DEPARTMENT OF COMPUTER APPLICATIONS

UG DEGREE PROGRAMME IN COMPUTER APPLICATIONS

PROGRAMME EDUCATIONAL OBJECTIVES	
The Graduates will	
PEO1.	pursue with confidence for higher studies in the form of MCA, MBA, etc., and excel in computer oriented skills to make successful career as professionals thereby acquiring greater competency.
PEO2.	exhibit the skills and abilities effectively as a team member and/or leader by adhering to ethical standards in the profession.
PEO3.	adapt to a rapidly upgrading technical environment with entrepreneurial pursuit.

PROGRAMME LEARNING OUTCOMES	
By the Completion BCA 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: 23GLC11	**Course Title:** C++ PROGRAMMING

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

CLO1[K2]	explain the procedural and object oriented paradigm, I/O streams, functions, classes and objects, files, templates, exceptions.
CLO2[K3]	demonstrate the uses of OOPs paradigm with the help of programs.
CLO3[K4]	classify inheritance and examine the exception handling mechanism and generic programming.
CLO4[K5]	assess the file handling and polymorphism mechanism.
CLO5[K6]	develop applications by using class, inheritance, files and templates

Core Course	
Course Code: 23GLC1L	**Course Title:** C++ PROGRAMMING LAB

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

CLO1[K2]	describe the I/O streams, functions, classes, files, templates, exceptions.
CLO2[K3]	make use of statements, functions and class to design programs.
CLO3[K4]	compare the types of inheritance and examine exception handling mechanism and generic programming.
CLO4[K5]	evaluate the file handling and polymorphism mechanism.
CLO5[K6]	design code, debug and execute the programs with object oriented paradigms.

Generic Elective Course	
Course Code: 23GLEG11	**Course Title:** DIGITAL LOGIC FUNDAMENTALS
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the number system, logic gates, flip flops and registers, working of arithmetic and combinational circuits, counters and memory structures.
CLO2[K3]	solve problems in number system and simplify Boolean algebraic expressions by using Karnaugh map and Boolean laws.
CLO3[K4]	examine the working of arithmetic and combinational circuits, flip-flops, counters and registers.
CLO4[K5]	evaluate various flip flops, counters and registers.
CLO5[K6]	design circuit diagram for various flip flops, registers and counters

Non Major Elective	
Course Code: 23GLNE11	**Course Title:** WEB DESIGNING
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe tags, styles in HTML and CSS.
CLO2[K3]	make use of HTML elements to design web pages.
CLO3[K4]	illustrate the working of cascading style sheets in web pages.
CLO4[K5]	choose suitable HTML elements and styles applicable for web pages.
CLO5[K6]	build static and dynamic web pages.

Foundation Course	
Course Code: 23GLFC1L	**Course Title:** OFFICE AUTOMATION LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the features of MS-Word, MS-Excel and MS-PowerPoint.
CLO2[K3]	build charts, tables and slides by using MS-Office.
CLO3[K4]	analyze the MS-Excel functions for data analysis and data plotting.
CLO4[K5]	assess the functions and operations in word and excel.
CLO5[K6]	create and format the word document and PowerPoint presentation.

Ability Enhancement Compulsory Course	
Course Code: 23GSS11	**Course Title:** ENGLISH FOR COMMUNICATION
On successful completion of the course, the learners should be able to	

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: 23GLC21	**Course Title:** PYTHON PROGRAMMING
On successful completion of the course, the learners should be able to	
CLO1[K2]	describe the features of Python and the usage of modules, text files and OOPs concept.
CLO2[K3]	make use of control structures, functions, list, text files, dictionaries and sets for constructing python programs.
CLO3[K4]	examine the concepts of strings, files and data structures.
CLO4[K5]	interpret the methods to create and manipulate the python programs.
CLO5[K6]	develop real world applications using functions, data structures, strings and exceptions.

Core Course	
Course Code: 23GLC2L	**Course Title:** PYTHON PROGRAMMING LAB
On successful completion of the course, the learners should be able to	
CLO1[K2]	explain the decision making statements, data structures and arrays in python.
CLO2[K3]	develop programs to solve real time problems by using python.
CLO3[K4]	illustrate the working process and usage of arrays and strings.
CLO4[K5]	predict the output for file and list programs by using python.
CLO5[K6]	build programs using functions, array and data structures.

Generic Elective Course	
Course Code: 23GLEG21	**Course Title:** DISCRETE MATHEMATICS
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the basic principles and foundations of mathematics.
CLO2[K3]	perform the operations on relations, functions, matrices, logic and recurrence relations.
CLO3[K4]	classify the types of formulae, relations, functions and matrices.
CLO4[K5]	determine solutions for system of linear equations and recurrence relations.
CLO5[K6]	draw trees and construct truth tables for the statement formulae.

Core Course	
Course Code: 23GLC31	**Course Title:** DATA STRUCTURES
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the operations and applications of linear and nonlinear data structures.
CLO2[K3]	solve problems in linear and nonlinear data structures.
CLO3[K4]	analyze the basic operations of different data structures.
CLO4[K5]	appraise different sorting and traversal techniques.
CLO5[K6]	construct programs using diverse data structures.

Non Major Elective	
Course Code: 23GLNE21	**Course Title:** FUNDAMENTALS OF BIG DATA
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the lifecycle, terminologies and technologies of big data.
CLO2[K3]	demonstrate the Map Reduce programming in Hadoop framework.
CLO3[K4]	analyze the concept of data storage and data processing of big data.
CLO4[K5]	justify the role of NoSQL, Hadoop and Map Reduce in big data.
CLO5[K6]	develop programs by using Hadoop and Map Reduce.

Core Course	
Course Code: 23GLC3L	**Course Title:** DATA STRUCTURES LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the data structure techniques and its usages.
CLO2[K3]	develop programs by using appropriate data structures.
CLO3[K4]	illustrate searching and sorting techniques.
CLO4[K5]	choose the appropriate data structures for solving the problems.
CLO5[K6]	build programs for sorting, searching and traversal techniques.

Discipline Specific Elective Course	
Course Code: 23GLDE31	**Course Title:** DATABASE MANAGEMENT SYSTEM

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

CLO1[K2]	describe the basic concepts of Database Management Systems, data models and data normalization.
CLO2[K3]	apply the DDL, DML commands and set operators to solve queries using SQL.
CLO3[K4]	classify the different SQL functions and various join operations.
CLO4[K5]	assess and recommend the data models for real time systems.
CLO5[K6]	develop PL/SQL programs using cursor and exceptions.

Discipline Specific Elective Course	
Course Code: 23GLDE32	**Course Title:** RDBMS WITH PL/SQL

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

CLO1[K2]	explain the basics of DBMS, SQL and ER Model.
CLO2[K3]	apply aggregate functions, DDL and DML commands to solve queries.
CLO3[K4]	examine the concepts of normalization and relational model.
CLO4[K5]	justify the relational database design and model.
CLO5[K6]	develop PL/SQL programs using integrative control, procedure, cursor and exceptions.

Skill Enhancement Course	
Course Code: 23GLES3L	**Course Title:** OPEN SOURCE SOFTWARE TECHNOLOGY LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the UNIX and shell commands.
CLO2[K3]	build UNIX programs using decision making statements.
CLO3[K4]	analyze the basic statements, commands and operators in UNIX.
CLO4[K5]	assess file and directory commands.
CLO5[K6]	construct AWK and shell programs to create, list the contents and sort the files.

Skill Enhancement Course	
Course Code: 23GLDS3L	**Course Title:** PL/SQL LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain SQL query, functions, operators, cursors and procedure.
CLO2[K3]	apply the aggregate functions, DDL and DML commands to solve queries by using SQL.
CLO3[K4]	analyze DDL and DML commands.
CLO4[K5]	interpret the SQL queries in extracting the essential information.
CLO5[K6]	develop PL/SQL programs by using procedure, cursor and exceptions.

Core Course	
Course Code: 23GLC41	**Course Title:** PROGRAMMING IN JAVA

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

CLO1[K2]	explain the primitives of class, operators, inheritance, packages, interfaces, multithreading and AWT controls.
CLO2[K3]	write programs using class, AWT and swing controls.
CLO3[K4]	analyze the methodologies of using inheritance, package, exception and file streams.
CLO4[K5]	assess the significance of class, inheritance, AWT and swing controls.
CLO5[K6]	construct window based applications.

Core Course	
Course Code: 23GLC4L	**Course Title:** JAVA PROGRAMMING LAB

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

CLO1[K2]	describe class, inheritance, packages, interfaces, multithreading, controls.
CLO2[K3]	implement programs using class, AWT and swing controls.
CLO3[K4]	illustrate the mechanism of inheritance, package, and exception and file streams.
CLO4[K5]	assess the significance of class, inheritance, AWT and swing controls.
CLO5[K6]	construct console and GUI based applications.

Discipline Specific Elective Course	
Course Code: 23GLDE41	**Course Title:** OPTIMIZATION TECHNIQUES
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the terminologies, rules, methods in solving decision making problems.
CLO2[K3]	solve linear programming, transportation and assignment problems.
CLO3[K4]	examine the characteristics of game theory and network.
CLO4[K5]	determine optimum outcome in TP, AP and game theory.
CLO5[K6]	create networks to plan, schedule and control the activities of project.

Discipline Specific Elective Course	
Course Code: 23GLDE42	**Course Title:** NUMERICAL METHODS
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe numerical methods for solving mathematical problems.
CLO2[K3]	solve algebraic, transcendental and simultaneous equations using numerical methods.
CLO3[K4]	analyze relevant numerical techniques for interpolation of data.
CLO4[K5]	estimate approximate solution to problems using numerical differentiation and integration.
CLO5[K6]	formulate numerical solutions to ordinary differential equations.

Core Course	
Course Code: 23GLC51	**Course Title:** OPERATING SYSTEMS
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the fundamentals of OS, process, scheduling, deadlock and memory management.
CLO2[K3]	apply scheduling and page replacement algorithms to solve problems.
CLO3[K4]	examine the virtual memory organization and management.
CLO4[K5]	assess and choose appropriate scheduling and page replacement algorithms.
CLO5[K6]	predict and formulate solutions for concurrent processing problems and scheduling algorithms.

Core Course	
Course Code: 23GLC52	**Course Title:** COMPUTER NETWORKS
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the basic terminologies, communication channel and layered protocol models.
CLO2[K3]	solve the problems by using algorithms in physical, data link and network layers.
CLO3[K4]	compare and analyze the performance of transmission media, algorithms and protocols.
CLO4[K5]	assess the issues, services, elements and protocols of network. transport and application layers.
CLO5[K6]	design and compose the algorithms of network layer.

Core Course	
Course Code: 23GLC5L	**Course Title:** WEB PROGRAMMING LAB
On successful completion of the course, the learners should be able to	
CLO1[K2]	demonstrate the usage of statements, methods and arrays in .NET and PHP.
CLO2[K3]	make use of standard form and web controls to design applications.
CLO3[K4]	compare and analyze the working of controls.
CLO4[K5]	assess the working and execution of web pages.
CLO5[K6]	develop web applications to solve real-world problems by using.NET and PHP.

Core Course	
Course Code: 23GLC5P	**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 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: 23GLDE51	**Course Title:** DOT NET PROGRAMMING

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

CLO1[K2]	describe the fundaments of .NET framework, C# and ASP.NET.
CLO2[K3]	make use of statements, arrays, loops and string operations to build console programs in C#.
CLO3[K4]	illustrate the controls of C# and ASP .NET and examine the usage of ADO.Net.
CLO4[K5]	assess different web and validation controls in ASP.Net.
CLO5[K6]	predict and propose a web application by using Microsoft ASP.NET and XML.

Discipline Specific Elective Course	
Course Code: 23GLDE52	**Course Title:** PHP PROGRAMMING

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

CLO1[K2]	describe the primitives of JavaScript, JQuery, PHP and database.
CLO2[K3]	make use of PHP flow control, libraries and AJAX in web program development.
CLO3[K4]	examine security issues in object oriented PHP programming.
CLO4[K5]	assess the working mechanism to build a database in web application.
CLO5[K6]	design and develop a web pages using PHP statements and MySQL.

Discipline Specific Elective Course	
Course Code: 23GLDE53	**Course Title:** SOFTWARE ENGINEERING
On successful completion of the course, the learners should be able to	
CLO1[K2]	outline the analysis, designing and testing in software engineering process life cycle.
CLO2[K3]	apply the software lifecycle model during software plan and development.
CLO3[K4]	examine the system modeling, designing, testing and the quality management techniques.
CLO4[K5]	estimate the software metrics of system design and testing phases.
CLO5[K6]	design a reliable and cost effective software system.

Discipline Specific Elective Course	
Course Code: 23GLDE54	**Course Title:** SOFTWARE PROJECT MANAGEMENT
On successful completion of the course, the learners should be able to	
CLO1[K2]	summarize the product development life cycle, models, goals, estimation, dependencies and software configuration management.
CLO2[K3]	make use of cost estimation techniques in designing a software.
CLO3[K4]	examine the WBS, resource assignment, scheduling and quality assurance of software.
CLO4[K5]	assess the software cost estimation, metrics and techniques.
CLO5[K6]	predict the best life cycle models for software development and effective cost measures for software estimation.

Core Course	
Course Code: 23GLC61	**Course Title:** FUZZY LOGIC
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the basics of fuzzy set operations and properties, membership functions, defuzzification applications.
CLO2[K3]	apply operations, functions and properties on fuzzy relations and use the tolerance and equivalence relations.
CLO3[K4]	analyze fuzzification, defuzzification methods and features of membership functions.
CLO4[K5]	evaluate membership and defuzzification methods for real time applications.
CLO5[K6]	design an application using fuzzy logic and its relations

Core Course	
Course Code: 23GLC62	**Course Title:** DATA ANALYTICS USING R PROGRAMMING
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the fundamentals of R, storage formats and interfaces.
CLO2[K3]	make use of data structures to build programs.
CLO3[K4]	analyze the data frames, factors, tables and strings in R.
CLO4[K5]	predict the output of R programs.
CLO5[K6]	develop programs for real time data analysis.

Core Course	
Course Code: 23GLC6L	**Course Title:** R PROGRAMMING LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the data structures, data frames, tables and classes in R.
CLO2[K3]	apply programming constructs to design applications.
CLO3[K4]	examine the functions, data frames, tables and classes in R.
CLO4[K5]	choose the appropriate data structures to solve problems.
CLO5[K6]	design data analytical programs in R.

Discipline Specific Elective Course	
Course Code: 23GLDE6L1	**Course Title:** MOBILE APPLICATION DEVELOPMENT LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the features of mobile application framework.
CLO2[K3]	build mobile applications using various views.
CLO3[K4]	examine the usage of GUI components, font and colors.
CLO4[K5]	assess the usage of intents in mobile applications.
CLO5[K6]	develop activity based mobile applications.

Discipline Specific Elective Course	
Course Code: 23GLDE6L2	**Course Title:** MULTIMEDIA LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the features of Flash, 3ds Max and Maya environment.
CLO2[K3]	apply 2D and 3D techniques to create scenes and animations.
CLO3[K4]	examine the designing and modelling techniques in Flash, 3dsMax and Maya.
CLO4[K5]	predict the appropriate tool for making the image effects, animation and video transition.
CLO5[K6]	create realistic modellings and animations using Flash, 3ds max and Maya.

Discipline Specific Elective Course	
Course Code: 23GLDE63	**Course Title:** CLOUD COMPUTING
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the fundamental mechanisms, architecture, services, models and applications of cloud.
CLO2[K3]	utilize specialized and management mechanism for cloud deployments.
CLO3[K4]	examine the cloud infrastructure and identify the security threats in cloud computing.
CLO4[K5]	assess the services rendered by the cloud providers and the applications in business and media.
CLO5[K6]	design a suitable cloud platform for cloud-based businesses and consumer applications.

Discipline Specific Elective Course	
Course Code: 23GLDE64	**Course Title:** IOT AND ITS APPLICATIONS
On successful completion of the course, the learners should be able to	
CLO1[K2]	describe the fundamentals, domain specific and design methodologies of IoT.
CLO2[K3]	make use of protocols and cloud offerings to design an IoT architecture.
CLO3[K4]	compare the different IoT Physical Devices and endpoints.
CLO4[K5]	assess transducers, sensors, actuators and various IoT protocols
CLO5[K6]	create IoT based applications in python.

Job Oriented Course	
Course Code: 23GJO47	**Course Title:** DATA ANALYTICS USING PYTHON
On successful completion of the course, the learners should be able to	
CLO1[K2]	illustrate the basics of python and its libraries.
CLO2[K3]	utilize flexible tools to load, clean, merge and visualize data.
CLO3[K4]	analyze the built-in methods of python.
CLO4[K5]	assess various data pre-processing activities.
CLO5[K6]	develop code by using data structures, functions and packages.

Job Oriented Course	
Course Code: 23GJO47L	**Course Title:** DATA ANALYTICS USING PYTHON LAB
On successful completion of the course, the learners should be able to	
CLO1[K2]	explain the data structures, decision making statements and functions of Python.
CLO2[K3]	build programs by using mathematical, statistical and analytical operations.
CLO3[K4]	analyze the methods to perform manipulations with datasets.
CLO4[K5]	assess the data using various graph-based representations
CLO5[K6]	create array and data structure based python programs.

Extra Credit Course	
Course Code: 23EID1L	**Course Title:** IMAGE DESIGNING LAB-I
On successful completion of the course, the learners should be able to	
CLO1[K2]	describe the features of Photoshop IDE and tools.
CLO2[K3]	apply various filter effects in Photoshop.
CLO3[K4]	analyze the usage of Photoshop functionalities in designing the images.
CLO4[K5]	assess the creation of business cards, invitations and pamphlets using Photoshop.
CLO5[K6]	design images by using various effects. .

Extra Credit Course	
Course Code: 23EID2L	**Course Title:** IMAGE DESIGNING LAB-II
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the features of CorelDraw tools.
CLO2[K3]	apply various effects in CorelDraw.
CLO3[K4]	analyze the usage of Photoshop and CorelDraw functionalities in designing animated images.
CLO4[K5]	assess the creation of animated advertisements using Photoshop.
CLO5[K6]	create logos, flyers and advertisements.

Extra Credit Course	
Course Code: 23EPP1L	**Course Title:** PYTHON PROGRAMMING LAB-I
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the strings, arrays, files and functions.
CLO2[K3]	illustrate the different data structures in Python.
CLO3[K4]	build programs by using statements.
CLO4[K5]	develop python programs by using arrays and strings.
CLO5[K6]	create file, functions and list programs.

Extra Credit Course	
Course Code: 23EPP2L	**Course Title:** PYTHON PROGRAMMING LAB-II
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the statistical methods and operations.
CLO2[K3]	implement GUI based programs by using Python.
CLO3[K4]	analyze the user-defined data types in Python.
CLO4[K5]	assess the library methods and modules.
CLO5[K6]	develop graphics and charts.

**THE STANDARD FIREWORKS RAJARATNAM COLLEGE FOR WOMEN (AUTONOMOUS),
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College with Potential for Excellence by UGC and Mentor Institution under UGC PARAMARSH)

DEPARTMENT OF COMPUTER APPLICATIONS

PG DEGREE PROGRAMME IN COMPUTER APPLICATIONS

PROGRAMME EDUCATIONAL OBJECTIVES	
The Graduates will	
PEO1.	emerge as successful professionals ready for industry, government sectors and consultancy firms.
PEO2.	comprehend, analyze, design and construct computing solutions for the real-time problems and relate them with research.
PEO3.	act with creative, innovative and entrepreneurial potentials using latest technology and trends.

PROGRAMME LEARNING OUTCOMES	
By the Completion MCA 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: 23PLC11	**Course Title:** PYTHON PROGRAMMING
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the features of python, operators, statements, widgets, functions, lists and tuples.
CLO2[K3]	implement the operators, statements, functions, database and modules in python code.
CLO3[K4]	examine the working of class, inheritance, operator overloading and exception handling mechanism.
CLO4[K5]	assess the data structures, data visualization and database in python.
CLO5[K6]	develop programs by using data structures, strings, class and exceptions.

Core Course	
Course Code: 23PLC12	**Course Title:** LINUX AND SHELL PROGRAMMING
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the LINUX commands, control structures, loops, arrays, functions and database of shell programming.
CLO2[K3]	apply the bash and structured commands in Linux environment.
CLO3[K4]	analyze the methodology of regular expression, zsh, gawk and sed.
CLO4[K5]	assess the ways to get user input, create widget and script control.
CLO5[K6]	develop shell scripts to explore real-time problem solution.

Discipline Specific Elective Course	
Course Code: 23PLDE11	**Course Title:** DISCRETE STRUCTURES
On successful completion of the course, the learners should be able to	

CLO1[K2]	summarize the basic principles of discrete mathematical structures.
CLO2[K3]	solve problems using mathematical Logic, relations, functions and automata.
CLO3[K4]	classify the types of relations, functions and graphs.
CLO4[K5]	determine the shortest path and the equivalence of FA and NFA.
CLO5[K6]	design and formulate the different concepts in Theory of Automata.

Discipline Specific Elective Course	
Course Code: 23PLDE13	**Course Title:** DOT NET TECHNOLOGY
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the components of .NET framework, database, namespaces, pointers, delegates, collections in C# and life cycle of ASP.net web page.
CLO2[K3]	design web based programs by using web form and validation controls.
CLO3[K4]	examine the building blocks of .NET, layers of ADO.net and the strategy of WCF and WPF.
CLO4[K5]	assess the working process of ADO.NET, WCF and WPF architecture.
CLO5[K6]	create console based applications.

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: 23PLC21	**Course Title:** DATA STRUCTURES AND ALGORITHMS
On successful completion of the course, the learners should be able to	

CLO1[K2]	illustrate the features of data structures and algorithmic techniques.
CLO2[K3]	solve problems by using linear and nonlinear data structures and greedy methods.
CLO3[K4]	examine the strategy and applications of data structures and algorithms.
CLO4[K5]	assess different sorting, searching and traversal techniques.
CLO5[K6]	predict and propose solutions to the problems by using data structures and algorithms.

Core Course	
Course Code: 23PLC22	**Course Title:** BIG DATA ANALYTICS

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

CLO1[K2]	describe the characteristics and the fundamentals of big data technologies.
CLO2[K3]	build queries by using MongoDB query language.
CLO3[K4]	analyze the architecture, datatypes, operators and functions in Hive and Pig.
CLO4[K5]	assess the execution flow of Pig Latin scripts and Map reduce programs.
CLO5[K6]	create Pig Latin script with operators and functions.

Core Course	
Course Code: 23PLC2L1	**Course Title:** DATA STRUCTURES AND ALGORITHMS LAB

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

CLO1[K2]	describe the data structure techniques and its usages.
CLO2[K3]	develop programs using appropriate data structures.
CLO3[K4]	illustrate searching and sorting techniques.
CLO4[K5]	choose suitable data structures and predict the best method to solve problems.
CLO5[K6]	build programs for sorting, searching and traversal techniques.

Core Course	
Course Code: 23PLC2L2	**Course Title:** BIG DATA ANALYTICS LAB

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

CLO1[K2]	describe the datatypes, operators and functions in Hive and Pig.
CLO2[K3]	build programs by using Map reduce, Pig and Hive technologies.
CLO3[K4]	analyze the commands to create and manipulate the Hive database.
CLO4[K5]	assess the working mechanism of Map reduce, Pig and Hive technologies.
CLO5[K6]	design queries in Mongodb.

Discipline Specific Elective Course	
Course Code: 23PLDE21	**Course Title:** CRYPTOGRAPHY AND NETWORK SECURITY

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

CLO1[K2]	describe the classical encryption techniques, block cipher, DES, AES, RSA, cryptographic hash functions and digital signatures.
CLO2[K3]	solve problems in RSA, classical encryption techniques and block ciphers.
CLO3[K4]	examine the classical encryption techniques, block cipher, DES, AES, RSA, cryptographic hash functions and digital signatures.
CLO4[K5]	assess the encrypted text and find the original text by using classical encryption techniques.
CLO5[K6]	formulate algorithms to encrypt the text.

Discipline Specific Elective Course	
Course Code: 23PLDE22	**Course Title:** INTERNET OF THINGS
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the fundamentals of IoT, architecture, smart objects and protocols of IoT.
CLO2[K3]	make use of IoT architecture, protocols and security in smart and connected cities.
CLO3[K4]	compare the different IoT architecture, sensors and actuators.
CLO4[K5]	assess the data analytical strategies and tools in IoT.
CLO5[K6]	build use cases for IoT applications.

Skill Enhancement Course	
Course Code: 23PLSE2L	**Course Title:** COMPUTER VISION LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	illustrate the basic image handling and processing in python.
CLO2[K3]	apply computer vision fundamental algorithms in images.
CLO3[K4]	analyze the image processing operations and algorithms.
CLO4[K5]	assess the image segmentation process by using edge detection operations.
CLO5[K6]	develop programs for image clustering and classification algorithms in OpenCV.

Core Course	
Course Code: 23PLC31	**Course Title:** ADVANCED JAVA PROGRAMMING
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the primitives of class, inheritance, packages, interfaces, multithreading, events, controls, beans, socket, Servlet, JSP, Spring.
CLO2[K3]	build programs by using Swing controls, JDBC, JSP, Servlet, Bean.
CLO3[K4]	analyze the features, components, architecture of Servlet, JSP, Struts, Spring.
CLO4[K5]	assess the working mechanism of class, exception, thread, JDBC, JSP, Servlet.
CLO5[K6]	design event driven GUI and web related applications.

Core Course	
Course Code: 23PLC32	**Course Title:** WEB TECHNOLOGIES
On successful completion of the course, the learners should be able to	

CLO1[K2]	summarize the features and fundamentals of HTML, XHTML, CSS, XML, JavaScript, jQuery and Angular.
CLO2[K3]	design web pages by using XHTML, CSS, JavaScript and jQuery.
CLO3[K4]	Examine the dynamic web page designing process in JavaScript and XML.
CLO4[K5]	assess the components of Xhtml and JavaScript in document object model.
CLO5[K6]	construct web applications in PHP, Angular and jQuery.

Core Course	
Course Code: 23PLC3L1	**Course Title:** ADVANCED JAVA PROGRAMMING LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe class, inheritance, packages, interfaces, multithreading, sockets, servlets.
CLO2[K3]	build programs by using applets, Swing and AWT controls.
CLO3[K4]	analyze the features, components, architecture of Servlet, JSP, Struts, Spring.
CLO4[K5]	assess the working strategy of JDBC, JSP, Servlet and Bean.
CLO5[K6]	design event driven GUI and web related applications.

Core Course	
Course Code: 23PLC3L2	**Course Title:** WEB TECHNOLOGIES LAB
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the HTML tags, CSS, JavaScript, jQuery and PHP and its usage in web pages.
CLO2[K3]	make use of method and events in JavaScript to build web pages.
CLO3[K4]	analyze the database creation, collections and jQuery methods.
CLO4[K5]	choose the appropriate technology to assess the real time web applications.
CLO5[K6]	develop web applications by using client and server side scripting languages.

Discipline Specific Elective Course	
Course Code: 23PLDE31	**Course Title:** HIGH PERFORMANCE COMPUTING
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the principles and techniques of modern processors, data access optimization algorithms and parallel programming.
CLO2[K3]	make use of optimization techniques and algorithms in parallel computing
CLO3[K4]	examine the role of compilers, parallel programming techniques and algorithms
CLO4[K5]	evaluate and determine efficient MPI programming.
CLO5[K6]	design efficient and optimized parallel programming by using OpenMP.

Discipline Specific Elective Course	
Course Code: 23PLDE32	**Course Title:** MOBILE COMPUTING
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the fundamentals and computational processing of mobile network.
CLO2[K3]	demonstrate the usage of protocols for mobile and wireless networks.
CLO3[K4]	classify different types of mobile telecommunication and wireless systems
CLO4[K5]	evaluate the effectiveness of different mobile computing systems.
CLO5[K6]	formulate a mobile application system for real world applications.

Skill Enhancement Course	
Course Code: 23PLIN31	**Course Title:** INTERNSHIP
On successful completion of the course, the learners should be able to	

CLO1[K2]	relate the theoretical knowledge with work place practice.
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.

Skill Enhancement Course	
Course Code: 23PLSE31	**Course Title:** NETWORK PROTOCOLS
On successful completion of the course, the learners should be able to	

CLO1[K2]	illustrate the functions, architecture and services of communication protocols.
CLO2[K3]	apply the appropriate internet architecture along with efficient protocol models for the user defined communication environment.
CLO3[K4]	analyze the functions, services and deployments of virtual wired service and IP/optical networking.
CLO4[K5]	inspect the security strategy in IP traffic engineering and its models.
CLO5[K6]	formulate IP routing protocol use cases to establish an efficient data transfer.

Skill Supportive Course	
Course Code: 23PLSS31	**Course Title:** SOFTWARE DEVELOPER SKILLS

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

CLO1[K2]	explain the technical competencies.
CLO2[K3]	apply technical capabilities to create successful programs and applications.
CLO3[K4]	analyze the technical methods applicable for problem solving.
CLO4[K5]	choose a language and determine which type of program is suitable for code development.
CLO5[K6]	design real world applications by using appropriate technology.

Core Course	
Course Code: 23PLC41	**Course Title:** MACHINE LEARNING

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

CLO1[K2]	describe the components of learning and the theories of supervised, unsupervised, reinforcement and ensemble learning.
CLO2[K3]	solve problems by using supervised and unsupervised learning methods.
CLO3[K4]	classify and analyze the algorithms of machine learning.
CLO4[K5]	evaluate the statistical measures and algorithmic metrics in Machine Learning.
CLO5[K6]	create classifiers and clusters for the input dataset.

Core Course	
Course Code: 23PLC42	**Course Title:** NEURAL NETWORKS

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

CLO1[K2]	explain the basics, architecture, algorithms and applications of ANN.
CLO2[K3]	solve problems by using feedforward and feedback networks.
CLO3[K4]	analyze the applications of neural networks and special networks.
CLO4[K5]	interpret the adaptive resonance theory and different types of networks.
CLO5[K6]	develop algorithms for image processing and face recognition.

Core Course	
Course Code: 23PLC4L	**Course Title:** SOFTWARE DEVELOPMENT LAB

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

CLO1[K2]	describe the implementation procedures for the machine learning and image processing algorithms.
CLO2[K3]	apply suitable python libraries for machine learning and image processing algorithms to solve real world problems.
CLO3[K4]	analyze the text and image dataset by using machine learning and image processing algorithms.
CLO4[K5]	calculate statistical measures for the given text/image data.
CLO5[K6]	create python programs for machine learning and image processing task.

Core Course	
Course Code: 23PLC4P	**Course Title:** PROJECT WITH VIVA-VOCE
On successful completion of the course, the learners should be able to	

CLO1[K2]	define the hardware and/or software techniques for business to meet the global competency.
CLO2[K3]	apply professional and managerial skills to achieve project goal.
CLO3[K4]	test and analyze the modules of planned project.
CLO4[K5]	assess the literature and develop solutions for real-time problem statement.
CLO5[K6]	design technical report and deliver presentation.

Discipline Specific Elective Course	
Course Code: 23PLDE41	**Course Title:** BIOMETRICS
On successful completion of the course, the learners should be able to	

CLO1[K2]	explain the biometrics and watermarking techniques.
CLO2[K3]	demonstrate biometric authentication, multimodal biometrics and watermarking techniques.
CLO3[K4]	compare the face, fingerprint, retina, iris techniques.
CLO4[K5]	assess the working practices, challenges and performance of biometric techniques.
CLO5[K6]	design face recognition, iris and fingerprint systems.

Discipline Specific Elective Course	
Course Code: 23PLDE42	**Course Title:** BLOCK CHAIN TECHNOLOGY

On successful completion of the course, the learners should be able to	
CLO1[K2]	explain the fundamentals and the cryptographic building blocks of blockchain technology.
CLO2[K3]	summarize the cryptographic algorithms, smart contracts and biotins.
CLO3[K4]	examine the decentralization methods and applications.
CLO4[K5]	assess and recommend the ethereum development tools and languages.
CLO5[K6]	develop applications by using solidity language on ethereum platform.

Skill Enhancement Course	
Course Code: 23PLSE41	**Course Title:** TRAINING FOR COMPETITIVE EXAMINATIONS

On successful completion of the course, the learners should be able to	
CLO1[K2]	explain the core areas of Computer Science and applications.
CLO2[K3]	apply cognitive abilities to solve quantitative and qualitative problems.
CLO3[K4]	examine the underlying processes in different domains on Computer Science and applications.
CLO4[K5]	justify and evaluate the applicability of computational techniques and theory of computation.
CLO5[K6]	formulate solutions for resource management techniques and computer graphics algorithms.

Skill Supportive Course	
Course Code: 23PLSS41	**Course Title:** PROFESSIONAL SKILLS
On successful completion of the course, the learners should be able to	

CLO1[K2]	illustrate the aspects of intellectual property rights.
CLO2[K3]	apply academic and professional skills in the work place.
CLO3[K4]	analyze the importance and type of communication in professional environment.
CLO4[K5]	choose an insight for technical and non-technical qualities in career planning.
CLO5[K6]	develop leadership, team building, decision making and stress management.

Generic Elective Course	
Course Code: 23PLEG21	**Course Title:** BUSINESS DATA ANALYTICS
On successful completion of the course, the learners should be able to	

CLO1[K2]	describe the basics of business analytics, descriptive measures, data modeling and decision analysis.
CLO2[K3]	solve problems in statistical measures and probability distribution.
CLO3[K4]	examine sampling, intervals and hypothesis testing.
CLO4[K5]	assess data visualization, regression analysis and classification techniques.
CLO5[K6]	create charts and tables in excel.