

**Department of Computer Science and Engg.
SGB Amravati University, Amravati**

PO, PSO, CO's of PGDCS, MSC (Computer Science), MCA, ME (CSIT)

Programme code	Programme Name	Department
	P.G.Diploma in Computer Science	Computer Science

Program Details:

The P.G. Diploma in Computer Science Program of department of Computer Science at SantGadge Baba Amravati University , started in 1986, aims to educate student with problem solving using computer science and technologies. It aims to provide technology-oriented students with the ability to develop software solutions and technology.

This program develops human resource for IT industries as well as equipped students to start their own business as a software developer, database administrator, programmer, system analyst.

Programme Specific Outcomes (PSOs):

PSO 1: The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, and networking for efficient design of computer-based systems of varying complexity.

PSO 2: The ability to understand the evolutionary changes in computing, apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success, real world problems and meet the challenges of the future.

PSO3: The ability to employ modern computer languages, environments, and platforms in creating innovative career paths to be an entrepreneur, lifelong learning and a zest for higher studies and also to act as a good citizen by inculcating in them moral values & ethics.

PSO4: Students will be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building.

Program Outcomes :

PO1: Create , identify and apply appropriate techniques, resources and modern computing tools to Complex computing problems.

PO2: Apply Computer Science and Information Technology skills team to develop computing based solutions for the society.

PO3: Apply knowledge of computing fundamentals and domain knowledge to aquire the skills.

PO4: Design and evaluate solutions for complex computing problems with appropriate considerations.

PO5: Identify the need and have the ability to engage in independent learning as a computing professional.

Course Outcomes (COs):

S.No.	Name of the course	Course Code	Course Outcome
1	Computer Organization and Architecture	PGDCS / MCA19101	<ul style="list-style-type: none">• Understanding of digital system, its organization and architecture.• Apply knowledge of digital electronics logic gate to combinational and sequential circuits.• Knowledge of the basics of computer hardware and how software interacts with computer hardware.• Apply concepts of assembly language in solving problems.• Illustrate the concept of processing I/O organization and examine different ways of communicating with I/O devices and

			standard I/O interfaces.
2	Object Oriented Programming with C++	PGDCS / MCA19102	<ul style="list-style-type: none"> • Understanding of Object oriented programming and advanced C++ concepts. • Use C++ Concepts for solving real life problems. • Develop problem solving skills using object oriented techniques.
3	Mathematical Foundation	PGDCS / MCA19103	<ul style="list-style-type: none"> • Understanding of floating point representation and arithmetic. • Ability of solving equations using interactive methods, matrices and linear system of equations. • Understanding of different curve fitting by approximation of functions. • Ability of solving numerical differentiation and integration using iterative methods.
4	Elective – I (i) System Analysis Design	PGDCS /MCA19104	<ul style="list-style-type: none"> • Understand different phases of Systems Development life cycle. • Understand how projects are initiated and selected, define a business problem and determine the feasibility of a proposed project. • Apply information gathering methods effectively to elicit human information requirement. • Understand prototyping and develop logical DFD's that illustrate the proposed system. • Create data dictionary and choose an appropriate decision analysis method for analyzing structured decision and creating process specification. • Design input-output for user interface and database for storing data.
5	Elective – I (ii) Management Information	PGDCS /	<ul style="list-style-type: none"> • Understand the leadership role of Management Information

	System	MCA19104	<p>Systems in achieving business competitive advantage through informed decision making.</p> <ul style="list-style-type: none"> • Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives. • Effectively communicate strategic alternatives to facilitate decision making. • Evaluate the role of information systems in today's competitive business environment. • Assess the relationship between the digital firm, electronic commerce, electronic business and internet technology.
6	Elective – I (iii) Accounting and Financial Management	PGDCS / MCA19104	<ul style="list-style-type: none"> • Understanding of importance of Book-keeping. • Knowledge of different methods and practices of book-keeping. • Knowledge of types of accounting. • Understanding of financial management. • Knowledge of different methods and practices in financial management.
7	Lab 1 – Based on C++	PGDCS / MCA19106	<ul style="list-style-type: none"> • Skill of application of OOP concept for solving problems.
8	Lab 2 – Based on Mathematical Foundation	PGDCS / MCA19107	<ul style="list-style-type: none"> • Skill of solving mathematical problems using numerical and statistical methods.
9	Lab. 3 – Based on Web Technology	PGDCS / MCA19108	<ul style="list-style-type: none"> • Gain conceptual as well as practical knowledge of web-development Languages and web-designing tools. • Develop skills of basic web-development. • Able to use web design tools and to design and develop web-pages professionally.
10	Data Structures	PGDCS / MCA19109	<ul style="list-style-type: none"> • Knowledge of basic data structures and algorithms.

			<ul style="list-style-type: none"> • Understand concepts of searching and sorting techniques • Understand concepts of stacks, queues, lists, trees and graphs. • Able to write algorithms for solving problems with the help of fundamental datastructures
11	Operating System	PGDCS / MCA19110	<ul style="list-style-type: none"> • Analyze & Classify different types of operating system • Understand the working of Operating system • Understand the Memory Management policies. • Concepts of input/output, storage and file management • Understand various protection and security mechanisms
12	Database Management System	PGDCS / MCA19111	<ul style="list-style-type: none"> • Understand concepts of database system architecture. • Able to understand relational model and perform SQL operations. • Understand the importance of normal forms and learn query optimization. • Learns the importance of transaction processing and concurrency control. • Learn the concept of data warehousing and data mining.
13	Elective – II (i) E-Commerce	PGDCS / MCA19112	<ul style="list-style-type: none"> • Gain a comprehensive understanding of the E-Commerce landscape, currentandemergingbusiness models, and the technology and infrastructureunderpinnings of the business. • Leverage the E-Commerce platforms to enhance current business orincubate new businesses. • Gain an understanding on how innovative use of the E-Commerce canhelp developing competitive advantage. • Develop an understanding on how internet can help business grow. • Gain an understanding on the importance of security, privacy, and ethicalissues as they relate to E-Commerce.

14	Elective – II (ii) Operation Research	PGDCS / MCA19112	<ul style="list-style-type: none"> • Model a real-world problem as a mathematical programming model. • Understand the theoretical workings of the simple method for linear programming and perform iterations of it by hand. • Understand the relationship between a linear program and its dual, including strong duality. • Solve specialized linear programming problems like: Transportation and Assignment Problems. • Solve network models like the shortest path, minimum spanning tree and maximum flow problems.
15	Elective – II (iii) Software Project Management	PGDCS / MCA19112	<ul style="list-style-type: none"> • Able to recognize evolving role of software project management. • Understand and estimate cost for software project. • Identify & analyze aspect in s/w to manage time, process & resources effectively with quality concept. • Estimate software productivity using metrics and indicator & identify important issues for planning a project. • Judge different testing techniques used to test software. • Evaluate the role of user and software teams.
16	Lab 4 – Based on Data Structures	PGDCS / MCA19114	<ul style="list-style-type: none"> • Skill of application of different data structures for solving problems.
17	Lab 5 – Based on DBMS	PGDCS / MCA19115	<ul style="list-style-type: none"> • Skill of effective use of database management system.
18	Lab 6- Based on Linux and Windows	PGDCS / MCA19116	<ul style="list-style-type: none"> • Able to understand the Basics of Windows & Linux working • Ability to learn the creation of Windows with various components

			<ul style="list-style-type: none"> • Able to perform the shell scripting programs . • Able to create file handling utilities by using Linux shell environment.
--	--	--	--

Programme code	Programme Name	Department
	P.G.Diploma in E-Learning and M-learning	Computer Science

Programme Specific Outcomes (PSOs):

PSO1: Students will be able to understand the various technologies for Education and all the advancements in the on-line teaching.

PSO2: Students will be able to demonstrate and apply their knowledge of Data Communications and networking, web technology and Mobile Technology to develop effective solutions needed for the application areas.

PSO3: Students will be able to learn principles of management, web technology and Mobile Technology, Database Technology which is useful for product design, development, maintenance, and project management.

PSO4: Students will be able to demonstrate adequate skills in oral and written communication for technical English language, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building.

Program Outcomes:

PO1: Apply the knowledge of Computer science for education and e-learning and m-learning methodology.

PO2: Apply Computer Science and Information Technology skills team to develop computing based solutions for the society.

PO3: Apply knowledge of computing fundamentals and domain knowledge to acquire the skills.

PO4: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the societal, and environmental considerations.

PO5: Identify the need and have the ability to engage in independent learning as a computing professional.

Syllabus of PGDEM

SEMESTER I

Sr. No.	Subject	Course Outcome
1.	Technology for education (1EM1)	<ol style="list-style-type: none">1. Develop, communicate, implement, and evaluate technology-infused strategic plans2. Maintain and manage a variety of digital tools and resources for use in technology-rich learning environment.3. Demonstrate field experience in a working environment where educational technology services and programs are used or developed.4. Use the existing technologies in education.5. Design and develop ICT integrated learning resources.6. Develop cognizance of critical perspectives of Hardware & Software Tools.7. Use Technologies to support students' special learning needs.

2.	Digital Communication & Networking (1EM2)	<ol style="list-style-type: none"> 1. Understand the concepts of Digital Communication System and its components. 2. Learn various types of network topologies and their appropriateness for designing a network. 3. Understand the various standard models of networking. Acquire deeper understanding about service implementation of various protocols used during network communication. 4. Understand roles and importance of different network devices within a network.
3.	Elective-II :Digital Systems & Microprocessors (1EM3) (I)	<ol style="list-style-type: none"> 1. Learn representation of numbers in digital systems, Karnaugh map, TTL, ECL, MOS, CMOS logic families. 2. Understand working of multiplexers, demultiplexers, digital comparators, code convertor, decoder. 3. Design arithmetic circuits, Flip-flops such as RS, JK, JK-MS, D and T flip-flops, counters. Understand the working of microcomputer, microprocessor. 4. Able to write codes for 8086 microprocessor with interrupt processing and memory management.
4.	Elective-II :Embedded Systems (1EM3) (II)	<ol style="list-style-type: none"> 1. Foster ability to understand the internal architecture and interfacing of different peripheral devices with Microcontrollers. 2. Foster ability to write the programs for microcontroller. 3. Foster ability to understand the role of embedded systems in industry.

		4. Foster ability to understand the design concept of embedded systems.
5.	Elective-II :Client Server Computing (1EM3) (III)	<ol style="list-style-type: none"> 1. Acquire knowledge of Server Side programming by implementing Servlet and JSP. 2. Acquire the knowledge of J2EE architecture, MVC Architecture. 3. Distinguish Web Server, Web Container and Application Server, Serialization, Internationalization 4. Understand and write the deployment descriptor and enterprise application deployment. 5. Design and implement components like: Session, Java Beans, JSTL, Tag Extension and Filter. 6. Gain knowledge of frameworks such as Struts Architecture and Hibernate Architecture
6.	Elective-II :System Analysis, Design & Software Engineering (1EM3) (IV)	<ol style="list-style-type: none"> 1. Able to recognize evolving role of software Analysis & Design. 2. Understand and estimate cost for software project. 3. Identify& analyze aspect in s/w to manage time, process & recourses. 4. Recognize evolving role of software project management. 5. Understand and estimate cost for software project. 6. Identify analyze aspect in s/w to manage time, process &recourses effectively with quality concept. 7. Estimate software productivity using metrics and indicator & identify important issues for

		planning a project
--	--	--------------------

Semester-II

Sr. No	Subject	Course Outcomes
1.	Mobile Communications (2EM1)	<ul style="list-style-type: none"> • Understand the concepts of mobile communication, signal propagation, modulation, medium access control. • Learn concepts of telecommunication systems, satellite systems, broadcast systems. • Understand wireless LAN, mobile network layer, adhoc networks, mobile transport layer. • Understand and analyse various supports for mobility such as file systems, www, WAP, i-mode, SyncML.
2.	Multimedia Techniques (2EM2)	<ul style="list-style-type: none"> • Define and discuss the Introduction to Multimedia, Identify the multimedia components, Multimedia Authoring and Tools. • Understand the various multimedia software and tools for customized graphic, video and audio designs. • Understand the hardware requirement and Classification multimedia software. • Understand the Graphics and Image Data Representation, Color in Image & Video, Fundamental Concept in Video, Audio. • Understand analog and digital conversion process. • Understand the audio digitization, audio file format and audio software, digital video standards, formats and technology. • Understand the various techniques for Multimedia Data Compression, Image Compression Standards, Basic Video Compression, MPEG Coding Scheme
3.	Elective-II (I) Windows	<ul style="list-style-type: none"> • Define basics of Windows programming model

	Programming(2EM3)	<ul style="list-style-type: none"> • Describe methods of applying messages as basic elements in Windows programming • Demonstrate usage of standard input and output in Windows operating system • Create windows by using different basic elements and resources • Produce Windows application according to requirements (pre-defined input and output parameters) • Select engineering approach to problem solving based on the acquired knowledge in the field of programming
4.	Elective-II (II) Advance Computer Networks(2EM3)	<ul style="list-style-type: none"> • Learn data transmission models, modulation, multiplexing. • Understand applications of layers such as application layer, transport layer, network layer, and data link layer. • Understand the importance of Multimedia • Understand the concept of IP Routing • Understand various Network Devices • Understand the importance of network security and management
5.	Elective-II (III) Microprocessor Programming & Interfacing (2EM3)	<ul style="list-style-type: none"> • Describe the architecture and organization of microprocessor along with instruction set format. • Describe modes and functional block diagram of 8086 along with pins and their function. • List and describe memory and addressing modes. • List, describe and use different types of instructions, directives and interrupts. • Develop assembly language programs using various programming tools.
6.	Elective-II (IV) Software Project Management(2EM3)	<ul style="list-style-type: none"> • Able to recognize evolving role of software project management. • Understand and estimate cost for software project. • Identify & analyze aspect in s/w to manage time, process & resources effectively with quality concept.

		<ul style="list-style-type: none"> • Estimate software productivity using metrics and indicator & identify important issues for planning a project. • Judge different testing techniques used to test software. • Evaluate the role of user and software teams.
--	--	--

Programme code	Programme Name	Department
	M.Sc. Computer Science	Computer Science

The Master in Computer Science Program of department of Computer Science at SantGadge Baba Amravati University , started in 1992, aims to educate student to identify and analyze complex scientific, societal, industrial problems and reaching effective software solutions using principles of mathematics, appropriate software tools, programming languages.It aims to provide technology-oriented students with the ability to design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the societal, and environmental considerations.

This program develops human resource for government organizations, IT industries as well as equipped students to start their own business as a software developer, database administrator, programmer, system analyst, data scientist, web application developer, system programmer, software testing, expert system designer.

Programme Specific Outcomes (PSOs):

PSO1: Ability to learn the skills to implement effective solutions for need based problems by applying knowledge gained through different programming languages, tools and software covered in the syllabus of program.

PSO2: Ability to learn and analyse working and type of operating systems, distributed operating systems, its process, memory and file management which enables them to take appropriate optimized decisions for applying necessary algorithms.

PSO3: Ability to understand the principles and working of computer systems. Students have a sound knowledge about the hardware and software aspects of computer systems.

PSO4: Ability to design and develop computer programs and understand the structure and development methodologies of software systems and able to apply knowledge to provide innovative novel solutions to existing problem and identify the research gaps.

Programme Outcomes

PO1: Provides technology-oriented students with the knowledge and ability to develop creative solutions

PO2: An ability to design and conduct experiments, as well as to analyze and interpret data

PO3: An ability to design a solution based system, process to meet desired needs within realistic constraints such as environmental, social, safety, and sustainability

PO4: An understanding of professional and ethical responsibility develop skills to learn new technology

PO5: An ability to acquire required programming skills, formulate and solve practical problems

Course Outcomes (COs):

S.No.	Name of the course	Course Code	Course Outcome
1	Digital System and Microprocessor	1MCS1	<ul style="list-style-type: none">• Learn representation of numbers in digital systems, Karnaugh map, TTL, ECL, MOS, CMOS logic families.• Understand working of multiplexers, demultiplexers, digital comparators, code convertor, decoder.• Design arithmetic circuits, Flip-flops such as RS,JK, JK-MS, D and T flip-flops, counters.

			<ul style="list-style-type: none"> • Understand the working of microcomputer, microprocessor. • Able to write codes for 8086 microprocessor with interrupt processing and memory management.
2	.Net Technologies and C#	1MCS2	<ul style="list-style-type: none"> • Learn the C# language of the .net technology of Microsoft corporation. • Able to understand object-oriented principles, inheritance along with its types, polymorphism, operator overloading, delegates, exception handling, multithreading. • Learn file manipulation and data access with ADO.Net. • Able to implement an efficient scalable software solution in the form of web or windows application.
3	Operating System	1MCS3	<ul style="list-style-type: none"> • Able to learn working and type of operating systems, its process management, process synchronization, deadlocks, memory management. • Able to analyse and write algorithms for disk, process and memory management. • Understand concepts of file system, directory structures, distributed file system and embedded operating system.
4	Computer Networks	1MCS4	<ul style="list-style-type: none"> • Learn data transmission models, modulation, multiplexing. • Understand applications of layers such as application layer, transport layer, network layer, data link layer. • Understand the importance of network security and management by analyzing different threats, principles of cryptography, digital signature, internet network management framework.
5	Lab I – Based on 1MCS1 and 1MCS3	1MCS5	<ul style="list-style-type: none"> • Skill to implement assembly language programs. • Skill to implement operating system related algorithms as

			programs.
6	Lab II – Based on 1MCS2	1MCS6	<ul style="list-style-type: none"> • Skill of writing C# application using OOP concept.
7	Java Programming	2MCS1	<ul style="list-style-type: none"> • Learn Java programming language which can be utilized to develop windows and internet based software solutions. • Able to understand and apply the knowledge of object-oriented principles, applets, graphical user-interface for scientific and business oriented applications.
8	Data Structures	2MCS2	<ul style="list-style-type: none"> • Understand the classification of data structures and Knowledge of basic and dynamic data structures.. • Compare and contrast various data structures and design techniques in the area of Performance and Memory Representation. • Ability to evaluate algorithms and data structures in terms of time and complexity of basic operations. • Ability to analyze algorithms for stack, queue and linked list, trees, and graphs and compare their Performance and tradeoffs. • Incorporate data structures into the applications such as binary search trees, AVL tree and B trees. • Ability to implement Data Structure Traversal such as Array, Stack, Queue, Linked List, Tree and Graph. • Apply and implement learned algorithm design techniques and data structures to solve problems. • Understand the various searching and sorting techniques
9	Software Engineering	2MCS3	<ul style="list-style-type: none"> • Able to apply the concepts of software engineering which is essentially important while working on big modules and or projects. • Understand the concept of system and able to

			<p>analyse its feasibility study.</p> <ul style="list-style-type: none"> • Understand software process framework , requirement modeling approaches, software design, software quality. • Able to apply software metrics and software testing.
10	Discrete Mathematical Structures	2MCS4(1)	<ul style="list-style-type: none"> • Prepare to develop mathematical logic essentially required in complex programming. • Able to learn and apply set theory, algebraic structures, lattices and Boolean algebra, graph theory. • Able to troubleshoot fault detection in combinational switching circuits. • Understand and able to apply learns to analyse algorithms for generating a fault matrix.
11	Compiler Construction	2MCS4(2)	<ul style="list-style-type: none"> • Understand the major phases of compilation and to Understand the knowledge of Lex tool & YACC tool. • Develop the parsers and experiment the knowledge of different parsers design without automated tools. • Construct the intermediate code representations and generation. • Convert source code for a novel language into machine code for a novel computer. • Apply for various optimization techniques for dataflow analysis.
12	Lab III – Based on 2MCS1	2MCS5	<ul style="list-style-type: none"> • Skill of writing core Java application using OOP concept. • Skill of writing applet for internet applications. • Skill of writing GUI based windows applications.
13	Lab IV – Based on 2MCS2 and 2MCS3	2MCS6	<ul style="list-style-type: none"> • Skill of applying and implementing linear and non-linear data structures in programs. • Skill of writing effective sorting and searching methods

			<p>depending upon factors like type and volume of data.</p> <ul style="list-style-type: none"> • Knowledge of software engineering methods and practice their appropriate applications. • Understands software testing approaches such as white box testing, black box testing. • Skill to take case studies with respect to components learned in software engineering.
14	Data Mining and Data Warehousing	3MCS1	<ul style="list-style-type: none"> • Develop research oriented applications of data mining and data warehousing. • Understand the necessity and importance of data preprocessing, data integration, data discretization. • Learn the concepts of OLAP technology, data mining methods, various classification and prediction methods. • Able to apply accuracy and error measures, methods of cluster analysis, graph mining and mining sequence patterns in biological data.
15	Computer Graphics	3MCS2	<ul style="list-style-type: none"> • Apply mathematical geometry and logic to develop Computer programs for elementary graphics operations and to develop scientific and strategic approach to solve complex problems in the domain of Computer Graphics. • Demonstrate an understanding of contemporary graphics hardware. • Ability to draw graphics using line & polygon and ability to perform operations on computer graphics. • Understand and demonstrate geometrical transformations, Segment, Windowing and Clipping, Interaction. • Understand and demonstrate 2D & 3D image processing techniques.

			<ul style="list-style-type: none"> • Understand and demonstrate Hidden Surfaces & Lines; Light, Colour& Shading; Curves and Fractals
16	Client-Server Computing	3MCS3	<ul style="list-style-type: none"> • Learn to implement network related programs with concepts of servers and sockets. • Understand JDBC concepts, prepared and callable statements and able to implement database connectivity applications. • Understand and learn effective implementation of Servlet and JSP technologies which is essential component implementing scalable and sturdy enterprise level applications. • Implement Remote method invocation applications for cross-platform data transaction. • Apply client-side scripting language JavaScript which can be utilized to optimize server load. • Learn advanced Java and able to develop enterprise level web applications.
17	Distributed Operating System	3MCS4(1)	<ul style="list-style-type: none"> • Understand distributed operating system concepts, design issues. • Learn communication, synchronization, processes and processors in distributed systems. • Understand distributed file systems, distributed shared memory concepts. • Analyse two distributed operating systems AMOEBA and MACH with reference to modules learned earlier as case study.
18	Theory of Computation	3MCS4(2)	<ul style="list-style-type: none"> • Use concepts of formal languages of finite automata techniques. • Design Finite Automata's for different regular expressions and languages. • Construct context free grammar for various languages. • Solve various problems of applying normal form techniques,

			push down automata and Turing Machines.
19	Lab V – Based on 3MCS1 and 3MCS2	3MCS5	<ul style="list-style-type: none"> • Understand stages in building a Data Warehouse • Understand the need and importance of pre-processing techniques • The data mining process and important issues around data cleaning, and integration. • The principle algorithms and techniques used in data mining, such as clustering, association mining, classification and prediction. • Draw primitive graphical shapes and perform transformation techniques programmatically. • Understand Text and Graphics mode, initialization of graphics mode, graphics drivers, switching between text and graphics mode programmatically. • Understand the basic principles of implementing computer graphics primitives programmatically. • Understand Graphics Primitives: Pixel, Line, Circle, Ellipse, Polygons, Line styles, Bar graphs, Pie Charts, filling a polygon with different methods, windowing programmatically. • Understand Colour, Colour Palette, Aspect ratio, Text: fonts, alignment, size, orientation and justification programmatically. • Understand and demonstrate geometrical transformations, Segment, Windowing and Clipping, Interaction, 2D & 3D image processing techniques; Hidden Surfaces & Lines; Light, Colour & Shading; Curves and Fractals programmatically.
20	Lab VI – Based on 3MCS3	3MCS6	<ul style="list-style-type: none"> • Skill to implement network based applications. • Skill to implement database connectivity application using client-server architecture. • Skill to write enterprise-level applications using Servlet and

			<p>JSP.</p> <ul style="list-style-type: none"> • Skill to develop RMI application for cross-platform data transaction. • Skill to develop component-based programming using beans. • Skill to implement client-side JavaScript modules for server optimization.
21	Artificial Intelligence and Expert Systems	4MCS1	<ul style="list-style-type: none"> • Learn the language for programming in logic (ProLog) which is based on ‘inferring with heuristic learning’, utilized for implementing artificial intelligence applications and design of expert systems of particular domain knowledge-base. • Understand wide range of techniques to represent knowledge in machines and develop perspective towards variety of methodologies to solve a problem which otherwise would not be possible by procedural languages. • Understand and able to implement game playing algorithms with minimax search procedure, predicate logic. • Understand the process of natural language understanding, applications of artificial neural networks, learning by machines.
22	Design and Analysis of Algorithms	4MCS2	<ul style="list-style-type: none"> • Learn to compute the time and space complexity of a given algorithm and analyse the efficiency of algorithms. • Learns the utilization of different prototypes of problem solving to solve a given problem. • Understand and analyse greedy algorithms, dynamic programming, concepts of tractable and intractable problems. • Understand the class of P, NP and NP-complete problems.
23	Network Security	4MCS3	<ul style="list-style-type: none"> • Develop basic skills of secure Network Architecture and explain the theory behind security • Study the basic idea behind cryptography and design the

			<p>algorithm to make a secure communication.</p> <ul style="list-style-type: none"> • Identify common Network vulnerabilities and attacks. • Learn too find the defense mechanism against network attack • Design the cryptographic protection mechanism. • Knowledge about the authentication and various techniques used for the authentication.
24	Mobile Communication	4MCS4(1)	<ul style="list-style-type: none"> • Understand the concepts of mobile communication, signal propogation, modulation, medium access control. • Learn concepts of telecommunication systems,satellite systems, broadcast systems. • Understand wireless LAN, mobile network layer, adhoc networks, mobile transport layer. • Understand and analyse various supports for mobility such as file systems, www, WAP, i-mode, SyncML.
25	Digital Image Processing	4MCS4(2)	<ul style="list-style-type: none"> • Able to learn and implement methodologies and approaches of image enhancement in the spatial domain, frequency domain. • Understand the concept and techniques of image restoration, color image processing, morphological image processing. • Apply approaches towards image segmentation. • Learn and able to implement in depth processing of digital image.
26	Software Testing	4MCS4(3)	<ul style="list-style-type: none"> • Distinguish characteristics of structural testing methods. • Design and conduct a software test process for a software testing project. • Understand and identify various software testing problems and able to solve these problems by designing and selecting software test models, criteria, strategies, and methods. • Able to apply software testing knowledge and engineering

			methods.
27	Lab VII – Based on 4MCS1 and 4MCS2	4MCS5	<ul style="list-style-type: none"> • Skill to write applications to prevent and/or enforce backtracking using Prolog. • Skill to write applications using lists with recursion. • Skills to write applications of AI in Prolog. • Skill to implement an expert system using Prolog. • Skill to compute the time and space complexity of a given program and analyse the efficiency of program. • Understands the utilization of different prototypes of problem solving to solve a given problem. • Skill to implement and analyse greedy algorithms, dynamic programming, tractable and intractable problems. • Understand the class of P, NP and NP-complete problems.
28	Project	4MCS6	<ul style="list-style-type: none"> • Learn to apply the knowledge gained through various courses in solving a real life problem. • Practice different phases of software/system development life cycle. • To introduce the student to a professional environment and/or style typical of a global IT industry, • To prepare for structured team work and project management. • Able to prepare effective, real-life, technical documentation. • To provide an opportunity to practice time, resource and person management.

Programme code	Programme Name	Department
-----------------------	-----------------------	-------------------

	Master in Computer Application	Computer Science
--	--------------------------------	------------------

The Master in Computer Application Program of department of Computer Science at SantGadge Baba Amravati University , started in 1995, aims to educate student to identify and analyze complex scientific, societal, industrial problems and reaching effective software solutions using principles of mathematics, appropriate modern IT tools, programming languages. Students of this programme will not only be able to function effectively both as a team leader and team member on multi disciplinary projects to demonstrate computing and management skills but also be able to communicate effectively and present technical information in oral and written reports. This programme develops perspective in context with ethics, social, cultural and cyber regulations.

It aims to provide technology-oriented students with the ability to design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the societal, and environmental considerations. This program develops human resource for government organizations, IT industries as well as equipped students to start their own business as a software developer, database administrator, programmer, system analyst, data scientist, web application developer, system programmer, software testing, expert system designer.

Programme Specific Outcomes (PSOs):

PSO1: Students will be able to adapt the skills to implement effective solutions for need based problems by applying knowledge gained through different programming languages, tools and software covered in the syllabus of program.

PSO2: The ability to understand, analyse and develop computer programs in the areas related to algorithms, system software, multimedia, web design, and networking for efficient design of computer-based systems of varying complexity.

PSO3: The ability to understand the changes in computing technologies, apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success, real world problems and meet the challenges of the future.

PSO4: The ability to employ modern computer languages, environments, and platforms in creating innovative career to be an entrepreneur because of full sem Industrial Project, lifelong learning and a passion for higher studies and also to act as a good citizen by inculcating in them moral values & ethics. Students will be able to demonstrate adequate skills in communication, actively participate in group discussions and interviews and exhibit the evidence of vocabulary building.

Program Outcomes:

PO1: Modern Tool Usage: Create, identify and apply appropriate technique, resource & modern computing tools to complex computing problem.

PO2: Apply computer Science & information Technology skills with learn to develop computing based solution for society.

PO3: Computational Knowledge : Apply Knowledge of computing fundamentals & domain Knowledge.

PO4: Development of Solutions: Design & Evaluate the solution of complex computing problem with appropriate consideration.

PO5: Life long learning: Identify the need & have the ability, to engage in independent learning as a computing professional.

S.No.	Name of the course	Course Code	Course Outcome
1	Computer Organization and Architecture	MCA19101/PGDC S19101	<ul style="list-style-type: none"> • Understanding of digital system, its organization and architecture. • Apply knowledge of digital electronics logic gate to combinational and sequential circuits. • Knowledge of the basics of computer hardware and how software interacts with computer hardware. • Apply concepts of assembly language in solving problems. • Illustrate the concept of processing I/O organization and examine different ways of communicating with I/O devices and

			standard I/O interfaces.
2	Object Oriented Programming with C++	MCA19102/PGDC S19102	<ul style="list-style-type: none"> • Students will be familiar with the main features of the C++ language. • Students will be able to apply the computer programming techniques to solve practical problems. • Students will be able to understand the difference between object oriented programming and procedural oriented language and data types in C++. • Students will be able to understand the concepts and implementation of constructors and destructors. • Students will be able to develop program using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc. • Students are able to learn C++ data types, memory allocation/deallocations, functions and pointers. • Students will be able to develop software applications using object oriented programming language in C++. • Be able to debug and test C++ programs. • Students are able to apply object oriented programming concepts to software problems in C++
3	Mathematical Foundation	MCA19103/PGDC S19103	<ul style="list-style-type: none"> • Understanding of floating point representation and arithmetic. • Ability of solving equations using interactive methods, matrices and linear system of equations. • Understanding of different curve fitting by approximation of functions. • Ability of solving numerical differentiation and integration using iterative methods.

4	Elective – I (i) System Analysis Design	MCA19104/PGDC S19104	<ul style="list-style-type: none"> • Understand different phases of Systems Development life cycle. • Understand how projects are initiated and selected, define a business problem and determine the feasibility of a proposed project. • Apply information gathering methods effectively to elicit human information requirement. • Understand prototyping and develop logical DFD's that illustrate the proposed system. • Create data dictionary and choose an appropriate decision analysis method for analyzing structured decision and creating process specification. • Design input-output for user interface and database for storing data.
5	Elective – I (ii) Management Information System	MCA19104/PGDC S19104	<ul style="list-style-type: none"> • Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making. • Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives. • Effectively communicate strategic alternatives to facilitate decision making. • Evaluate the role of information systems in today's competitive business environment. • Assess the relationship between the digital firm, electronic commerce, electronic business and internet technology.
6	Elective – I (iii) Accounting and Financial Management	MCA19104/PGDC S19104	<ul style="list-style-type: none"> • Understanding of importance of Book-keeping. • Knowledge of different methods and practices of book-keeping. • Knowledge of types of accounting. • Understanding of financial management. • Knowledge of different methods and practices in financial

			management.
7	Lab 1 – Based on C++	MCA19106/PGDC S19106	<ul style="list-style-type: none"> • Skill of application of OOP concept for solving problems.
8	Lab 2 – Based on Mathematical Foundation	MCA19107/PGDC S19107	<ul style="list-style-type: none"> • Skill of solving mathematical problems using numerical and statistical methods.
9	Lab. 3 – Based on Web Technology	MCA19108/PGDC S19108	<ul style="list-style-type: none"> • Gain conceptual as well as practical knowledge of web-development Languages and web-designing tools. • Develop skills of basic web-development. • Able to use web design tools and to design and develop web-pages professionally.
10	Data Structures	MCA19109/PGDC S19109	<ul style="list-style-type: none"> • Knowledge of basic data structures and algorithms. • Understand concepts of searching and sorting techniques • Understand concepts of stacks, queues, lists, trees and graphs. • Able to write algorithms for solving problems with the help of fundamental data structures
11	Operating System	MCA19110/PGDC S19110	<ul style="list-style-type: none"> • Analyze & Classify different types of operating system • Understand the working of Operating system • Understand the Memory Management policies. • Concepts of input/output, storage and file management • Understand various protection and security mechanisms
12	Database Management System	MCA19111/PGDC S19111	<ul style="list-style-type: none"> • Define Database Management System, explain fundamental elements of a database management system, compare the basic concepts of relational data model, entity relationship model. • Design entity-relationship diagrams to represent simple database application scenarios, translate entity-relationship diagrams into relational tables, populate a relational database

			<p>and formulate SQL queries on the data.</p> <ul style="list-style-type: none"> • Understand the basic concepts regarding database, know about query processing and techniques involved in query optimization and understand the concepts of database transaction and related database facilities including concurrency control, backup and recovery. • Analyze a database design and improve the design by normalization • Choose efficient query optimization techniques, select suitable transaction management, concurrency control mechanism and Recovery management techniques. • Explain File organization and use appropriate index structure. • Create and maintain tables using PL/SQL queries. • Design and implement a database schema for a given problem-domain • Prepare reports. • Apply and create different transaction processing and concurrency control applications. • Application development using PL/SQL & front end tools
13	Elective – II (i) E-Commerce	MCA19112/PGDC S19112	<ul style="list-style-type: none"> • Gain a comprehensive understanding of the E-Commerce landscape, current and emerging business models, and the technology and infrastructure underpinnings of the business. • Leverage the E-Commerce platforms to enhance current business or incubate new businesses. • Gain an understanding on how innovative use of the E-Commerce can help developing competitive advantage. • Develop an understanding on how internet can help business grow. • Gain an understanding on the importance of security, privacy, and ethical issues as they relate to E-Commerce.

14	Elective – II (ii) Operation Research	MCA19112/PGDC S19112	<ul style="list-style-type: none"> • Model a real-world problem as a mathematical programming model. • Understand the theoretical workings of the simple method for linear programming and perform iterations of it by hand. • Understand the relationship between a linear program and its dual, including strong duality. • Solve specialized linear programming problems like: Transportation and Assignment Problems. • Solve network models like the shortest path, minimum spanning tree and maximum flow problems.
15	Elective – II (iii) Software Project Management	MCA19112/PGDC S19112	<ul style="list-style-type: none"> • Able to recognize evolving role of software project management. • Understand and estimate cost for software project. • Identify & analyze aspect in s/w to manage time, process & resources effectively with quality concept. • Estimate software productivity using metrics and indicator & identify important issues for planning a project. • Judge different testing techniques used to test software. • Evaluate the role of user and software teams.
16	Lab 4 – Based on Data Structures	MCA19114/PGDC S19114	<ul style="list-style-type: none"> • Skill of application of different data structures for solving problems.
17	Lab 5 – Based on DBMS	MCA19115/PGDC S19115	<ul style="list-style-type: none"> • Skill of effective use of database management system.
18	Lab 6- Based on Linux and Windows	MCA19116/PGDC S19116	<ul style="list-style-type: none"> • Able to understand the Basics of Windows & Linux working • Ability to learn the creation of Windows with various components

			<ul style="list-style-type: none"> • Able to perform the shell scripting programs . • Able to create file handling utilities by using Linux shell environment.
19	Operating Systems	3MCA1	<ul style="list-style-type: none"> • Analyze & Classify different types of operating system. • Understand the working of Operating system. • Understand the Memory Management policies. • Concepts of input/output, storage and file management. • Understand various protection and security mechanisms
20	File Structures & Data Processing	3MCA2	<ul style="list-style-type: none"> • Design and implement efficient file structure using improved programming skills • To acquire the fundamental tools needed to design intelligent, cost-effective, and appropriate solutions to file structure problems with the fundamentals of file structures and their management. • The software and hardware characteristics that combine to make file structure design important to application development and to organize different file structures in the memory. • Effective use of files for storing and retrieving information by choosing appropriate file structure for storage representation. • Understand the data coding technique, apply data compressing algorithms, use file systems interfaces and apply indexing and hashing to file structures • Select file structures techniques, including direct access I/O, buffer packing and unpacking, consequential processing, B-trees, and external hashing and to identify a suitable sorting technique to arrange the data.
21	Java Programming	3MCA3	<ul style="list-style-type: none"> • Learn Java programming language which can be utilized to develop windows and internet based software solutions.

			<ul style="list-style-type: none"> • Able to understand and apply the knowledge of object-oriented principles, applets, graphical user-interface for scientific and business oriented applications.
22	Computer Networks	3MCA4	<ul style="list-style-type: none"> • Learn data transmission models, modulation, multiplexing. • Understand applications of layers such as application layer, transport layer, network layer, data link layer. • Understand the importance of network security and management by analyzing different threats, principles of cryptography, digital signature, internet network management framework.
23	Computer Oriented Optimization Techniques	3MCA5	<ul style="list-style-type: none"> • Learn dynamic programming concepts. • Learn linear programming and its model. • Understand transportation problem, its types and related optimization techniques. • Learn machine sequencing problem, branch and bound techniques. • Understands the concept of probability OR model. • Learns game theory concepts and able to draw expected pay-off.
24	F.S.D.P. Lab	3MCA6	<ul style="list-style-type: none"> • Design programs using a variety of data structures such as stacks, queues, hash tables, binary trees, search trees, heaps, graphs, and B-trees. • Analyze and implement various kinds of searching and sorting techniques. • Implement programs of for insert, delete, update records from file. • Design algorithms for hashing techniques.

25	Java Programming Lab	3MCA7	<ul style="list-style-type: none"> • Able to write Java applications using OOP concept • Learn to create and implement Java applets. • Learn to implement I/O operations with respect to file. • Able to write GUI based windows applications.
26	C.O.O.T. Lab based on 3MCA5	3MCA8	<ul style="list-style-type: none"> • Learn to implement dynamic and linear programming. • Learn to implement and apply transportation problem and its related optimization techniques. • Implement machine sequencing problem with branch and bound techniques. • Understands and able to use the concept of probability OR model. • Learns to implement game theory concepts, draw expected pay-off.
27	Computer Lab III	3MCA9	<ul style="list-style-type: none"> • Manage processes/tasks. • Implement multithreaded applications. • Handle Kernel object and learn to manipulate it. • Implement thread synchronization and inter-process communication. • Implement programs related to file systems, directories and memory management. • Implement device drivers and perform I/O Programming.
28	Database Management Systems	4MCA1	<ul style="list-style-type: none"> • Understand concepts of database system architecture. • Able to understand relational model and perform SQL operations. • Understand the importance of normal forms and learn query optimization. • Learns the importance of transaction processing and concurrency control.

29	Client-Server Computing	4MCA2	<ul style="list-style-type: none"> • Learn to implement network related programs with concepts of servers and sockets. • Understand JDBC concepts, prepared and callable statements and able to implement database connectivity applications. • Understand and learn effective implementation of Servlet and JSP technologies which is essential component implementing scalable and sturdy enterprise level applications. • Implement Remote method invocation applications for cross-platform data transaction. • Understand and apply the concept of XML for cross-platform transaction of data. • Understand and apply cascading stylesheets. • Learn advanced Java and able to develop enterprise level web applications.
30	Multimedia Technologies	4MCA3	<ul style="list-style-type: none"> • Define and discuss the Introduction to Multimedia, Identify the multimedia components, Multimedia Authoring and Tools. • Understand the various multimedia software and tools for customized graphic, video and audio designs. • Understand the hardware requirement and Classification multimedia software. • Understand the Graphics and Image Data Representation, Color in Image & Video, Fundamental Concept in Video, Audio. • Understand analog and digital conversion process. • Understand the audio digitization, audio file format and audio software, digital video standards, formats and technology. • Understand the various techniques for Multimedia Data Compression, Image Compression Standards, Basic Video Compression, MPEG Coding Scheme.
31	Electronic Commerce	4MCA4	<ul style="list-style-type: none"> • Gain a comprehensive understanding of the E-Commerce

			<p>landscape, current and emerging business models, and the technology and infrastructure underpinnings of the business.</p> <ul style="list-style-type: none"> • Leverage the E-Commerce platforms to enhance current business or incubate new businesses. • Gain an understanding on how innovative use of the E-Commerce can help developing competitive advantage. • Develop an understanding on how internet can help business grow. • Gain an understanding on the importance of security, privacy, and ethical issues as they relate to E-Commerce.
32	Elective – I (1)Computer Graphics	4MCA5	<ul style="list-style-type: none"> • To know the foundations & Core Concepts of computer graphics. • To comprehend the concept of geometric, mathematical and algorithmic concepts necessary for understanding computer graphics. • To understand the comprehension of windows, clipping and view-ports object representation in relation to images displayed on screen. • To understand the concepts of Output primitives, 2D-transformations , 2D-Viewing,Structural & Hierarchical Modeling. • To Understand the concepts of GUI & input methods, • To understand the concept of 3D , object representation in 3D, 3D Transformation & Viewing. • To familiarize the students with graphics concepts like clipping, splines, objects modeling, visible surface detection.
33	Elective – I (2)Modeling & Simulation	4MCA5	

34	Database Management Systems Laboratory	4MCA6	<ul style="list-style-type: none"> • Implement database models, schemas and instances. • Apply the use of constraints, normal forms and relational algebra operations. • Construct queries using SQL for efficient data transaction in a database. • Implement aggregate functions, joins, views and triggers in relational DBMS. • Handle relational database system like Oracle, MySQL by applying knowledge of DBMS. • Analyze and implement storage and recovery techniques of database system.
35	Client-Server Computing Lab	4MCA7	<ul style="list-style-type: none"> • Skill to implement network based applications. • Skill to implement database connectivity application using client-server architecture. • Skill to prepare DTDs for different web applications. • Skill to write enterprise-level applications using Servlet and JSP. • Skill to develop RMI application for cross-platform data transaction. • Skill to develop component-based programming using beans. • Skill to implement client-side JavaScript modules for server optimization.
36	Multimedia Technologies Laboratory	4MCA8	<ul style="list-style-type: none"> • Identify and implement the basic tools and components of a multimedia project. • Apply basic elements and principles of photo editing software. • Design and deploy animations using animation editing software. • Prepare and present a multimedia portfolio containing electronic media that demonstrates multimedia and problem-solving skills.

37	E-Commerce Laboratory	4MCA9	<ul style="list-style-type: none"> • Learn to constructing Document Type Definitions and XML Schema used to validate XML documents. • Develop dynamic web pages using XSL and learn to apply XSLT transformations and formatting to XML documents (XSL, XPath). • Understand Cascading Style Sheets (CSS) and learn various ways to apply it to web pages
38	Seminar	4MCA10	<ul style="list-style-type: none"> • To analyze a current topic of professional interest and present it before the audience. • To familiar with basic technical writing concepts and terms, such as audience analysis, jargon, format, visuals, and presentation. • Acquired the basic skills to for performing literature survey and paper presentation • To improve skills to read, understand, and interpret material on technology. • To improve communication and writing skills. • Prepare the report.
39	Artificial Intelligence	5MCA1	<ul style="list-style-type: none"> • Understand the concepts of Artificial intelligence. • Develop intelligent algorithms for constraint satisfaction problems and also design intelligent systems for Game Playing. • Represent knowledge of the world using logic and infer new facts from that Knowledge. • Demonstrate working knowledge in LISP in order to write simple LISP programs and explore more sophisticated LISP code on their own. • Know various AI search algorithms (uninformed, informed, heuristic, constraint satisfaction). • Understand the fundamentals of knowledge representation &

			<p>inference.</p> <ul style="list-style-type: none"> • Ability to apply knowledge representation & reasoning to the problems.
40	Software Project Management	5MCA2	<ul style="list-style-type: none"> • Apply the process to be followed in the software development life-cycle models. • Implement communication, modeling, construction & deployment practices in software development. • Analyze & design the software models using unified modeling language (UML). • Explain the concepts of various software testing methods & be able to apply appropriate testing approaches for development of software. • Explain the quality management & different types of metrics used in software development. • Apply the concepts of project management & planning. • Estimate project cost and perform cost-benefit evaluation among projects. • Perform project scheduling, activity network analysis and risk management. • Apply schedule and cost control techniques for project monitoring including contract management. • Apply quality models in software projects for maintaining software quality and reliability. • Use suitable project organization structure, leadership, decision and motivation styles, proper safety and ethical practices and be responsible to the society.
41	System Administration and Security	5MCA3	<ul style="list-style-type: none"> • Understand network security, its types, access control, model of internet network security, internet standards • Understand Cryptography , Encryption principles and various

			<p>algorithms, standardization process, key distribution, public key cryptography and message authentication.</p> <ul style="list-style-type: none"> • Understand various encryption & decryption algorithms, message authentication process. • Learn various Network security applications like Kerberos, X.509 directory authentication services, e-mail security PGP, MIME , S MIME functionality, IP Security Web Security, Network Management Security (SNMP, SNMPv1 SNMPv2). • Understand System Security concepts like password protection, password selection strategies, Intrusion detection, viruses, Firewall.
42	Management Information Systems	5MCA4	<ul style="list-style-type: none"> • Apply a framework and process for aligning and organization's IT objectives with business strategy. • Defend the strategic value of information resources for an organization. • Participate in an organization's information systems and technology decision making processes. • Identify ways information systems & technology may improve an organization's performance, including improving organizational processes, decision-making, collaboration, and personal productivity. • Define what a manager should be able to expect from an IT department in an organization. • Build a business case for IT, addressing key IT acquisition decisions such as make/buy; outsource/insource; project management. • Apply a framework for evaluating information-related ethical dilemmas commonly faced by managers.
43	Elective–II (1) Data Warehousing	5MCA5	<ul style="list-style-type: none"> • Develop research oriented applications of data mining and data

	and Data Mining		<p>warehousing.</p> <ul style="list-style-type: none"> • Understand the necessity and importance of data preprocessing, data integration, data discretization. • Learn the concepts of OLAP technology, data mining methods, various classification and prediction methods. • Able to apply accuracy and error measures, methods of cluster analysis, graph mining and mining sequence patterns in data.
44	Elective–II (2) Bioinformatics	5MCA5	
45	Artificial Intelligence Lab	5MCA6	<ul style="list-style-type: none"> • Exhibit strong familiarity with a number of important AI techniques, including in particular search, knowledge representation, planning and constraint management. • Interpret the modern view of AI as the study of agents that receive percepts from the environment and perform actions. • Build awareness of AI facing major challenges and the complexity of typical problems within the field. • Assess critically the techniques presented and apply them to real world problems. • Develop self-learning and research skills to tackle a topic of interest on his/her own or as part of a team
46	SPM Laboratory	5MCA7	<ul style="list-style-type: none"> • Estimate project cost and perform cost-benefit evaluation among projects. • Perform project scheduling, activity network analysis and risk management. • Apply schedule and cost control techniques for project monitoring including contract management. • Apply quality models in software projects for maintaining software quality and reliability. • Use suitable project organization structure, leadership, decision

			and motivation styles, proper safety and ethical practices and be responsible to the society.
47	System Ad and Security Lab	5MCA8	<ul style="list-style-type: none"> • Identify Vulnerabilities in a Network. • Solve Problems using various Algorithms. • Identify Various Attacks and Formulate Defence Mechanism. • Understand Wireless Security.
48	Mini Project	5MCA9	<ul style="list-style-type: none"> • Demonstrate a sound technical knowledge of their selected project topic. • Undertake problem identification, formulation and solution. • Practically understand and implement the concept of linking database and front end. • Design solutions to complex problems utilizing MVC architecture. • Demonstrate the knowledge, skills and attitudes as a professional engineer.
49	Project and Dissertation Full Time	6MCA1	<ul style="list-style-type: none"> • Avail semeseter long experience of industry working. • Get experience to handle and learn state-of-the art software tools and platform. • Develop skill to work as a part of team, leadership qualities. • Able to write technical reports of the project work undertaken. • Prepare furnished human resource for software/IT industry.

Revised Syllabus of Three years MCA 2019-20

MCA-I SEMESTER I

Sr.No.	Subject	Course Outcome
1	Computer Organization and Architecture(MCA19101)	<ol style="list-style-type: none">1. Understanding of digital system, its organization and architecture.2. Apply knowledge of digital electronics logic gate to combinational and sequential circuits.3. Knowledge of the basics of computer hardware and how software interacts with computer hardware.4. Apply concepts of assembly language in solving problems.5. Illustrate the concept of processing I/O organization and examine different ways of communicating with I/O devices and standard I/O interfaces
2	Object Oriented Programming with C++(MCA19102)	<ol style="list-style-type: none">1. Understanding of Object oriented programming and advanced C++ concepts.2. Use C++ Concepts for solving real life problems.3. Develop problem solving skills using object oriented techniques.
3.	Mathematical Foundation(MCA19103)	<ol style="list-style-type: none">1.Ability to apply mathematical logic to solve problems2.Understand sets, relations, functions and discrete structures3.Able to use logical notations to define and reason about fundamental mathematical concepts such as sets relations and functions4.Able to formulate problems and solve recurrence relations5.Able to model and solve real world problems using graphs and trees
4.	CO-1 Elective System Analysis Design(MCA19104)	<ol style="list-style-type: none">1. Understand different phases of Systems Development life cycle.2. Understand how projects are initiated and selected, define a business problem and determine the feasibility of a proposed project.

	<p>CO-2 Management Information System(MCA19104)</p> <p>CO-3 Accounting and Financial Management(MCA19104)</p>	<p>3. Apply information gathering methods effectively to elicit human information requirement.</p> <p>4. Understand prototyping and develop logical DFD's that illustrate the proposed system.</p> <p>5. Create data dictionary and choose an appropriate decision analysis method for analyzing structured decision and creating process specification.</p> <p>6. Design input-output for user interface and database for storing data.</p> <p>1. Understand the leadership role of Management Information Systems in achieving business competitive advantage through informed decision making.</p> <p>2. Analyze and synthesize business information and systems to facilitate evaluation of strategic alternatives.</p> <p>3. Effectively communicate strategic alternatives to facilitate decision making. Evaluate the role of information systems in today's competitive business environment.</p> <p>4. Assess the relationship between the digital firm, electronic commerce, Electronic business and internet technology.</p> <p>1. Understanding of importance of Book-keeping.</p> <p>2. Knowledge of different methods and practices of book-keeping.</p> <p>3. Knowledge of types of accounting.</p> <p>4. Understanding of financial management.</p> <p>5. Knowledge of different methods and practices in financial management.</p>
--	---	---

MCA-I SEMESTER II

Sr.No.	Subject	Course Outcome
1.	Data Structures(MCA19109)	<ol style="list-style-type: none"> 1. Knowledge of basic data structures and algorithms. 2. Understand concepts of searching and sorting techniques 3. Understand concepts of stacks, queues, lists, trees and graphs. 4. Able to write algorithms for solving problems with the help of fundamental data structures
2.	Operating System(MCA19110)	<ol style="list-style-type: none"> 1. Analyze & Classify different types of operating system 2. Understand the working of Operating system 3. Understand the Memory Management policies. 4. Concepts of input/output, storage and file management 5. Understand various protection and security mechanisms
3.	Database Management System(MCA19111)	<ol style="list-style-type: none"> 1. Describe the fundamental elements of relational database management systems 2. Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL. 3. Design ER-models to represent simple database application scenarios 4. Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data. 5. Improve the database design by normalization. 6. Familiar with basic database storage structures and access techniques: file and page organizations, indexing methods including B tree, and hashing.
4.	CO-1 Elective E-Commerce(MCA19112)	<ol style="list-style-type: none"> 1. Gain a comprehensive understanding of the E-Commerce landscape, current and emerging business models, and the technology and infrastructure Underpinnings of the business. 2. Leverage the E-Commerce platforms to enhance current business or Incubate new businesses. 3. Gain an understanding on how innovative use of the E-

	<p>CO-2 Operation Research(MCA19112)</p> <p>CO-3Software Project Management(MCA19112-)</p>	<p>Commerce can help developing competitive advantage.</p> <ol style="list-style-type: none"> 4. Develop an understanding on how internet can help business grow. 5. Gain an understanding on the importance of security, privacy, and ethical issues as they relate to E-Commerce. <ol style="list-style-type: none"> 1. Model a real-world problem as a mathematical programming model. 2.Understand the theoretical workings of the simple method for linear Programming and perform iterations of it by hand. 3. Understand the relationship between a linear program and its dual, including strong duality. 4.Solve specialized linear programming problems like: Transportation and Assignment Problems. 5. Solve network models like the shortest path, minimum spanning tree and maximum flow problems. <ol style="list-style-type: none"> 1. Able to recognize evolving role of software project management. 2. Understand and estimate cost for software project. 3. Identify& analyze aspect in s/w to manage time, process & recourses Effectively with quality concept. 4. Estimate software productivity using metrics and indicator & identify important issues for planning a project 5. Judge different testing techniques used to test software. 6.Evaluate the role of user and software teams
--	---	---

**M.C.A-II
SEMESTER III**

Sr.No.	Subject	Course Outcome
1.	Java Programming(MCA19201)	<ol style="list-style-type: none"> 1. Remember and know the use an integrated development environment to write, compile, run, and test simple Java programs and get knowledge of the structure and model of the Java programming language. 2. Understand Java as an Object oriented language and write programs that solve real-world problems. 3. Understand exception handling and multithreading in Java and apply the concepts to real problems 4. Understand Streams in Java and apply them to File handling, understand Generics 5. Understand Collection Frameworks and apply it for problem solving, design simple GUI based applications using Swing 6. Understand Event handling and analyze and apply the knowledge to develop small GUI based applications.
2.	Data Communication Network(MCA19202)	<ol style="list-style-type: none"> 1. Understand the concepts of Data Communication System and its components. 2. Learn various types of network topologies and their appropriateness for designing a network. 3. Understand the various standard models of networking. Acquire deeper understanding about service implementation of various protocols used during network communication. 4. Understand roles and importance of different network devices within a network. 5. Recognize the technological trends of Computer Networking. 6. Acquire introductory knowledge about digital wireless communication systems
3.	Design and Analysis of Algorithms(MCA19203)	<ol style="list-style-type: none"> 1. Understand the factors that affect the efficiency of algorithms and analyze the performance of algorithms. 2. Learn and Understand variety of divide and conquer algorithms, analyze

		<p>them and apply ideas to new situations.</p> <ol style="list-style-type: none"> 3. Learn and Understand variety of greedy algorithms, find out the basic ingredients of a greedy algorithm, and how to approach arguing the correctness of such algorithms. 4. Understand and Apply variety of dynamic programming algorithms. 5. Understand and solve variety of backtracking algorithms. 6. Analyze time and space complexity
4.	<p>CO-1 Elective MIS Framework and Implementation(MCA19 20</p> <p>CO-2Managerial Economics(MCA19204)</p> <p>CO-3 Object Oriented Analysis and</p>	<ol style="list-style-type: none"> 1. Ability recognize role of Management Information System in industry. 2. Evaluate the role of information systems in today's competitive business environment. 3. Assess the relationship between organizations, information systems and business processes, including the processes for customer relationship management and supply chain management. 4. Analyze the relationship between information systems and organizations. Evaluate the role of information systems in supporting various levels of business strategy 5. Understand and apply technology in Management Information System 6. Learn relevance of IT, MIS & BPR <ol style="list-style-type: none"> 1.Acquaint with concepts and techniques used in Micro-Economics and to enable their application 2. Acquire knowledge in business decision making . 3. Develop an understanding of the applications of managerial economics. 4. Interpret regression analysis and discuss why it's employed in decision-making. 5. Understand optimization and utility including consumer behavior. 6. Evaluate the relationships between short-run and long-run costs. 7. Understand uniform pricing and how it relates to price discrimination and total revenue. <ol style="list-style-type: none"> 1. Understand the issues involved in implementing an object-oriented design 2. Analyze requirements and produce an initial design.

	Design(MCA19204)	<p>3. Develop the design to the point where it is ready for implementation.</p> <p>4. Design components to maximize their reuse.</p> <p>5. Learn to use the essential modeling elements in the most recent release of the Unified Modeling Language</p>
--	------------------	---

M.C.A-II SEMESTER IV

Sr.No.	Subject	Course Outcome
1.	Client Server Computing(MCA19210)	<p>1. Acquire knowledge of Server Side programming by implementing Servlet and JSP.</p> <p>2. Acquire the knowledge of J2EE architecture, MVC Architecture.</p> <p>3. Distinguish Web Server, Web Container and Application Server, Serialization, Internationalization</p> <p>4. Understand and write the deployment descriptor and enterprise application deployment.</p> <p>5. Design and implement components like: Session, Java Beans, JSTL, Tag Extension and Filter.</p> <p>6. Gain knowledge of frameworks such as Struts Architecture and Hibernate Architecture</p> <p>7. Distinguish JDBC and Hibernate. Design and Develop various application by Integrating any of Servlets, JSPs, Database, Struts, Hibernate after analyzing requirements and evaluating existing system</p>
2.	Artificial Intelligence and Applications(MCA19211)	<p>1. Adopt an approach in view of Problem solving with AI.</p> <p>2. Identify and apply suitable 'Intelligent Agents for various AI applications.</p> <p>3. Identify knowledge statement and represent it.</p>

		<p>4. Empower students for path planning of a robotic system.</p> <p>5. To develop and survey embedded systems applications using machine learning.</p>
3.	Data Warehousing and Data Mining(MCA19212)	<p>1. Understand the functionality of the various data mining and data warehousing components</p> <p>2. Identify strengths and limitations of various data mining and data warehousing models</p> <p>3. Understand the analyzing techniques of various data</p> <p>4. Understand different methodologies used in data mining and data ware housing.</p> <p>5. Analyze different approaches of data ware housing and data mining with various technologies.</p> <p>6. Understand the use and importance of different end user applications</p>
4.	<p>CO-1 Elective Computer Graphics and Multimedia(MCA19213(01))</p> <p>CO-2 Cyber Security and Digital Forensic(MCA19213 (02))</p>	<p>1. Understand the core concepts of computer graphics, including viewing, projection, perspective, modeling and transformation in two dimensions.</p> <p>2. Apply the concepts of colour models, lighting and shading models, textures, ray tracing, hidden surface elimination, anti-aliasing, and rendering.</p> <p>3. Interpret the mathematical foundation of the concepts of computer graphics.</p> <p>4. Know the fundamentals of animation, parametric curves and surfaces, and spotlighting.</p> <p>5. Understand technical aspect of Multimedia Systems.</p> <p>6. Understand the standards available for different audio, video and text applications and Data Compression Techniques</p> <p>1. Understand the concepts and foundations of Cyber Security</p> <p>2. Identify security risks</p> <p>3. Ability to take preventive steps</p> <p>4. Investigate Cyber Crime and analysis of evidences</p> <p>5. Acquire knowledge of Digital Forensics</p>

	<p>CO-3 Visual Programming MCA19213 (03)</p>	<ol style="list-style-type: none"> 1. Understand the development and deployment cycles of enterprise applications. 2. Utilize the .NET framework to build distributed enterprise applications. 3. Develop ASP.NET Web Services, secure web services, and .NET remoting applications. 4. Understand the 3-tier software architecture (presentation/client tier, application tier, data tier) and develop multi-tier applications. 5. Understand and experiment with the deployment of enterprise applications. 6. Develop web applications using a combination of client-side and server-side JavaScript, HTML, HTML5, JQuery, AJAX ASP.NET, ADO.NET. 7. Develop network applications using state-of-the-art RPC technologies including: .NET remoting, and Web Services (SOAP).
	<p>CO-4 Cloud Computing(MCA19213 (04))</p>	<ol style="list-style-type: none"> 1. Understand the core concepts of the cloud computing and its benefits along with its various models and services in cloud computing. 2. Use various types of Virtualization techniques using its open source tools. 3. Handle various types of cloud file systems. 4. Install cloud computing environments. 5. Manage various stages of SLA life cycle. 6. Identify various security threats and issues in cloud environments.

M.C.A-II SEMESTER V

Sr.No.	Subject	Course Outcome
1.	Mobile Application Development(MCA19301)	<ol style="list-style-type: none">1. Identify various concepts of mobile programming that make it unique from programming for other platforms,2. Critique mobile applications on their design pros and cons.3. Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.4. Program mobile applications for the Android operating system that use basic and advanced phone features.5. Deploy applications to the Android marketplace for distribution
2.	Software Engineering(MCA19302)	<ol style="list-style-type: none">1. Recognize evolving role of software project management.2. Understand and estimate cost for software project.3. Identify analyze aspect in s/w to manage time, process &recourses effectively with quality concept.4. Estimate software productivity using metrics and indicator & identify important issues for planning a project5. Judge different testing techniques used to test software.6. Evaluate the role of user and software teams
3.	Distributed Systems(MCA19303)	<ol style="list-style-type: none">1. Understand the concept and foundations of Distributed Systems.2. Learn the principles and architectures in distributed systems.3. Learn Distributed models, algorithms and programming used4. Understand in detail the system level and support required for distributed system.5. Learn issues related to clock Synchronization and the need for global state in distributed systems.6. Understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.7. Learn how several machines orchestrate to correctly solve problems in an efficient, reliable and scalable way.8. Understand the issues involved

		in process management and resource management
4.	CO-1 Elective Data Analytics(MCA19304(01))	<ol style="list-style-type: none"> 1. Develop and maintain reliable, scalable systems using Apache, HADOOP 2. Write Map Reduce based application 3. Differentiate between conventional SQL and NoSQL 4. Analyze and develop Big Data solutions using HIVE and PIG
	CO-2 Bio-Informatics(MCA19304(02))	<ol style="list-style-type: none"> 1. Understand Biologists need of information in digital form for correct and meaningful interpretation. 2. Apply knowledge of Data mining and detail study of Genome analysis using different tools and databases. 3. Detail study of Gene Identification and prediction methods for micro analysis. 4. Apply knowledge of Protein and proteomics tools techniques as visualization methods in biological environment.
	CO-3 Game Programming(MCA19304(03))	<ol style="list-style-type: none"> 1. Write survey on the gamification paradigms. 2. Solve problems using gamification and open source tools. 3. solve problems for multi-core or distributed, concurrent/Parallel environments
	CO-4 Internet of Things(Elective- MCA19304(04))	<ol style="list-style-type: none"> 1. Identify the use of IoT from a global context. 2. Design application using IoT. 3. Analyze the IoT enabling Technologies 4. Determine the real world problems and challenges in IoT .

Revised Syllabus of Two Year MCA 2020-21

MCA-I Semester-I

Sr. No	Subject	Course Outcomes
1.	Advance Computer Architecture (MCA20101)	<ol style="list-style-type: none">1. Explain fundamentals of parallel processing and pipeline processing2. Analyze and classify different pipelined processors3. Describe architectural features of advanced processors.4. Demonstrate concepts of parallelism in hardware/software
2.	Data Structure & Algorithms (MCA20102)	<ol style="list-style-type: none">1. Explain and identify fundamental concepts of data structures2. Understand various data searching and sorting methods with its complexity3. Demonstrate operations such as insertion, deletion, searching and traversing on data structures.4. Design algorithms for solving problems with the help of fundamental data structures
3.	Operating System (MCA20103)	<ol style="list-style-type: none">1. Understand the concept of programs & processes along with the need of scheduling in operating systems2. Recognize different states of process and schedulers to apply scheduling algorithms to meet the scheduling objectives and acquire the knowledge of dealing with deadlocks.3. Apply memory management techniques & virtual memory concepts to avoid page faults and computing page replacement strategies4. Analyze and apply various protection and security mechanisms5. Compare different operating system
4.	Data Communication & Networks (MCA20104)	<ol style="list-style-type: none">1. Understand the concepts of Data Communication Systems and its components.2. Analyze various types of application layer protocols and its

		<p>applicability in various domains.</p> <p>3. Generalize all transport layer protocols to understand end-to-end communication over a network.</p> <p>4. Demonstrate basic understanding of network layer protocols for data routing in network.</p> <p>5. Analyze functional & procedural means to transfer data between network entities.</p> <p>6. Acquire introductory knowledge about digital wireless communication systems.</p>
5.	Mathematics & Statistical Techniques (MCA20105)	<p>1. Understand the foundations of mathematics.</p> <p>2. Apply mathematical ideas to model real-world problems.</p> <p>3. Analyze data using Statistical Methods</p> <p>4. Identify the type of statistical situation and solve statistical problems</p>

MCA-I Semester-II

Sr. No	Subject	Course Outcomes
1.	Client Server Computing (MCA20201)	<ol style="list-style-type: none"> 1. Acquire knowledge of Server-Side programming by implementing Servlets and JSP. 2. Acquire the knowledge of J2EE architecture, MVC Architecture. 3. Distinguish Web Server, Web Container and Application Server 4. Understand and write the deployment descriptor and enterprise application deployment. 5. Design and implement components like: Session, Java Beans, JSTL, Tag Extensions. 6. Gain knowledge of frameworks such as Struts Architecture and Hibernate Architecture 7. Distinguish JDBC and Hibernate. Design and Develop various application by Integrating any of Servlets, JSPs, Database, Struts, hibernate after analyzing requirements and evaluating existing system.
2.	Artificial Intelligence & Applications (MCA20202)	<ol style="list-style-type: none"> 1. Adopt an approach in view of Problem solving with AI. 2. Identify and apply suitable 'Intelligent Agents for various AI applications. 3. Identify knowledge statement and represent it. 4. Empower students for path planning of a robotic system. 5. To develop and survey embedded systems applications using machine learning
3.	Advance Data Base Management Systems (MCA20203)	<ol style="list-style-type: none"> 1. Describe the fundamental elements of relational database management systems 2. Apply the SQL queries on database for intended output. 3. Analyze the database and remove the redundancy. 4. Explain basic database storage structures and access techniques 5. Ensure accuracy and integrity using transaction properties. 6. Apply the concepts of database for data analytics, big data, parallel

		and distributed databases.
4.	Software Engineering (MCA20204)	<ol style="list-style-type: none"> 1. Recognize evolving role of software project management. 2. Understand and estimate cost for software project. 3. Identify & analyze aspect in s/w to manage time, process & resources effectively with quality concept. 4. Estimate software productivity using metrics and indicator & identify important issues for planning a project 5. Judge different testing techniques used to test software. 6. Evaluate the role of user and software teams.
5.	ELECTIVE 1 – Computer Graphics (MCA20205)	<ol style="list-style-type: none"> 1. Understand the core concepts of computer graphics, including viewing, projection, perspective, modelling and transformation in two dimensions. 2. Demonstrate various algorithms for scan conversion and filling of basic objects and their comparative analysis 3. Interpret the mathematical foundation of the concepts of computer graphics. 4. Apply geometric transformations, viewing and clipping on graphical objects 5. Explore solid model representation techniques and projections. 6. Understand visible surface detection techniques and illumination models.
6.	ELECTIVE 1 – Data Security (MCA20205)	<ol style="list-style-type: none"> 1. Explain different security attacks. 2. Analyze different security issues related to operating system. 3. Apply and understand security aspect with respect to database. 4. Solve network threats including detection of intrusion 5. Analyze and apply security protocols to improve the administration 6. Summarize different issues related to computer society and attempt to solve it

7.	ELECTIVE 1 – Optimization Techniques (MCA20205)	<ol style="list-style-type: none">1. Understand the importance of optimization of industrial process management2. Apply basic concepts of mathematics to formulate an optimization problem3. Analyze and appreciate variety of performance measures for various optimization problems
----	---	---

Programme code	Programme Name	Department
	M.E. (CSIT)	Computer Science

Programme Specific Outcomes (PSOs):

PSO1: Students will be able to adapt the skills to implement effective solutions through research and developments, for need based problems by applying knowledge gained through different architectures and models, tools and software covered in the syllabus to have optimum solution through best suited algorithms for the problem.

PSO2: Students will be able to understand the concept of wireless communication, radio propagation over wireless channels, learn the concepts of systems standards, understand spread spectrum technology, multiple access wireless communication, GSM, GPRS, imode, UMTS, Wireless data networks, RFID, wireless information security, convergence-3G, Future Trends, 4G.

PSO3: Students will be able to learn and apply the concepts while dealing with big software projects/ modules in the software industry. Students will be able to acquire adequate skills to design and analyse the distributed systems, distributed databases management, of software engineering, testing and reliability, get the knowledge of recent trends in computer architecture, advanced frameworks, understood the concept of Embedded System.

PSO4: Ability to adapt quickly to new technologies, assimilate new information, and work in multi-disciplinary areas with a strong focus on innovation and entrepreneurship. Work with and communicate effectively with professionals in various fields and pursue lifelong professional development in computing with ethics..

Programme outcome (POs):

PO1: This program develops human resource with technical skills with aquaring knowledge of different tools in the field of Computer Science and Information Technology.

PO2: This program develops skills with the ability to design solutions through research for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the societal and environmental considerations.

PO3: Analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions.

PO4: Design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline. This is the best combination of advance Computer science knowledge and it's practical applications in IT industries as well as business, development, administration, system designing and as a researcher.

PO5: Apply computer science and information technology theory and develop computing-based solutions for the society. Communicate effectively in a variety of professional contexts.

Course Outcomes (COs):

S.No.	Name of the course	Course Code	Course Outcome
1	Advanced Computer Architecture	1RNME1	<ul style="list-style-type: none">• Understand the theory and architecture of central processing unit.• Analyze some of the design issues in terms of speed, technology, cost, performance.• Design a simple CPU with applying the theory concepts.• Use appropriate tools to design verify and test the CPU architecture.• Learn the concepts of parallel processing, pipelining and interprocessor communication.• Understand the architecture and functionality of central processing unit.• Exemplify in a better way the I/O and memory organization.
2	Distributed Operating System Design	1RNME2	<ul style="list-style-type: none">• Able to learn Distributed Computing• Able to learn Distributed Computing Models

			<ul style="list-style-type: none"> • Able to understand various designing issues in Distributed Systems • Able to understand Remote communication in Distributed systems • Able to understand Distributed systems management with all its resources
3	Distributed Database Systems	1RNME3	<ul style="list-style-type: none"> • Understand and analyze distributed database management system concepts, design issues. • Understand distributed file systems, distributed shared memory concepts. • Understand interprocess communication, synchronization, processes, process migration and load balancing in distributed database management systems. • Understand the importance of normal forms and learn query optimization. • Learn the importance of transaction processing and concurrency control in distributed computing environment • Learn the concept of data warehousing and data mining. • Analyze performance of Market basket analysis, Apriori and other standard algorithms.
4	Wireless Communication & Network Computing	1RNME4	<ul style="list-style-type: none"> • Understand the concept of wireless communication present scenario and its fundamentals, source coding, channel coding. • Understand radio propagation over wireless channels and brief overview of channel models. • Learn the concepts of wireless communication systems standards, MAN, WLAN, WMAN, mimo. • Understand Spread spectrum technology, multiple access wireless communication, GSM. • Learn to use GPRS, imode, UMTS, Wireless data networks,

			<p>RFID.</p> <ul style="list-style-type: none"> • Able to apply the knowledge to connecting the last mile, wireless Information Security, convergence-3G, Future Trends, 4G.
5	Elective I (1) Expert System Design & Intelligent Systems	1RNME5	<ul style="list-style-type: none"> • Able to understand the introduction to ES, Overview of AI, Intelligent systems, knowledge representation, principles & techniques evaluating & comparing ES. • Understanding of TMS, Nonmonotonic justification, maintaining multiple contacts. • Analyses the rule based systems, Canonical systems, production systems, production systems, associate nets & frame systems, OOAD for ES. • Students able to determine the fuzzy systems foundation of fuzzy systems, fuzzy relations, and arithmetic operations of fuzzy numbers, linguistic descriptions and their analytical forms. • Students able to understand the genetic algorithms and evolutionary programming, evolutionary programming, genetic-algorithm based machine learning classifier system. • To explain the swarm intelligent systems, engineering applications of PSIS and future research. • Analyze system with artificial Neural Networks, functional link neural networks, cascade correlation neural networks.
6	Elective I (2) Algorithmics	1RNME5	<ul style="list-style-type: none"> • Able to understand the Different types of algorithms and evolutionary programming, evolutionary programming, genetic-algorithm • Analyze system with various algorithms. • Study and analysis of the practical problems based on the algorithms

7	Elective I (3) Information Technology Management	1RNME5	<ul style="list-style-type: none"> • To learn about the concepts and principles of Information Technology Management • Understanding the concept of Information Technology Management and various services provided. • Understanding of characteristics, fundamentals and infrastructure of Information Technology Management System. • To explore both the concepts and practical issues Information Technology Management • To develop skills of finding solutions and building software for Information Technology Management.
8	CSIT Lab-I	1RNME6	<ul style="list-style-type: none"> • To implement FCFS scheduling using JCreator • To implement deadlock JCreator LE • To implement process synchronization using Jcreator LE • Program to create one Grid resource with three machines • Program to creates Gridlets and sends them to a grid resource entity • PPogram to how two GridSim entities interact with each other • program to read a string from a user, and print that string back to the QtSpim console. • Design program for a functions NOT using a stack in the QtSpim Simulator. • Study of drcachesim Cache Simulator for DynamoRIO API. • Study of EasyCPU, Little Man Computer, and RTLSim.
9	CSIT Lab-II	1RNME7	<ul style="list-style-type: none"> • To perform plot function using freemat • create simple client to server wireless scenario using omnett++ • Create Network Using Router And Switches, create OSPF configuration in NETSIM

			<ul style="list-style-type: none"> • Neuroph Studio Tool.V2.92 • to create and train MaxNet network • Implement Genetic Algorithm with example by using BETA (IDE). • Implement Fuzzy Logic along with example using BETA Tool. • To perform prediction using Glue viz. • To perform K-means clustering using orange. • To perform text mining using orange. • To perform linear correlation matrix using KNIME • To perform the study of oracle data mining tool. • To perform the study of IBM Cognos tool.
10	Seminar & Technical Paper Writing	1RNME8	<ul style="list-style-type: none"> • To study the latest happenings in the field of IT for understanding of a new field, to summarise and review them. • Provide an opportunity to pursue their interest in research, theoretical and experimental approach. • To effectively communicate by making an oral presentation before an evaluation committee • To impart skills in preparing details report describing the research and results.
11	Real Time Embedded Systems	2RNME1	<ul style="list-style-type: none"> • Know what an embedded system is. • Understand the general process of embedded system development. • Different design platforms used for an embedded systems application. • Comprehend important embedded system terminology. • Experience common aspects of embedded system development. • Understanding of what an embedded system R&D project is,

			<p>and the activities it involves.</p> <ul style="list-style-type: none"> • Suggestion of own product concepts. • Understanding of a concept presentation. • Ability to use ANSI C to develop embedded software. • Interface to peripherals, knowledge of typical interfacing standards. • Development of prototype circuit on breadboard.
12	Performance Analysis for Imaging Systems	2RNME2	<ul style="list-style-type: none"> • Understand basic principles of imaging, imaging system, Performance and imaging system issues. • Able to acquire images, find image quality, apply signal processing to acquire images and evaluate the performance. • Learn signal & image processing, image resampling and apply it to observe performance issues. • Understand and apply super resolution, image deblurring, performance analysis. • Able to use image contrast enhancement, non uniformity correction, and observe performance issues. • Understand time scale, image fusion, performance measurement.
13	Information Technology & Security	2RNME3	<ul style="list-style-type: none"> • Able to understand Data security Techniques • Able to understand Mobile security and Forensics techniques • Able to understand scanning and sniffing tools • Able to understand Hacking, cracking and various vulnerabilities • Able to understand Incident Handling
14	Software Engineering, Testing & Reliability	2RNME4	<ul style="list-style-type: none"> • Understand various phases of Software Development Life Cycle • Understand the concept of system, it's characteristics and types. • Understand various Software development Models viz.

			<p>Waterfall, Rapid Development, Prototype etc.</p> <ul style="list-style-type: none"> • Understand software process framework , requirement modeling approaches, Software design, Software quality Assurance (SQA) • Able to apply software metrics and software reliability. • Distinguish characteristics of various testing methods. • Design and conduct a software test process for a software testing project. • Understand and identify various software testing problems and able to solve these problems by designing and selecting software test models, criteria, strategies, and methods. • Able to apply software testing knowledge and engineering methods. • Able to prepare SRS (Software Requirement Specification)
15	Elective II (1) Advanced Compiling Techniques	2RNME5	<ul style="list-style-type: none"> • To learn about the concepts and principles of Advanced Compiling Techniques • To explore both the concepts and practical issues of Advanced Compiling Techniques • To develop skills of finding solutions and building software for Advanced Compiling Techniques based applications.
16	Elective II (2) Mobile Computing	2RNME5	<ul style="list-style-type: none"> • To learn about the concepts and principles of mobile computing. • Understanding the concept of cellular concept, mobile communication systems, ad hoc and sensor network, wireless MANs, LANs and PAN's, multimedia services requirement. • Understanding of characteristics, fundamentals and infrastructure of cellular system. • Knowledge of satellite system, network protocol, Ad Hoc and sensor network, Wireless MAN's, LAN's and PAN's.

			<ul style="list-style-type: none"> • Illustrate the concept of mobile radio propagation, types of radio waves, propagation mechanism, free space propagation, land propagation, path loss. • Understanding of slow fading, fast fading, Doppler Effect, delay spread, coherence bandwidth, inter symbol and co-channel interferences. • To explore both the concepts and practical issues of mobile computing. • To develop skills of finding solutions and building software for mobile computing applications.
17	Elective – II (3) Digital Media Development	2RNME5	<ul style="list-style-type: none"> • To learn about the concepts and principles of Digital Media Development • To explore both the concepts and practical issues of Digital Media Development • To develop skills of finding solutions and building software for Digital Media Development applications.
18	CSIT LAB – III	2RNME6	<p>Based on Real Time Embedded Systems:</p> <ul style="list-style-type: none"> • Ability to study different tools/software like EMU-8086, GUI Turbo Assembler, LabView, Keil uvision-5, Xcode, Android Studio. • Able to Design a Traffic light control system calculator by using 8086 microprocessor. • Able to create a stepper motor controller and snake game by using EMU-8086. • Able to convert the string by using 8086 microprocessor. • Able to make your own calculator by using LabView software. • Able to create a virtual instrument “Thermometer” that converts Celsius to Fahrenheit using the $F = (9/5 * C) + 32$ formula by using LabView software.

			<ul style="list-style-type: none"> • To perform a Bit operation, Bank operation and LED Blinking operation by using Keiluvision software. <p>Based on Performance Analysis for Imaging Systems:</p> <ul style="list-style-type: none"> • Ability to study different tools/software like GNU Octave, Matlab, OpenCV, Scikit-Image. • Able to perform trigonometric function and axis function in octave. • To perform graph on data point by using GNU Octave. • Able to plot 3D graph, smoother graph by using GNU Octave. • To plot filter design and mesh grid in octave. • Able to perform a basic Gray level transformation and Image enhancement by using Matlab • To perform most basic Morphological operations, histogram equalization and edge detection in Matlab.
19	CSIT LAB – IV	2RNME7	<p>Based on Information Technology & Security:</p> <ul style="list-style-type: none"> • Ability to study differenttools/software like AutospY, Fiddler, Wireshark, PuTTY, Zenmap. • To view delete file, delete file information and recover it by using AutospY software. • Able to view a file by its extension and its size by using AutospY software. • To find session and monitor web session by using Fiddler software. • Able to trace the packets of the wifi connection in Wireshark. • To perform Intense scan, Ping scan, Quick scan plus in Zenmap. • Able to perform Quick Traceroute and TCP scan in Zenmap. <p>Based on Software Engineering, Testing & Reliability:</p>

			<ul style="list-style-type: none"> • Ability to study different tools/software likeDia, Soap UI, Neoload, Ranorex, TestComplete. • Create a component diagram for Bank management system and ER diagram for hotel management system by using Dia. • Create a use- case diagram for tour management system and library domain model by using Dia. • Find out complexities & create route testing for ATM transaction using Dia software. • To perform a positive load testing on web browser by configuring a default server for different pages, request & users by considering response time, response error and alerts by using Neoload testing tool. • Ability to perform a load & stress testing using the custom load variation policy by considering time policy & maximum numbers of users for small & big city population by using Neoload testing tool & display in the form of graph. • Able to perform a negative load testing on web browser by configuring particular server for different pages, requests, users by considering response time, error, alerts by using Neoload testing tool. <p>Based on Mobile Computing:</p> <ul style="list-style-type: none"> • Ability to study different tools/software like J2ME(Java 2 Platform, Micro Edition),corona simulator, AngularJS, PhoneGap, firebase tool. • Write programs to implement HelloWorld MIDlet and write the program on to create a photoalbum in that to test Chart graph by using J2ME tool. • Create a MIDlet application which contain the multiple games and also create a program which creates to cut, copy, past, delete, select all, unselect all kind of menu by using J2ME
--	--	--	--

			<ul style="list-style-type: none"> • Create a Frame animation and a Flashlight on mobile screen by using corona simulator. • Write program to display the “Hello World!” and create a collision between two objects(fish) using corona simulator. • Write program of container graphics and for moving the fishes on the mobile screen using the corona simulator. • Able to write program on AngularJScontollert,AngularJS operation and apply Bootstrap CSS to AngularJS Form.
20	Seminar	2RNME8	<ul style="list-style-type: none"> • To study the latest happenings in the field of IT for understanding of a new field, to summarise and review them. • Provide an opportunity to pursue their interest in research, theoretical and experimental approach. • To effectively communicate by making an oral presentation before an evaluation committee
21	Seminar & Dissertation	3RNME1	<ul style="list-style-type: none"> • To study the latest happenings in the field of IT and the research in the domain of IT for understanding of a new field, to summarise and review them. • Provide an opportunity to pursue their interest in research, theoretical and experimental approach. • To effectively communicate by making an oral presentation before an evaluation committee
22	Seminar & Dissertation	4RNME1	<p>Knowledge:</p> <ul style="list-style-type: none"> • To study research papers for understanding of a new field, to summarise and review them. • Provide an opportunity to pursue their interest in research, theoretical and experimental approach. • To effectively communicate by making an oral presentation before an evaluation committee.

			<ul style="list-style-type: none"> • Knows basic statistical methods used to describe variables, describe relationships between variables, and to verify research hypotheses through inferential statistics. • Understands the methods and its advantages and limitations. • Knows the basic concepts of intellectual property and uses them in academic life. <p>Skills:</p> <ul style="list-style-type: none"> • To impart skills in preparing details report describing the project and results. • The student is able to find, analyses, evaluate, select and integrate information using various sources, also from fields of knowledge and from critical judgments on its basis, as an exit point to planning his own studies. • Can formulate research questions and hypotheses, and operationalize them. Can create a research plan adequate to the research question. • To enable the students to identify a topic of interest and complete the preliminary work of undertaking case studies, data collection and feasibility studies. • Students get guidance to formulate and develop a design proposal and to effectively communicate the same. • Has advanced research skills, research tools and conducting experiments, which allow for solving complex problems in research.
--	--	--	--