 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 C programs |

Ability Enhancement Compulsory Course

Course Code: 23GSS11

Course Title: ENGLISH FOR
COMMUNICATION

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

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| CLO1[K2] | understand the prominent methods and models of communication |
| CLO2[K3] | identify the basic principles of communication |
| CLO3[K4] | analyze the various types of communication |
| CLO4[K5] | evaluate information critically to express opinions and engage in thoughtful discussions |
| CLO5[K6] | develop interpersonal communication skills and make use of the essential principles of communication in everyday usage |

Core Course

Course Code: 23GSC21

Course Title: DATA STRUCTURES AND
ALGORITHMS

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

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|----------|---|
| 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 algorithms in divide and conquer, greedy method, dynamic programming and backtracking |
| CLO4[K5] | interpret evaluation of expressions and choose the appropriate methods to solve the problem |
| CLO5[K6] | devise algorithms for tree traversals, graph operations, backtracking and divide and conquer problems |

Discipline Specific Elective

Course Code: 23GSDE21

Course Title: OBJECT ORIENTED
PROGRAMMING IN C++

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

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|----------|---|
| CLO1[K2] | explain the features of object oriented paradigm and constructs |
| CLO2[K3] | implement object oriented programming concepts to solve problems using C++ |
| CLO3[K4] | compare and analyze the features of object oriented programming |
| CLO4[K5] | justify and assess the importance of object oriented characteristics |
| CLO5[K6] | construct classes for a given problem using appropriate encapsulation and design principles |

Core Course

Course Code: 23GSC2L

Course Title: DATA STRUCTURES AND
ALGORITHMS LAB

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

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|----------|--|
| CLO1[K2] | express in own words the concepts in data structures and algorithms |
| CLO2[K3] | write simple C++ programs to implement the algorithms and data structures |
| CLO3[K4] | debug the programs and correct the syntax and logical error |
| 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 program |

Discipline Specific Elective

Course Code: 23GSDE22

Course Title: INTRODUCTION TO DATA SCIENCE

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

| | |
|----------|---|
| CLO1[K2] | explain the basics of Data Science and Big data |
| CLO2[K3] | apply various Algorithms in Data Science |
| CLO3[K4] | analyze the building properties of Data Science, Hadoop and concepts in Case study |
| CLO4[K5] | evaluate the outcome using machine learning algorithm and MapReduce, ACID, CAP & BASE |
| CLO5[K6] | optimize the solution for problems using machine learning algorithms |

Non Major Elective

Course Code: 23GSNE21

Course Title: G-WORK SPACE

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

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|----------|--|
| CLO1[K2] | describe the basics of G- Workspace |
| CLO2[K3] | develop simple forms and print certificate using add-ons |
| CLO3[K4] | analyze how to organize and present data professionally using G- Workspace |
| CLO4[K5] | evaluate large amounts of data with built – in – functions |
| CLO5[K6] | create quiz, survey and slide presentation using animations effects |

Non Major Elective

Course Code: 23GSNE22

Course Title: STORY BOARDING AND ANIMATICS

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

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|----------|---|
| CLO1[K2] | describe the basics of Storyboard Workspace and its components |
| CLO2[K3] | develop simple Storyboard Animations |
| CLO3[K4] | analyze how to create, working with layers and workspace for the storyboard |
| CLO4[K5] | choose visual methods of expressing character attitudes and acting that are related to storytelling |
| CLO5[K6] | create a layer and workspace for storyboarding |

Skill Enhancement Course

Course Code: 23GCS21

Course Title: CYBER SECURITY AND DIGITAL ETHICS

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

| | |
|----------|---|
| CLO1[K2] | outline the WWW, Internet, cyberspace, and cyber security concepts |
| CLO2[K3] | identify the cyber threats on using Social networks |
| CLO3[K4] | classify the cybercrimes that are targeting computers, mobiles, and human |
| CLO4[K5] | assess the cybercrimes, usage of social media platforms, and social media marketing |
| CLO5[K6] | predict the appropriate cyber laws for the cyber attacks |

| Core Course | |
|--|--|
| Course Code: 23GSC31 | Course Title: DATABASE MANAGEMENT SYSTEMS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the DBMS concepts, data models, database architecture, and SQL relational database terminology |
| CLO2[K3] | construct E-R models, translate them into relational tables, and build SQL query constructs |
| CLO3[K4] | distinguish and compare different data models used to represent a database and various normal forms |
| CLO4[K5] | criticize a database design and improve the design by normalization |
| CLO5[K6] | create SQL Queries, PL/SQL blocks, exceptions, and triggers |

| Core Course | |
|--|--|
| Course Code: 23GSC3L | Course Title: DATABASE MANAGEMENT SYSTEMS LAB |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | express in own words about the database concepts and logic used in PL/SQL |
| CLO2[K3] | write SQL queries and PL/SQL programs for scientific and general applications |
| CLO3[K4] | debug the SQL queries and PL/SQL 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 SQL and PL/SQL programs |

Generic Elective Course

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|--|---|---|
| Course Code: 23GSEG31 | | Course Title: OPTIMIZATION TECHNIQUES |
| On successful completion of the course, the learners should be able to | | |
| CLO1[K2] | summarize various algorithms and rules used in solving OR problems | |
| CLO2[K3] | solve all problems of Linear Programming, Transportation, Assignment and Network scheduling | |
| CLO3[K4] | analyze various problems for infeasibility, degeneracy, unboundedness and alternate solutions | |
| CLO4[K5] | find the best suitable method for obtaining optimal solution to Linear Programming, Transportation, Assignment problems | |
| CLO5[K6] | formulate the real world decision making problems into mathematical models | |

Skill Enhancement Course – Discipline Specific Course

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|--|---|--|
| Course Code: 23GSDS3L | | Course Title: WEB DESIGNING LAB |
| On successful completion of the course, the learners should be able to | | |
| CLO1[K2] | express in own words about the HTML tags and logic used in JavaScript programs | |
| CLO2[K3] | writing HTML and JavaScript programs for web pages | |
| CLO3[K4] | debug the HTML and JavaScript 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 HTML and JavaScript programs | |

Skill Enhancement Course – Entrepreneurial Skill

Course Code: 23GSES31

Course Title: DIGITAL MARKETING

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

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| CLO1[K2] | explain the key components of digital marketing |
| CLO2[K3] | utilize the appropriate marketing strategies for the development of digital marketing |
| CLO3[K4] | analyze the different types of insights and tools that digital media offers and challenges faced by digital marketing |
| CLO4[K5] | evaluate the effectiveness of digital marketing strategies |
| CLO5[K6] | create goal-oriented advertisements and marketing plan for business applications |

Core Course

Course Code: 23GSC41

Course Title: JAVA PROGRAMMING

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

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|----------|--|
| CLO1[K2] | describe the various features, programming constructs and concepts of Java |
| CLO2[K3] | apply object-oriented programming concepts to solve problems |
| CLO3[K4] | analyze the various object-oriented principles and concepts of Java through examples |
| CLO4[K5] | criticize the mechanism and influence of unique Java features in developing programs |
| CLO5[K6] | create applets and GUI based applications with AWT and Swing components |

| Core Course | |
|--|--|
| Course Code: 23GSC4L | Course Title: JAVA 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 java programs |
| CLO2[K3] | write java programs for scientific and general applications |
| CLO3[K4] | debug the java 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 java programs |

| Generic Elective Course | |
|--|---|
| Course Code: 23GSEG41 | Course Title: NUMERICAL METHODS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | define errors in numerical computation and describe the methods to solve problems using numerical methods |
| CLO2[K3] | use method of least squares to find the curve of best fit to a given set of data and interpolate the unknown values of the function |
| CLO3[K4] | compare the efficiency of methods in solving algebraic, transcendental equations and system of simultaneous linear equations |
| CLO4[K5] | evaluate the approximate numerical value of differentials, integrals and interpret how the values differ from actual integration |
| CLO5[K6] | formulate approximate solutions to ordinary differential equations |

Skill Enhancement Course - Job Oriented Course

Course Code: 23GJO45

Course Title: TALLY

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

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|----------|---|
| CLO1[K2] | explain the basics of manual accounting, computerized accounting, VAT and GST |
| CLO2[K3] | implement computerized accounting |
| CLO3[K4] | analyze accounting procedures, automatic calculations and reports generated |
| CLO4[K5] | prepare stock summary, VAT payable report, Payroll report and attendance report |
| CLO5[K6] | generate financial reports namely journal, Trial Balance, Pay roll and Final Accounts |

Skill Enhancement Course - Job Oriented Course

Course Code: 23GJO48

Course Title: CALL CENTER
MANAGEMENT

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

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|----------|---|
| CLO1[K2] | Summarize the classification, functioning and working environment of call centers |
| CLO2[K3] | identify customers, services and offer solutions |
| CLO3[K4] | analyze various recruitment and training process |
| CLO4[K5] | interpret the complaints in tricky situation |
| CLO5[K6] | develop a scenario for CRM using telephonic communication |

| Skill Enhancement Course - Job Oriented Course | |
|--|--|
| Course Code: 23GJO45L | Course Title: TALLY LAB |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe the basic concepts of Financial Accounting |
| CLO2[K3] | prepare daybook for transactions |
| CLO3[K4] | analyze the working principles of tax procedures |
| CLO4[K5] | compute profit/loss and stock summary for an account |
| CLO5[K6] | generate trial balance and balance sheet reports |

| Skill Enhancement Course - Job Oriented Course | |
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| Course Code: 23GJO48L | Course Title: CALL CENTER MANAGEMENT LAB |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | summarize the role, functions and basic operations of call centers |
| CLO2[K3] | apply communication skills to face group discussions and mock interviews |
| CLO3[K4] | probe the problem situations to select appropriate remedies |
| CLO4[K5] | evaluate the training needs required for self and the team |
| CLO5[K6] | develop proposals for managing call centers |

| Core Course | |
|--|---|
| Course Code: 23GSC51 | Course Title: SOFTWARE ENGINEERING |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basic concepts of software engineering. |
| CLO2[K3] | use software requirement specification techniques, design techniques and notations |
| CLO3[K4] | distinguish and compare different project sizes, organization structures, coupling, cohesion, design notations, verification and validation techniques. |
| CLO4[K5] | evaluate the programmer months and development time using cost estimation techniques source code metrics, stepwise refinement |
| CLO5[K6] | construct state oriented notations, design notations and techniques |

| Core Course | |
|--|---|
| Course Code: 23GSC52 | Course Title: .NET PROGRAMMING |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basic concepts of .NET Framework, Visual Studio IDE and ASP.NET with C# |
| CLO2[K3] | develop web applications using standard controls |
| CLO3[K4] | analyze the usage of ADO.NET in web applications |
| CLO4[K5] | choose the appropriate validation and navigation controls while developing web applications |
| CLO5[K6] | design and develop web pages using ASP.NET controls for specific applications |

| Core Course | |
|--|--|
| Course Code: 23GSC5L | Course Title: .NET 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 ASP.NET Web Applications |
| CLO2[K3] | design and develop web pages for real time applications |
| CLO3[K4] | debug the web application 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 web programs |

| Core Course | |
|--|--|
| Course Code: 23GSC5P | Course Title: PROJECT WITH VIVA- VOCE |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | identify a problem in their area of interest and demonstrate the applicability of computerizing it |
| CLO2[K3] | participate in a group project to illustrate the dynamics of a diverse work environment |
| CLO3[K3] | demonstrate basic level of competency in programming and logic skills |
| CLO4[K4] | apply the skills acquired through the program to business scenarios |
| CLO5[K6] | present conclusions effectively orally and in writing |

| Discipline Specific Elective Course | |
|--|--|
| Course Code: 23GSDE51 | Course Title: OPERATING SYSTEMS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the concepts of operating system, process, memory management and file system |
| CLO2[K3] | identify and handle the deadlocks in process synchronization and scheduling algorithms |
| CLO3[K4] | analyze the various CPU scheduling algorithms and memory management strategies |
| CLO4[K5] | interpret the allocation methods of File systems and virtual memory management |
| CLO5[K6] | formulate the solutions to schedule the CPU, disk, replace the page for real time applications |

| Discipline Specific Elective Course | |
|--|---|
| Course Code: 23GSDE52 | Course Title: VIRTUAL REALITY |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basics and components of Virtual Reality |
| CLO2[K3] | identify content, current state and near future in Virtual Reality |
| CLO3[K3] | analyze the ways to plan a Virtual Reality Project |
| CLO4[K4] | interpret the ways to create content for Virtual and Augmented Realit |
| CLO5[K6] | predict the future of Virtual Reality |

Discipline Specific Elective Course

Course Code: 23GSDE53

Course Title: PHP PROGRAMMING

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

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

Discipline Specific Elective Course

Course Code: 23GSDE54

Course Title: MOBILE APPLICATION
DEVELOPMENT

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

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|----------|--|
| CLO1[K2] | describe the basics and components of mobile applications |
| CLO2[K3] | apply proper user interfaces and Java programming features to mobile application development |
| CLO3[K3] | analyze the problem and add necessary user interface components, graphics and multimedia components into the application |
| CLO4[K4] | evaluate the results by implementing the concept behind the problem with proper code |
| CLO5[K6] | design and develop mobile application using Android development platform |

| Internship | |
|--|---|
| Course Code: 23GSIN51 | Course Title: INTERNSHIP |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | relate the class room theory with work place practice |
| CLO2[K3] | apply the practices / procedures observed in real time working environment |
| CLO3[K3] | analyze the workflow and communication flow prevailing in the institution / industry |
| CLO4[K4] | 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: 23GSC61 | Course Title: COMPUTER NETWORKS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe the basics of Computer Network architecture, OSI and TCP/IP reference models |
| CLO2[K3] | utilize checksum and cyclic redundancy check for error detection and MAC protocols for flow control, identify the class of network address |
| CLO3[K4] | compare the various transmission media, topologies, connecting devices and routing methods |
| CLO4[K5] | examine the various media access protocols transport layer protocols, IP Protocol and client server protocol |
| CLO5[K6] | design a network for data communication in an organization using LAN, WAN, FTP and Telnet |

| Core Course | |
|--|---|
| Course Code: 23GSC62 | Course Title: DATA ANALYTICS USING R |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe the various features of R and explain the basics of big data |
| CLO2[K3] | apply the features of R to solve simple data analytics problems |
| CLO3[K4] | examine the usage of vectors, lists, data frames, factors and tables |
| CLO4[K5] | choose the appropriate R packages for processing the datasets |
| CLO5[K6] | develop R programs to do data analytics on the datasets |

| Core Course | |
|--|--|
| Course Code: 23GSC6L | Course Title: DATA ANALYTICS USING R 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 R |
| CLO2[K3] | write R programs and construct NoSQL queries for data analytics |
| CLO3[K4] | debug the 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 R programs |

| Discipline Specific Elective Course | |
|--|---|
| Course Code: 23GSDE61 | Course Title: COMPUTER GRAPHICS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe the applications and basic concepts of Computer Graphics |
| CLO2[K3] | apply various geometric transformations and tests to two-dimensional objects |
| CLO3[K4] | analyze the various scan conversion algorithms to rasterize two-dimensional objects through examples |
| CLO4[K5] | evaluate the performance of algorithms for two dimensional output primitives and choose appropriate techniques and parameters used to enhance the quality of pictures |
| CLO5[K6] | develop algorithms for two dimensional output primitives and viewing in C |

| Discipline Specific Elective Course | |
|--|---|
| Course Code: 23GSDE62 | Course Title: ARTIFICIAL INTELLIGENCE |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain basics of artificial intelligence and expert system, search techniques |
| CLO2[K3] | identify problems where artificial intelligence techniques are applicable |
| CLO3[K3] | analyze the applications of neural networks, and Distributed representation of connectionist model |
| CLO4[K4] | evaluate search techniques, knowledge representing rules, fuzzy logic systems and genetic algorithm |
| CLO5[K6] | propose solutions to problems using genetic algorithm |

Discipline Specific Elective Course

Course Code: 23GSDE63

Course Title: IoT AND ITS
APPLICATIONS

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

| | |
|----------|--|
| CLO1[K2] | describe the basics, design principles of IoT, M2M and components of IoT |
| CLO2[K3] | identify the appropriate protocol used in IoT for communication |
| CLO3[K4] | analyze data acquiring and storage process in IoT system |
| CLO4[K5] | justify the need for sensor technology in IoT System |
| CLO5[K6] | develop a design for IoT based smart city and smart home |

Discipline Specific Elective Course

Course Code: 23GSDE64

Course Title: CLOUD COMPUTING
FUNDAMENTALS

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

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|----------|---|
| CLO1[K2] | explain the concepts and technologies involved in Cloud Computing |
| CLO2[K3] | apply various cloud services and their implementation in Amazon, Microsoft and Google cloud computing platforms |
| CLO3[K3] | analyze the security issues in cloud services |
| CLO4[K4] | evaluate the application performance metrics in benchmarking and cloud security |
| CLO5[K6] | develop cloud services for various domains |



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College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

**DEPARTMENT OF COMPUTER SCIENCE
PG DEGREE PROGRAMME IN COMPUTER SCIENCE**

PROGRAMME EDUCATIONAL OBJECTIVES

The Graduates will

| | |
|-------|--|
| PEO1. | be prepared to achieve successful career in academia / industry as reflected by advancement to positions that include greater responsibility and grow as computing professionals. |
| PEO2. | have an ability to contribute significantly to contemporary research domains in computer science by pursuing research oriented higher education and/or leading, designing developing or maintaining projects in various technical areas of computer science ethically. |
| PEO3. | be able to promote companies or lead teams/organizations to solve socially relevant problems. |

PROGRAMME LEARNING OUTCOMES

By the completion of the M.Sc.Computer Science 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. |

COURSE LEARNING OUTCOME

| Core Course | |
|--|--|
| Course Code: 23PSC11 | Course Title: PYTHON PROGRAMMING |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | demonstrate the building blocks, statements, and data structures in Python |
| CLO2[K3] | make use of the data structures of Python, numpy, and pandas for data manipulation |
| CLO3[K4] | analyze data using numpy, pandas, loading, and wrangling methods |
| CLO4[K5] | choose the appropriate tools for indexing, slicing and plotting data |
| CLO5[K6] | create scripts using arrays, functions, lists, tuples and dictionaries |

| Core Course | |
|--|--|
| Course Code: 23PSC12 | Course Title: INTERNET OF THINGS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe the basics and design principles of IoT and python data structures |
| CLO2[K3] | identify the design methodology protocol and make use python language packages for IoT application |
| CLO3[K4] | analyse data storage, connectivity, components and compare IoT and M2M |
| CLO4[K5] | evaluate the function of IoT modules using software and hardwar |
| CLO5[K6] | develop an IoT Based application for home automation, cities, environment and agriculture using python |

Generic Elective Course

| | |
|--|--|
| Course Code: 23PSC1L | 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 Scripts |
| CLO2[K3] | write python scripts for scientific and general applications |
| CLO3[K4] | debug the Python scripts 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 scripts |

Discipline Specific Elective

| | |
|--|---|
| Course Code: 23PSDE11 | Course Title: ADVANCED DATABASE MANAGEMENT SYSTEM |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basics of DBMS, Relational Model, Data storage, Query Optimization and Distributed Database |
| CLO2[K3] | construct queries using Relational Algebra and Calculus and perform B+ tree operations & Hashing |
| CLO3[K4] | analyse the sorting of data and transaction management, concurrent control |
| CLO4[K5] | evaluate and optimize queries using query optimization techniques |
| CLO5[K6] | build Normal Forms for real world databases |

| Discipline Specific Elective | |
|--|--|
| Course Code: 23PSDE12 | Course Title: NETWORK PROTOCOLS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe the basic concepts of TCP/IP protocols and its functions, Internet architecture, Mobility support for IP and the process related to data transfer |
| CLO2[K3] | identify the addressing of different Internet protocols, security issues related to IP mobility, and quality of service mechanisms for a give computer network |
| CLO3[K4] | analyze the technologies and services associated with network protocols along with the challenges of data transfer, the importance and functioning of Routing Protocols over communication service and differentiate the types of virtual wired services |
| CLO4[K5] | interpret multicast routing procedures, IP and Optical routing technologies, IP traffic and security ensuring procedures |
| CLO5[K6] | develop procedures for routing protocols, optimal routing protocols, IP security problems |

| Discipline Specific Elective | |
|--|--|
| Course Code: 23PSDE13 | Course Title: DISCRETE MATHEMATICS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basic principles of discrete mathematical structures |
| CLO2[K3] | solve problems using mathematical Logic, relations, functions and perform matrix operations |
| CLO3[K4] | analyze the solutions to system of linear equations, recurrence relations and the significance of eigen values and eigen vectors |
| CLO4[K5] | interpret various normal forms and theory of inference |
| CLO5[K6] | draw simple graphs and to construct shortest path and Spanning trees |

Discipline Specific Elective

| | |
|--|---|
| Course Code: 23PSDE14 | Course Title: OBJECT ORIENTED ANALYSIS AND DESIGN & C++ |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe the concept of Object-Oriented development and modeling techniques |
| CLO2[K3] | find out the steps performed during object design |
| CLO3[K4] | relate and link OOAD with C++ language |
| CLO4[K5] | interpret various abstract object-based views for generic software systems |
| CLO5[K6] | create C++ programs with OOAD features. |

Skill Enhancement Course

| | |
|--|---|
| Course Code: 23PLCS11 | Course Title: CYBER SECURITY AND DIGITAL ETHICS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe the basics of internet, file systems, cyber security, cybercrime, data protection, data security |
| CLO2[K3] | identify the cyber-attacks and cybercrime used on social media. |
| CLO3[K4] | analyze the cyber laws, cyber forensics |
| CLO4[K5] | assess the cybercrime and cyber attacks |
| CLO5[K6] | predict the appropriate cyber law for the cybercrime in digital world |

| Core Course | |
|--|---|
| Course Code: 23PSC21 | Course Title: DESIGN AND ANALYSIS OF ALGORITHMS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the various algorithm design techniques |
| CLO2[K3] | apply the different algorithm design techniques to solve searching and sorting problems |
| CLO3[K4] | analyze a problem and identify the computing requirements appropriate for its solution |
| CLO4[K5] | evaluate the applications solved by Greedy Technique and Backtracking |
| CLO5[K6] | devise algorithms for real world applications |

| Core Course | |
|--|---|
| Course Code: 23PSC22 | Course Title: BIG DATA ANALYTICS |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basic concepts of big data, Hadoop and Hadoop ecosystem |
| CLO2[K3] | apply the MapReduce Programming and Pig script for the big data and implement the CRUD operations in NoSQL databases. |
| CLO3[K4] | analyze the various Hadoop Ecosystem components |
| CLO4[K5] | choose the appropriate methods for process the Data on Distributed File System using MapReduce and Pig, Hive |
| CLO5[K6] | Design Schema and construct queries using NoSQL Databases and create reports from NoSQL Databases |

| Core Course | |
|--|--|
| Course Code: 23PSC2L | Course Title: DESIGN AND ANALYSIS OF ALGORITHMS 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 algorithms |
| CLO2[K3] | write Python programs for searching and sorting 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 an algorithm |

| Discipline Specific Elective | |
|--|---|
| Course Code: 23PSDE21 | Course Title: MOBILE APPLICATION DEVELOPMENT |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe android environments, basic controls, widgets of mobile applications |
| CLO2[K3] | develop the database and map service applications |
| CLO3[K4] | analyze the features of various dialogs, communication controls, media controls, menus and action bar |
| CLO4[K5] | design code and validate the input and output with appropriate messages |
| CLO5[K6] | build and publish web pages and android applications |

Discipline Specific Elective

Course Code: 23PSDE22

Course Title: SOFT COMPUTING

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

| | |
|----------|--|
| CLO1[K2] | illustrate the various soft computing techniques like neural networks, fuzzy systems and genetic algorithm |
| CLO2[K3] | apply suitable soft computing techniques for real-time applications |
| CLO3[K4] | compare and analyze the fuzzy logic and genetic algorithm components |
| CLO4[K5] | choose the appropriate soft computing techniques for solving real-time problems |
| CLO5[K6] | develop decision-making and expert system using fuzzy rules and reasoning |

Skill Enhancement Course

Course Code: 23PSSE2L

Course Title: MOBILE APPLICATION
DEVELOPMENT 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 mobile application |
| CLO2[K3] | write java and xml programs for mobile application development |
| CLO3[K4] | debug the java and xml 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 mobile application |

| Core Course | |
|--|---|
| Course Code: 23PSC32 | Course Title: ADVANCED MACHINE LEARNING TECHNOLOGIES |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basics and applications of machine learning |
| CLO2[K3] | identify the various decision processes and learning models in machine learning |
| CLO3[K4] | analyze the various classification problems in machine learning |
| CLO4[K5] | interpret challenges in learning through artificial neural networks and support vector machine |
| CLO5[K6] | build efficient machine learning based problem solving systems and propose expert systems by using domain knowledge |

| Core Course | |
|--|---|
| Course Code: 23PSC31 | Course Title: ADVANCED JAVA PROGRAMMING |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | describe working of exception and event handling, threads, strings, Swing |
| CLO2[K3] | apply packages, interfaces, exception handling, threads and write Java programs |
| CLO3[K4] | analyze the working of applets, New I/O Packages, process Regular Expression and networking |
| CLO4[K5] | interpret the use of AWT controls, Layout menus, Swing in Java applications |
| CLO5[K6] | create Java programs to implement graphics, networking, RMI and Servlets |

Core Course

Course Code: 23PSC3L

Course Title: ADVANCED JAVA
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 java programs. |
| CLO2[K3] | write java programs for scientific and general applications. |
| CLO3[K4] | debug the java 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 java programs. |

Core Industrial Module

Course Code: 23PSCI31

Course Title: FULL STACK
DEVELOPMENT - I

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

| | |
|----------|---|
| CLO1[K2] | demonstrate the features of TypeScript, JavaScript, and Angular framework |
| CLO2[K3] | utilize events, forms, custom components, pipes, and directives to construct dynamic, responsive web applications |
| CLO3[K4] | analyze the usage of various components, directives, and form controls of Angular framework |
| CLO4[K5] | interpret the working of dependency injection, data bindings, and services |
| CLO5[K6] | create fast, modern, scalable web applications using the Angular framework |

| Discipline Specific Course | |
|--|---|
| Course Code: 23PSDE31 | 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 Warehouse, OLAP, data features, preprocessing and data mining techniques |
| CLO2[K3] | clean and reduce the data using preprocessing techniques, compute the central tendency of data and visualize data |
| CLO3[K4] | analyze the methods for data classification, clustering and outlier detection |
| CLO4[K5] | evaluate the performance of classification methods using metrics and choose the appropriate clustering algorithms for various applications. |
| CLO5[K6] | develop classification models using decision tree, Bayesian and rule based classifiers. |

| Discipline Specific Course | |
|--|--|
| Course Code: 23PSDE32 | Course Title: COMPUTER VISION |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the basic tools for working with images and the Python modules |
| CLO2[K3] | use the Python interface for OpenCV and transformation methods for image computation |
| CLO3[K4] | analyze different techniques for dividing, grouping and organizing images |
| CLO4[K5] | justify and assess the importance of clustering, classification and reconstruction methods in image processing |
| CLO5[K6] | build efficient image retrieval techniques for images |

Skill Enhancement Course

Course Code: 23PSSE31

Course Title: RESEARCH
METHODOLOGY

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

| | |
|----------|---|
| CLO1[K2] | explain in their own words about the basics of research and its methodology |
| CLO2[K3] | identify the problem statement and apply the research methods for it |
| CLO3[K4] | examine and analyze the data for the problem statements |
| CLO4[K5] | choose appropriate design and methods to the research objectives |
| CLO5[K6] | formulate the problem statement and develop the solution for it |

Internship

Course Code: 23PSIN31

Course Title: INTERNSHIP

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

| | |
|----------|---|
| CLO1[K2] | relate the class room theory with work place practice. |
| CLO2[K3] | apply the practices / 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 |

| Skill Enhancement Course | |
|--|---|
| Course Code: 23PSSS31 | Course Title: INTERPERSONAL ETIQUETTE - I |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | demonstrate the nature of soft skills through individual and group activities |
| CLO2[K3] | organize the work station and workflow to make better use of time |
| CLO3[K4] | analyze the time stealers and handle them appropriately |
| CLO4[K5] | assess the scheduling, planning and prioritizing skills |
| CLO5[K6] | build active participation in group discussion, interviews and prepare, deliver presentations |

| Core Course | |
|--|---|
| Course Code: 23PSC41 | Course Title: FULL STACK DEVELOPMENT – II |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | demonstrate the fundamental concepts of development and deployment of Node.js web application |
| CLO2[K3] | implement web applications using Node fundamental programming techniques, APIs with express framework, and make use of Web Server to manage database. |
| CLO3[K4] | analyse front-end building systems, server-side frameworks, events and data storage |
| CLO4[K5] | interpret the working of Connect middleware, web application templating, testing and deploying Node applications |
| CLO5[K6] | create Node.js modules, Express code modules in an application and desktop applications using Electron |

| Core Course | |
|--|--|
| Course Code: 23PSC42 | Course Title: DIGITAL IMAGE PPROCESSING |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | demonstrate the fundamental concepts of digital image processing |
| CLO2[K3] | make use of intensity transformation procedures and various filtering techniques in frequency domain |
| CLO3[K4] | analyse the techniques of color image, image restoration, reconstruction and morphological operations and filtering technologies |
| CLO4[K5] | interpret the various techniques of image description, image compression and segmentation |
| CLO5[K6] | compose images using morphological operations, segmentation and image compression |

| Core Course | |
|--|--|
| Course Code: 23PSC4L | Course Title: FULL STACK DEVELOPMENT 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 Node.js and Angular framework programs |
| CLO2[K3] | construct web programs using modules, call backs, event handlers, community tools and serial and parallel flow control |
| CLO3[K4] | debug the Web 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 Node.js and Angular Framework. |

| Core Course | |
|--|---|
| Course Code: 23PSC4P | Course Title: MAJOR PROJECT AND VIVA-VOCE |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | demonstrate the applicability of automating it and design solutions using systematic approach |
| CLO2[K3] | identify a problem in their area of interest |
| CLO3[K4] | exhibit in-depth knowledge in their problem domain |
| CLO4[K5] | communicate with the community and present the results in the form of project report |
| CLO5[K6] | formulate and develop solution to the selected problem |

| Discipline Specific Elective Course | |
|--|---|
| Course Code: 23PSDE41 | Course Title: ADVANCED CLOUD COMPUTING |
| On successful completion of the course, the learners should be able to | |
| CLO1[K2] | explain the core concepts of the cloud computing paradigm, services and application |
| CLO2[K3] | make use of cost estimation techniques and capacity planning in cloud computing deployment |
| CLO3[K4] | analyze the various cloud storage and cloud security techniques and Service oriented architecture |
| CLO4[K5] | choose among various cloud technologies for implementing applications experiment with mobile cloud |
| CLO5[K6] | design & develop backup strategies for cloud |

Discipline Specific Elective Course

Course Code: 23PSDE42

Course Title: OPTIMIZATION
TECHNIQUES

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

| | |
|----------|---|
| CLO1[K2] | summarize various algorithms and rules used in solving OR problems. |
| CLO2[K3] | solve all problems of Linear Programming, Transportation, Assignment, Network scheduling and Non-Linear Optimization. |
| CLO3[K4] | analyze various problems for infeasibility, degeneracy, unboundedness and alternate solutions. |
| CLO4[K5] | find the best suitable method for obtaining optimal solution with Linear Programming, Transportation, Assignment problems and Evolutionary Optimization algorithms. |
| CLO5[K6] | formulate the real world decision making problems into mathematical models. |

Skill Enhancement Course

Course Code: 23PSSE41

Course Title: EMPLOYABILITY SKILLS

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

| | |
|----------|--|
| CLO1[K2] | recall the basic concepts in core areas of Computer Science and applications |
| CLO2[K3] | apply cognitive abilities to solve quantitative and qualitative problems |
| CLO3[K4] | analyze the various methods and techniques to find solutions to problems |
| CLO4[K5] | examine the underlying processes in different domains of Computer Science and applications |
| CLO5[K6] | recommend the techniques for problem solving in Computer Science |

Skill Enhancement Course

Course Code: 23PSSS41

Course Title: INTERPERSONAL
ETIQUETTE - II

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

| | |
|----------|---|
| CLO1[K2] | demonstrate the nature of soft skills through individual and group activities |
| CLO2[K3] | develop the individuals through goal/target setting, self-motivation and practicing creative thinking |
| CLO3[K3] | analyze the team efficiency through the knowledge of team work and interpersonal relationships |
| CLO4[K4] | assess the leadership and project management abilities |
| CLO5[K6] | be prepared and face the interviews |

Generic Elective Course

Course Code: 23PSEG21

Course Title: ELECTRONIC COMMERCE

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

| | |
|----------|--|
| CLO1[K2] | explain mobile commerce features, services and applications |
| CLO2[K3] | apply various payment methods in Mobile Commerce |
| CLO3[K4] | analyze the features and functions of various mobile devices |
| CLO4[K5] | interpret various security and privacy issues of mobile commerce |
| CLO5[K6] | formulate the steps to design mobile commerce application |