Department of Computer Science

M.Sc. Computer Science

S.No.	Course Code	Course Name	Course Outcomes
			SEMESTER- I
1.	21PCSC11	Core Course - I: Design and Analysis of Algorithms	**CO1[K1]:** describe the fundamentals of designing, analyzing and algorithm **CO2[K2]:** explain elementary data structures, divide & conquer, greedy method, basic traversal & searching technique, backtracking **CO3[K3]:** use binary search, merge & quick sort, minimum cost spanning trees, 0/1 knapsack to solve simple sorting & searching problem **CO4[K4]:** analyze divide and conquer, greedy, dynamic programming, backtracking methodologies and compare different data structures **CO5[K5]:** choose elementary data structures, sorting techniques, dynamic programming and basic traversal searching techniques.

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S.No.	Course Code	Course Name	Course Outcomes
2.	21PCSC12	Core Course - II: Advanced DBMS	**CO1[K1]:** describe DBMS architecture, Data Models, ER Models, Relational Model, Functional Dependency, Transactions and Recovery. **CO2[K2]:** explain database architecture, relational algebra, structure of relational database, advanced SQL concepts, normalization, transaction model and concurrency control **CO3[K3]:** apply structured query language (SQL) for database definition and database manipulation. **CO4[K4]:** analyze query languages, relational algebra and SQL query language and differentiate keys, normal forms and various concurrencymechanisms **CO5[K6]:** design the ER Model for given database requirements and to developdatabase tables.

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S.No.	Course Code	Course Name	Course Outcomes
3.	21PCSC13	Core Course - III: Distributed Operating System	**CO1[K1]:** describe functions of operating system, distributed resource management, failure recovery and fault tolerance, multiprocessor and database operating systems **CO2[K2]:** explain functions of operating system, distributed resource management, failure recovery and fault tolerance, multiprocessor and database operating systems **CO3[K3]:** determine mutual exclusion algorithms, resource required for distributed OS **CO4[K4]:** examine failure recovery and fault tolerance protocols and multiprocessor design issues **CO5[K5]:** justify distributed deadlock detection algorithms, agreement protocols, Non Token based algorithms and Lamport's algorithm, Token Based algorithms in resource sharing , Two-Phase and Non blocking commit Protocols in fault tolerance

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S.No.	Course Code	Course Name	Course Outcomes
4.	21PCSO11	Elective Course - I: Data Science and Big Data	**CO1[K1]:** describe the concepts and technologies of big data, basic and advancedanalytic theory ,methods, technologies and tools in data science **CO2[K2]:** explain the basics of analytics, analytic methods using R, clustering, regression, classification, time series analysis and text analysis in R **CO3[K3]:** apply R techniques for mining, analytical methods, classification, time series analysis and text analysis **CO4[K4]:** compare analytical theory and methods, classification, clustering, association rules and regression techniques ,time series and text analysisin R. **CO5[K4]:** examine clustering and classification concepts, statistical methods, tools and technologies used in data science analytics
5.	21PCSO12	Elective Course - I: Data Mining	**CO1[K1]:** describe data mining, association pattern mining, cluster analysis, classification and text, time series and web data mining **CO2[K2]:** explain the algorithms of data mining, text, time series and web data mining and social network analysis **CO3[K3]:** use various kinds of data, Data preparation, association, clustering and classification techniques in mining **CO4[K4]:** examine association mining, clustering and classification concepts and algorithms **CO5[K5]:** choose appropriate data mining concepts required to solve real world problems.

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6.	21PCSO13	Elective Course - I: Embedded System	**CO1[K1]:** describe embedded system, core elements, RTOS based design and components **CO2[K2]:** explain purpose and characteristics and elements in embedded system **CO3[K4]**: analyze application and domain specific embedded system. **CO4[K5]**: choose processors, sensors and computational models for a specific domain. **CO5[K6]**: design simple real time embedded systems using the concepts ofRTOS.
7.	21PCSC1P	Practical: Algorithm & OS	**CO1[K2]:** demonstrate data structure and OS algorithms **CO2[K3]:** use data structure and OS algorithms **CO3[K3]:** apply different sorting and searching method **CO4[K4]:** simplify the development of solution using the OS & Data structure algorithm. **CO5[K6]:** design simple program using data structure and OS algorithms
8.	21PCSC1Q	Practical: DBMS	**CO1[K2]:** demonstrate SQL queries and PL/SQL constructs **CO2[K3]:** apply limit, range queries and use string, aggregate and date function **CO3[K3]:** perform sub-queries and exception handling **CO4[K5]:** choose among Procedures, stored Functions and Cursor to construct aPL/SQL **CO5[K6]:** construct PL/SQL program to execute procedure, function and cursor
SEMESTER- II			

S.No.	Course Code	Course Name	Course Outcomes
9.	21PCSC21	Core Course VI: Advanced Computer Networks	**CO1[K1]:** describe the functions of each layer in OSI and TCP/IP model, Encoding, Wireless, Internetworking, End to End protocols, Congestion Control mechanism, Network security, Applications andInfrastructure services **CO2[K2]:** explain the framing, internetworking, RBC, resource allocation, security issues and applications **CO3[K3]:** determine the usage of ethernet, routing, congestion control and internetworking **CO4[K4]:** examine types of network architecture, encoding and applications **CO5[K5]:** choose appropriate protocols for framing, reliable transmission, congestion control and internetworking.
10.	21PCSC22	Core Course VII: Advanced Java Programming	**CO1[K1]:** describe exception handling, multithreading, web services andconcepts of struts 2 **CO2[K2]:** illustrate the creation of GUI components, networking using TCP/IPand datagram, Connecting DB using JDBC **CO3[K3]:** apply Thread Synchronization, Creation of User Defined Exception and basic event handling in GUI Components. **CO4[K4]:** examine the application of built-in exceptions, usage of JDBC and working of SOAP web services **CO5[K5]:** choose corresponding GUI components to design a GUI based Java Application

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11.	21PCSC23	Core Course VIII: Compiler Design	**CO1[K1]:** describe the front end and back end process of the compiler during compilation **CO2[K2]**: explain the functionalities of each phase in compilation **CO3[K3]:** draw finite automata from regular expression, flow graph from intermediate code and use context free grammar **CO4[K4]:** differentiate bottom up parsing, top down parsing and LR Parsing **CO5[K4]:** examine the lexical analysis, syntax analysis, SDT, intermediate code generation, code optimization phases of compilation
12.	21PCSC2P	Core Course IX: Practical: Advanced Java Programming	**CO1[K1]:** describe Collection Classes, exception handling, multithreading, Swing Components, Networking using java, connecting DB using JDBC, web services and concepts of struts 2 **CO2[K2]:** illustrate Collection classes, Handling Exceptions & Multithreading, creation of GUI components, networking using TCP/IP & UDP, creating and accessing DB, SOAP based web services, simple struts2 applications. **CO3[K4]:** apply the concepts of Collection Methods, Exception Handling, Multithreading, Swings, Networking, DB accessing, simple SOAP Applications. **CO4[K5]:** examine various Collection classes, the working of try, catch, throw and throws, Thread handling concepts, accessing DB using Rowset and prepared statement and the concepts of Webservices and Struts2. **CO5[K6]:** choose exception handling methods, GUI components to design an GUI Application and justify the networking methods and DB handling methods

S.No.	Course Code	Course Name	Course Outcomes
13.	21PCSC2Q	Core Course IX: Practical: Python Programming	**CO1[K2]:** demonstrate python programming constructs **CO2[K3]:** perform operations using list, tuples, arrays, dataframes and dictionaries**.** **CO3[K4]:** examine the working of list, tuples, dataframes and dictionaries. **CO4[K5]:** choose the appropriate python modules/libraries to solve a problem. **CO5[K6]:** develop a solution for a basic data science problems
14.	21PCSN21	Non Major Elective Course I: Web Designing	**CO1[K1]:** define the concepts of HTML and javascript **CO2[K2]:** demonstrate basic tags of HTML , elements of CSS and javascript constructs **CO3[K3]:** develop a HTML page using text, images, tables, lists and links **CO4[K4]:** simplify a webpage using CSS **CO5[K4]:** examine HTML tags to design a website
SEMESTER- III			
15.	21PCSC31	Core Course XI: Machine Learning	**CO1[K1]:** describe classification, regression, support vector machine, decision tree, dimensionality reduction and clustering. **CO2[K2]:** explain machine learning approaches, feature extraction, dimensionality reduction, training model, testing model and performance measurement. **CO3[K3]:** choose the appropriate machine learning algorithm based on the natureof the dataset. **CO4[K4]:** compare different machine learning algorithms like classification, regression, support vector machine, decision tree, random forest and clustering. **CO5[K5]:** choose supervised, unsupervised and semi supervised machine learning models to solve problems

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16.	21PCSC32	Core Course XII: Advanced Web Technology	**CO1[K1]:** describe HTML tags, CSS, syntaxes in Bootstrap and PHP constructs **CO2[K2]:** illustrate the working of HTML tags, CSS, PHP constructs used for server side scripting **CO3[K3]:** apply the appropriate HTML tags, Bootstrap classes and PHP statements to develop a user friendly server side and client side scripting **CO4[K4]:** examine the application of HTML tags, CSS and PHP statementsfor server side coding **CO5[K5]:** choose corresponding HTML tags, CSS and PHP statements todesign a responsive website
17.	21PCSC33	Core Course XIII: Digital Image Processing	**CO1[K1]:** describe the fundamental concepts of digital image, image enhancement, image restoration, image compression, image segmentation and edge detection **CO2[K2]:** explain the image enhancement using filters, filters in image restoration, morphological image processing, image segmentationand edge detection. **CO3[K3]:** use various filters in image enhancement and image restoration and basic algorithms for morphological image processing , image compression and various operators in edge detection. **CO4[K4]:** compare lossy and lossless compression and various operators inEdge detection **CO5[K5]:** choose appropriate technique for image enhancement, restoration, compression, segmentation and Edge detection

S.No.	Course Code	Course Name	Course Outcomes
18.	21PCSO31	Elective Course II: Cryptography and Network Security	**CO1[K1]:** describe the concepts of Cryptography and Security **CO2[K2]:** explain encryption techniques, block ciphers, public key cryptography and IP Security **CO3[K3]:** apply simple encryption and decryption techniques **CO4[K4]:** examine DES, AES, RSA, Diffie-hellman key exchange and EllipticCurve Cipher algorithms. **CO5[K5]:** choose suitable cryptography algorithms among DES, AES, RSA, Diffie-hellman key exchange and Elliptic Curve cryptography.
19.	21PCSO32	Elective Course II: Mobile Computing	**CO1[K1]:** describe the Mobile Computing Architecture, mobile devices, GSM, CDMA,3G and 4G and short range networks **CO2[K2]:** explain GSM, CDMA, 2G, 3G, 4G, GPRS, HSPA, LTE, Wireless LAN, WIMAXand BLUETOOTH. **CO3[K2]:** interpret the GSM, CDMA, 2G, 3G, 4G, GPRS, HSPA, LTE, Wireless LAN, WIMAX and BLUETOOTH. **CO4[K4]:** examine the Working of GSM, CDMA, 2G, 3G, 4G, GPRS, HSPA, LTE, Wireless LAN, WIMAX and BLUETOOTH. **CO5[K4]:** compare the Process of GSM, CDMA, 2G, 3G, 4G, GPRS, HSPA, LTE, Wireless LAN, WIMAX and BLUETOOTH.

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20.	21PCSO33	Elective Course II: Wireless Network	**CO1[K1]:** define the basics of wireless networks, spread spectrum, IEEE architecture **CO2[K2]:** explain wireless networks, protocol architecture, IEEE architecture, IoT andbluetooth and LTE **CO3[K2]:** illustrate the process of FHSS, DSSS, CDMA, LAN, MAN, WAN, OSI, TCP/IP,Bluetooth, LTE, IEEE 802.11 and IEEE 802.15 standards. **CO4[K4]:** compare the FHSS, DSSS, CDMA, LAN, MAN, WAN, OSI,TCP/IP, Bluetooth, LTE, IEEE 802.11 and IEEE 802.15 standards. **CO5[K4]:** differentiate the FHSS, DSSS, CDMA, LAN, MAN, WAN, OSI, TCP/IP, Bluetooth, LTE,IEEE 802.11 and IEEE 802.15 standards.
21.	21PCSC3P	Core Course XIV: Practical: Advanced Web Technology	**CO1[K2]:** demonstrate HTML tag, classes in Bootstrap and PHP statements **CO2[K3]:** apply appropriate HTML tags, Bootstrap classes and PHP constructs todevelop a user friendly server side and client side scripting **CO3[K4]:** examine the working of formatting, table tags and PHP statements **CO4[K5]:** choose corresponding tags, responsive classes and PHP statements fordesigning a responsive website **CO5[K6]:** design an user friendly website using HTML, Bootstrap and PHP

Course Outcomes (COs)

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22.	21PCSC3Q	Core Course XV: Practical: Open Source Tools	**CO1[K2]:** explain the looping and functions in R,UML diagrams and linux commands **CO2[K3]:** draw use case, state transition, deployment, activity and componentdesign notations **CO3[K4]:** examine the working of vectors, factors, arrays and list in R, linuxcommands **CO4[K6]:** construct simple plots for given statistical problems in R,UML diagrams **CO5[K6]:** develop R code and design UML diagrams
23.	21PCSM31	Swayam Course: Computer Architecture and Organization	**CO1[K1]:** identify the background and the key words in Computer Architecture and Organization. **CO2[K2]:** demonstrate independent and self-paced learning for clear understanding of the concept **CO3[K3]:** develop computer and communication skills to broaden their knowledge in the course **CO4[K3]:** use high quality reading resources, communication tools and technology to send assignments and to take up test **CO5[K4]:** analyse critically and apply technical skills to comprehend the ideasor

Course Outcomes (COs)

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S.No.	Course Code	Course Name	Course Outcomes
24.	21PCSM32	Swayam Course: Computer Organization and Architecture: A Pedagogical Aspect	**CO1[K1]:** identify the background and the key words in Computer Organization and Architecture. **CO2[K2]:** demonstrate independent and self-paced learning for clear understanding of the concept **CO3[K3]:** develop computer and communication skills to broaden their knowledge in the course **CO4[K3]:** use high quality reading resources, communication tools and technology to send assignments and to take up test **CO5[K4]:** analyse critically and apply technical skills to comprehend the ideasor
SEMESTER- IV			
25.	21PCSC41	Core Course XVI: Internet of Things	**CO1[K1]**: describe IoT, internet principles, prototyping for embedded devices , fourpillars of IoT and connecting IoT to cloud **CO2[K2]:** explain the principles of IoT and applications **CO3[K2]**: illustrate the usage of connected devices, MAC addresses, Non-digital methods,3D printing , four pillars of IoT and connecting IoT to cloud **CO4[K4]**: examine internet principles and embedded devices required for IoT andreal time applications of IoT **CO5[K5]**: choose the IoT connected devices, internet principles and Embedded devices to solve real time applications

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26.	21PCSC42	Core Course XVII: Software Project Management	**CO1[K1]:** describe the key phases of software project management **CO2[K2]:** explain software project and programme management, project and activity planning, project evaluation, risk management, monitoring and control, managing contracts, people and environment **CO3[K3]:** apply project and programme management, project and activity planning,project evaluation and risk management **CO4[K4]:** examine project planning, activity planning and risk management in software project management **CO5[K4]:** analyze case studies on stakeholder identification, cost analysis, project Planning and network planning models
27.	21PCSC43	Core Course XVIII: Research Methodology	**CO1[K1]:** describe research, research problem, research design, sampling design, measurement and scaling techniques, methods of data collection, processing and analysis of data and plagiarism. **CO2[K2]:** explain types of research, research process, research problem, research design, steps in sampling, measurement and scaling techniques,interpretation, research reports and plagiarism **CO3[K3]:** choose the appropriate research problem, research design, method of data collection, sampling design, measurement and scaling technique **CO4[K4]:** examine research methods and methodologies, research process, research problem, research design, research reports. **CO5[K6]:** design a data collection method for their research problem & create plagiarism free research reports.

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28.	21PCSJ41	Core Course XIX: Project	**CO1[K2]:** demonstrate the skills in handling latest technologies **CO2[K3]:** use appropriate software and hardware tools to solve the problem **CO3[K3]:** apply the skills acquired throughout the programme to propose asolution **CO4[K4]:** analyze existing problem in their selected domain and present newideas **CO5[K6]:** design a simple system to meet the requirements for the givenconstraints