DANTULURI NARAYANA RAJU COLLEGE
(Autonomous)
BHIMAVARAM, W.G.DIST, ANDHRA PRADESH, INDIA, PIN- 534202.
(Accredited at 'B++' level by NAAC)
(Affiliated to Adikavi Nannaya University, Rajamahendravaram)

MCA (2019-20)

SEMESTER I

COURSE 1 - DISCRETE MATHEMATICAL STRUCTURES

CO	Course Outcomes (COs)	Level
CO1	Understand fundamental concepts of discrete mathematics	L2
CO2	Apply counting techniques (permutations, combinations)	L3
CO3	Solve problems using recurrence relations	L3
CO4	Analyze and interpret graphs and trees	L4
CO5	Apply Boolean algebra principles ethically	L3
CO6	Design and evaluate models of computation	L5

COURSE 2 - MANAGEMENT OF ACCOUNTANCY

CO	Course Outcomes (COs)	Level
CO1	Understand basic principles of accounting	L2
CO2	Analyze financial statements using ratio analysis	L4
CO3	Understand costing methods and budgetary control	L2
CO4	Gain understanding of computerized accounting systems	L2

COURSE 3 - C PROGRAMMING AND DATA STRUCTURES

CO	Course Outcomes (COs)	Level
CO1	Understand fundamentals of C programming	L2
CO2	Demonstrate proficiency in arrays, functions, etc.	L2
CO3	Understand derived data types and structures	L2
CO4	Explore advanced data structures and algorithms	L2

COURSE 4 – COMPUTER ORGANIZATION

CO	Course Outcomes (COs)	Level
CO1	Understand the basics of Digital Logic Circuits	L2
CO2	Discuss about the Concepts of Data Representation	L2
CO3	Relate the concept of Basic Computer Organization	L3
CO4	Summarize about the concept of Memory Organization	L5

COURSE 5 – OPERATING SYSTEMS

CO	Course Outcomes (COs)	Level
CO1	Understand fundamental concepts of operating systems	L2
CO2	Analyze process synchronization techniques and deadlocks	L4
CO3	Explain memory management techniques and file system design	L2
CO4	Understand protection mechanisms in operating systems	L2

COURSE 6 – C & DS LAB

CO	Course Outcomes (COs)	Level
CO1	Understand fundamental concepts of operating systems	L2
CO2	Analyze process synchronization techniques and deadlocks	L4
CO3	Explain memory management techniques and file system design	L2
CO4	Understand protection mechanisms in operating systems	L2

COURSE 7 – OS LAB

CO	Course Outcomes (COs)	Level
CO1	Demonstrate ability to use UNIX operating system commands effectively	L2
CO2	Write shell scripts to automate tasks in the UNIX environment	L4
CO3	Implement algorithms using C, C++, or Java programming languages	L2
CO4	Design and implement digital logic circuits using logic gates, flip-flops, etc.	L2
CO5	Evaluate programs in assembly language for 8085/86 microprocessor	L5

DANTULURI NARAYANA RAJU COLLEGE
(Autonomous)
BHIMAVARAM, W.G.DIST, ANDHRA PRADESH, INDIA, PIN- 534202.
(Accredited at 'B++' level by NAAC)
(Affiliated to Adikavi Nannaya University, Rajamahendravaram)

SEMESTER II

COURSE 1- MCA-19201 PROBABILITY STATISTICS AND QUEUING THEORY

CO	Course Outcomes (COs)	Level
CO1	Understand the concepts of statistical measures like mean, variance, and standard deviation of a random variable.	**L2**
CO2	Summarize different types of probability distributions and their properties.	**L5**
CO3	Calculate simple correlation between variables and fit straight lines or parabolas by the principle of least squares.	**L3**
CO4	Analyze statistical data and apply various small or large sample tests for testing hypotheses.	**L4**
CO5	Describe different Queuing models and their applications.	**L1**

COURSE 2- MCA-19202 INFORMATION SYSTEMS AND ORGANIZATIONAL BEHAVIOR

CO	Course Outcomes (COs)	Level
CO1	Analyze the behavior of individuals and groups in organizations	**L4**
CO2	Evaluate the potential effects of important developments in the external environment on organizational behavior	**L5**
CO3	Analyze organizational behavioral issues using theories, models, and concepts	**L4**
CO4	Differentiate conflict in organizational context and deal with stress	**L4**
CO5	Demonstrate how organizational behavior can integrate in understanding motivation behind behavior	**L3**

COURSE 3-MCA-19203OBJECT ORIENTED PROGRAMMING THROUGH JAVA

CO	Course Outcomes (COs)	Level
CO1	Define Introduction to OOP and concept of Inheritance.	L1
CO2	Understand about Interfaces, Packages, and Enumeration, Exceptions & Assertions.	L2
CO3	Explain about Multi-Threading and Applets.	L2
CO4	Describe the concept of Event Handling and Abstract Window Toolkit (AWT).	L1

COURSE 4- MCA-19204FORMALLANGUAGES&AUTOMATATHEORY

CO	Course Outcomes (COs)	Level
CO1	Define the concept of Finite Automata and Regular Expressions, Regular sets & Regular Grammars.	L1
CO2	Explain the concept of Context-Free Grammars and Languages, Push-Down Automata.	L2
CO3	Understand about Turing Machines, Universal Turing Machines, and Undecidability in detail.	L2
CO4	Describe the concept of The Propositional Calculus and The Predicate Calculus.	L1

COURSE 5- MCA 19205 WEB TECHNOLOGIES

CO	Course Outcomes (COs)	Level
CO1	Explain the concept of Networking Protocols and OSI Model, Inter-networking Concepts, Devices, Basics, History, and Architecture.	L2
CO2	Describe TCP/IP and Electronic Commerce in detail.	L1
CO3	Analyze the concept of Web Technology and types of Web Pages.	L4
CO4	Understand the concept of Middleware and Component-based E-commerce Architectures, EDI, XML, and WAP.	L2

COURSE 6-MCA-19206 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

CO	Course Outcomes (COs)	Level
CO1	Write programs in Java using OOP.	L6
CO2	Write programs related to real-life scenarios.	L6
CO3	Write code programs in Java using Inheritance and using Adapter classes.	L6

COURSE 7-MCA-19207WEB TECHNOLOGIESLAB

CO	Course Outcomes (COs)	Level
CO1	write SQL queries using DDL, DML, DCL commands.	L6
CO2	write SQL queries on aggregate and conversion functions.	L6
CO3	write PL/SQL programs on exception handling, control structures.	L6
CO4	write PL/SQL programs on cursors, procedures, triggers.	L6

SEMESTER III

COURSE 1- MCA-19301 OPERATIONS RESEARCH

CO	Course Outcomes (COs)	Level
CO1	Understand optimization techniques using OR tools.	L2
CO2	Interpret minimum cost of transporting items from source to destination using transportation problems.	L3
CO3	Evaluate the total elapsed time for processing jobs.	L5
CO4	Understand network construction and how to find critical paths and total project duration.	L2

COURSE 2-MCA-19302 DESIGN AND ANALYSIS OF ALGORITHMS

CO	Course Outcomes (COs)	Level
CO1	Define Asymptotic Notations, Mathematical Analysis of Algorithms, and Sorting Algorithms.	L1
CO2	Solve Divide-and-Conquer, Decrease-and-Conquer, and Transform-and-Conquer techniques.	L3
CO3	Analyze Optimal Binary Search Trees, The Knapsack Problem, Prim's Algorithm, Kruskal's Algorithm, and Dijkstra's Algorithm.	L4
CO4	Understand Decision Trees, P, NP, and NP-complete problems, Backtracking, Branch-and-Bound, and Approximation Algorithms for NP-hard Problems.	L2

COURSE 3- MCA-19303 COMPUTER NETWORKS

CO	Course Outcomes (COs)	Level
CO1	Define the basics of computer networks and data communication.	L1
CO2	Understand the Data Link Layer, IEEE Standards, and design issues in computer networks.	L2
CO3	Explain Internet Transport Protocols and different types of network protocols.	L2
CO4	Describe an overview of various types of network devices and different types of networks.	L1

COURSE 4- MCA-19304 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

CO	Course Outcomes (COs)	Level
CO1	Explain the basic concept of Artificial Intelligence.	L2
CO2	Solve the algorithms and logics in Artificial Intelligence.	L3
CO3	Describe the theories and functions related to Artificial Intelligence.	L1
CO4	Understand the concept, characteristics, and applications of Expert Systems.	L2

COURSE 5- MCA-19305 DATABASE MANAGEMENT SYSTEMS

CO	Course Outcomes (COs)	Level
CO1	Understand the Introduction of Database System and Data Modeling Using the Entity-Relationship Model.	L2
CO2	Explain the Relational Data Model, Relational Database Constraints, and Relational Algebra.	L2
CO3	Discuss Relational Calculus, Schema Definition, Basic Constraints, and Queries.	L2
CO4	Describe Relational Database Design and Indexing Structures for Files.	L1
CO5	Define Transaction Processing and Concurrency Control Techniques.	L1

COURSE 6- MCA-19306 COMPUTER NETWORKS LAB

CO	Course Outcomes (COs)	Level
CO1	Explain the practical approach to network communication protocols.	L2
CO2	Define network layers, structure/format, and role of each network layer.	L1
CO3	Design and implement various network applications such as data transmission between client and server, file transfer, real-time multimedia transmission.	L6
CO4	Demonstrate various Routing Protocols/Algorithms and Internetworking.	L2

COURSE 7- MCA-19307 DATABASE MANAGEMENT SYSTEMS LAB

CO	Course Outcomes (COs)	Level
CO1	Define SQL queries using DDL, DML, and DCL commands.	L1
CO2	Describe SQL queries on aggregate and conversion functions.	L2
CO3	Discuss PL/SQL programs on exception handling and control structures.	L2
CO4	Explain PL/SQL programs on cursors, procedures, and triggers.	L2

SEMESTER II

COURSE 1- MCA-19401 INFORMATION SECURITY AND CRYPTOGRAPHY

CO	Course Outcomes (COs)	Level
CO1	Understand the security approaches and techniques, Introduction to number theory.	L2
CO2	Define Symmetric key and Asymmetric key cryptographic algorithms.	L1
CO3	Discuss about User Authentication Mechanisms, System security.	L2
CO4	Explain Internet Security Protocols and Network Security.	L2

COURSE 2-MCA-19402 CLOUD COMPUTING

CO	Course Outcomes (COs)	Level
CO1	Describe Cloud Computing basics, Intranet and Cloud, Services and Business Applications, Salesforce.com, Organization and Cloud Computing.	L1
CO2	Explain about Hardware and Infrastructure, Overview of Software as a Service, Overview of Industries Software plus Services, Mobile device Integration.	L2
CO3	Understand Developing the Applications like Google, Microsoft, Intuit Quick Base, Local Clients and thin clients.	L2
CO4	Discuss Migrating the Cloud, Cloud Service.	L2

COURSE 3-MCA-19403 DATA MINING CONCEPTS AND TECHNIQUES

CO	Course Outcomes (COs)	Level
CO1	Understand the overview of Data Warehouse Basic Concepts, Data Warehouse Modelling, Pre-processing.	L2
CO2	Describe Introduction to Data Mining, Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity.	L1
CO3	Explain the Concept Description, Generalization by AOI, Mining Frequent Patterns, Associations and Correlations, Mining Frequent Item set.	L2
CO4	Describe the Basic Concepts of Classification, Different Methods of Classification.	L2

COURSE 4-MCA-19404 OBJECT-ORIENTED SOFTWARE ENGINEERING

CO	Course Outcomes (COs)	Level
CO1	Describe Introduction to Object-Oriented Software Engineering, Object Orientation, Requirements Engineering.	**L2**
CO2	Construct Unified Modeling Language & Use Case Modeling, Class Design and Class Diagrams.	**L3**
CO3	Describe the Software Design and Architecture, Design Patterns.	**L2**
CO4	Analyze the Software Testing, Software Project Management, Software Process Models.	**L4**

COURSE 5-MCA-19405.1 DISTRIBUTED SYSTEMS

CO	Course Outcomes (COs)	Level
CO1	Define the Introduction to Distributed Systems: Goals, Design Issues, Hardware Concepts.	**L1**
CO2	Understand Communication in distributed systems, Client-server model, Clock synchronization Algorithms.	**L2**
CO3	Discuss about Processes and Processors, Threads, System models, Distributed File Systems.	**L2**
CO4	Describe the Distributed Shared Memory, Consistency Models, Page-based distributed shared memory, Synchronization.	**L1**

COURSE 5-MCA-19405.2 INTERNET OF THINGS (IOT)

CO	Course Outcomes (COs)	Level
CO1	Define Introduction to Internet of Things, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs.	**L1**
CO2	Understand IoT & M2M, SNMP.	**L2**
CO3	Construct IoT Platforms Design Methodology.	**L3**
CO4	Discuss about IoT Physical Devices & Endpoints.	**L2**

COURSE 5-MCA-19405.3 IMAGE PROCESSING

CO	Course Outcomes (COs)	Level
CO1	Define Fundamentals of Image Processing, Basics of Histogram, Definition and Algorithm of Histogram Equalization.	L1
CO2	Describe about Image Transforms: A Detail Discussion On Fourier Transform, DFT, FFT, Image Enhancement.	L2
CO3	Explain EDGE Enhancement, Smoothening Filters in Frequency Domain. Butterworth Filter, Homomorphic Filters, Image Compression.	L2
CO4	Discuss about Image Segmentation, Morphology.	L2

COURSE 6-MCA 19406 DATA MINING CONCEPTS AND TECHNIQUES LAB

CO	Course Outcomes (COs)	Level
CO1	Explain about aware of usage of few packages, functions, and libraries of R.	L2
CO2	Develop basic R commands, Interact data, Clean Data, Visualize statistical measures, data frame.	L6
CO3	Develop Apply group of functions, rbind, cbind, and some more libraries.	L6
CO4	Develop K-medoids and density-based clustering, decision trees.	L6

COURSE 7-MCA 19407 OBJECT-ORIENTED SOFTWARE ENGINEERING LAB

CO	Course Outcomes (COs)	Level
CO1	Understand how to specify, visualize, construct, and document the artifacts of software systems.	L2
CO2	Understand how to use Rational Rose Enterprise Edition for modeling.	L2
CO3	Construct and Develop Software Project Management and Software Engineering activities specified can be customized according to the features of the project.	L6

DANTULURI NARAYANA RAJU COLLEGE
(Autonomous)
BHIMAVARAM, W.G.DIST, ANDHRA PRADESH, INDIA, PIN- 534202.
(Accredited at 'B++' level by NAAC)
(Affiliated to Adikavi Nannaya University, Rajamahendravaram)

SEMESTER - V

COURSE 1 – BIGDATA ANALYTICS

CO	Course Outcomes (COs)	Level
CO1	Understand introduction to Big Data and Hadoop.	**L2**
CO2	Analyze Real-Time Analytics, Map Reduce Programming.	**L4**
CO3	Summarize Streaming in Spark, Machine Learning, Map Reduce Advanced Programming.	**L5**
CO4	Define Graph Representation in Map Reduce, Graph Analytics in Spark, Programming with RDDs-Basics, Spark SQL overview.	**L1**

COURSE 2 – CYBER SECURITY AND FORENSICS

CO	Course Outcomes (COs)	Level
CO1	Understand information security and Threats, Data Leakage.	**L2**
CO2	Explain Cyber Security Introduction, Cyber Security Evolution, Cyber Security Objectives, Guidance for Decision Makers, Cyber Governance Issues.	**L2**
CO3	Define Cyber User Issues, Cyber Conflict Issues, Cyber Management Issues, Cyber Infrastructural Issues.	**L1**

COURSE 3 – BLOCK CHAIN TECHNOLOGY

CO	Course Outcomes (COs)	Level
CO1	Understand introduction to Blockchain, Basic Distributed System Concepts.	**L2**
CO2	Define Cryptography in Blockchain, Cryptography algorithms.	**L1**
CO3	Analyze Bitcoin-Cryptography, Hyperledger Fabric.	**L4**
CO4	Compare Use cases of Blockchain, Financial Service, healthcare, energy markets, media, Cyber Crime, e-Governance, Tax payments, land registry records, and blockchain in IoT.	**L5**

COURSE 4 – FOUNDATIONS OF DATA SCIENCE

CO	Course Outcomes (COs)	Level
CO1	Understand Key concepts in data science, including tools, approaches, and application scenarios.	L2
CO2	Summarize Topics in data collection, sampling, quality assessment, and repair.	L5
CO3	Define Topics in statistical analysis and machine learning.	L1
CO4	Evaluate State-of-the-art tools to build data-science applications for different types of data, including text and CSV data.	L5

COURSE 5 – HUMAN COMPUTER INTERACTION

CO	Course Outcomes (COs)	Level
CO1	Understand what interaction design is and how it relates to human-computer interaction and other fields.	L2
CO2	Define what cognition is and why it is important for interaction design.	L1
CO3	Analyze the social mechanisms that are used by people to communicate and collaborate.	L4
CO4	Demonstrate the nature of user frustration and how to reduce it.	L3

COURSE 6 – PYTHON PROGRAMMING

CO	Course Outcomes (COs)	Level
CO1	Understand the basics of Python Programming language.	L2
CO2	Use various functions and methods of Python Programming.	L1
CO3	Comprehend Multithread Programming and GUI Programming.	L4
CO4	Understand Web Programming and Database Programming.	L2

COURSE 7 – PERL PROGRAMMING

CO	Course Outcomes (COs)	Level
CO1	Understand the basic syntax and semantics of the Perl language.	L2
CO2	Define various forms of data representation and structures supported by the Perl language.	L1
CO3	Analyze Files and Filehandles, Runtime Evaluation & Error Trapping.	L4
CO4	Understand CGI Programming and Administration.	L2

COURSE 8 – PHP PROGRAMMING

CO	Course Outcomes (COs)	Level
CO1	Understand the fundamentals of PHP.	L2
CO2	Describe PHP programming works on the Web.	L1
CO3	Explain databases in PHP.	L4
CO4	Select databases and the functioning of FTP in PHP.	L1

COURSE 9 – MACHINE LEARNING

CO	Course Outcomes (COs)	Level
CO1	Understand the basic concepts and techniques of Machine Learning.	L2
CO2	Evaluate Decision Tree learning, Artificial Neural Networks.	L5
CO3	Define Bayesian learning, Instance-Based Learning.	L1
CO4	Analyze Genetic Algorithms, Learning Sets of Rules.	L4

COURSE 10 – EMBEDDED SYSTEMS

CO	Course Outcomes (COs)	Level
CO1	Understand the basic architecture of 8051 microcontroller.	L2
CO2	Analyze various software architectures in embedded systems.	L4
CO3	Describe Advanced Controller and Processors, Advanced Microcontrollers ATOM processor - Architecture-Instruction set.	L1
CO4	Understand embedded software development tools.	L2

COURSE 11 – ROBOTICS

CO	Course Outcomes (COs)	Level
CO1	Understand the basics of control systems and components.	L2
CO2	Analyze robot end effectors its Types, Tools as End Effectors, Gripper Selection and Design, Forward and Inverse Kinematics.	L4
CO3	Define machine vision, Sensor Characteristics, Image processing and Analysis, Robotic Applications.	L1
CO4	Understand robot programming, Motion Commands, program Control and Subroutines, Programming methods and Branching.	L2

COURSE 11 – BIG DATA ANALYTICS LAB

CO	Course Outcomes (COs)	Level
CO1	Describe Implement data structures, generic types.	L2
CO2	Analyze Setup and install Hadoop.	L4
CO3	Explain Implementation file management tasks and programs in Hadoop.	L1

COURSE 12 – MINI PROJECT

CO	Course Outcomes (COs)	Level
CO1	Define Implementation data structures, generic types.	L2

MCA (2020-21)

SEMESTER I

COURSE 1 - DISCRETE MATHEMATICAL STRUCTURES

CO	Course Outcomes (COs)	Level
CO1	Understand fundamental concepts of discrete mathematics	L2
CO2	Apply counting techniques (permutations, combinations)	L3
CO3	Solve problems using recurrence relations	L3
CO4	Analyze and interpret graphs and trees	L4
CO5	Apply Boolean algebra principles ethically	L3
CO6	Design and evaluate models of computation	L5

COURSE 2 - MANAGEMENT OF ACCOUNTANCY

CO	Course Outcomes (COs)	
CO1	Understand basic principles of accounting	L2
CO2	Analyze financial statements using ratio analysis	L4
CO3	Understand costing methods and budgetary control	L2
CO4	Gain understanding of computerized accounting systems	L2

COURSE 3 - C PROGRAMMING AND DATA STRUCTURES

CO	Course Outcomes (COs)	
CO1	Understand fundamentals of C programming	L2
CO2	Demonstrate proficiency in arrays, functions, etc.	L2
CO3	Understand derived data types and structures	L2
CO4	Explore advanced data structures and algorithms	L2

COURSE 4 – COMPUTER ORGANIZATION

CO	Course Outcomes (COs)	Level
CO1	Understand the basics of Digital Logic Circuits	L2
CO2	Discuss about the Concepts of Data Representation	L2
CO3	Relate the concept of Basic Computer Organization	L3
CO4	Summarize about the concept of Memory Organization	L5

COURSE 5 – OPERATING SYSTEMS

CO	Course Outcomes (COs)	Level
CO1	Understand fundamental concepts of operating systems	L2
CO2	Analyze process synchronization techniques and deadlocks	L4
CO3	Explain memory management techniques and file system design	L2
CO4	Understand protection mechanisms in operating systems	L2

COURSE 6 -DESIGN AND ANALYSIS OF ALGORITHMS

CO	Course Outcomes (COs)	Level
CO1	Define Asymptotic Notations, Mathematical Analysis of Algorithms, and Sorting Algorithms.	L1
CO2	Solve Divide-and-Conquer, Decrease-and-Conquer, and Transform-and-Conquer techniques.	L3
CO3	Analyze Optimal Binary Search Trees, The Knapsack Problem, Prim's Algorithm, Kruskal's Algorithm, and Dijkstra's Algorithm.	L4
CO4	Understand Decision Trees, P, NP, and NP-complete problems, Backtracking, Branch-and-Bound, and Approximation Algorithms for NP-hard Problems.	L2

COURSE 7 – C & DS LAB

CO	Course Outcomes (COs)	Level
CO1	Understand fundamental concepts of operating systems	L2
CO2	Analyze process synchronization techniques and deadlocks	L4
CO3	Explain memory management techniques and file system design	L2
CO4	Understand protection mechanisms in operating systems	L2

COURSE 8 – OS & CO LAB

CO	Course Outcomes (COs)	Level
CO1	Demonstrate ability to use UNIX operating system commands effectively	L2
CO2	Write shell scripts to automate tasks in the UNIX environment	L4
CO3	Implement algorithms using C, C++, or Java programming languages	L2
CO4	Design and implement digital logic circuits using logic gates, flip-flops, etc.	L2
CO5	Evaluate programs in assembly language for 8085/86 microprocessor	L5

COURSE 09- MCA SKILL DEVELOPMENT COURSES/ MOOCS

CO	Course Outcomes (COs)	Level
CO1	The students apply to enhance their programming skills.	L3
CO2	The students use to do multiple courses through MOOCS	L3

COURSE 10- MCA BRIDGE COURSE FUNDAMENTALS OF COMPUTERS

CO	Course Outcomes (COs)	Level
CO1	Explain the concept of input and output devices of Computers and how it works and	L2
CO2	Define the basic terminology used in computer programming	L1
CO3	Apply to develop techniques of writing algorithms, pseudo codes and logic	L3
CO4	describe the concepts of Operating Systems	L2

COURSE 11- MCA BRIDGE COURSE FUNDAMENTALS OF COMPUTERS LAB

CO	Course Outcomes (COs)	Level
CO1	Understand about the internal parts of a computer	L2
CO2	TO knowledge to install Operating System	L1
CO3	Understand about Internet	L2
CO4	Plan to work on Office Tools such as Word processors	L5
CO5	To analize and Write Algorithms, Flow Charts for simple programs in C	L4

SEMESTER II

COURSE 1- MCA-20201 COMPUTER NETWORKS

CO	Course Outcomes (COs)	Level
CO1	Define the basics of computer networks and data communication.	L1
CO2	Understand the Data Link Layer, IEEE Standards, and design issues in computer networks.	L2
CO3	Explain Internet Transport Protocols and different types of network protocols.	L2
CO4	Describe an overview of various types of network devices and different types of networks.	L1

COURSE -2-20202-MCAOBJECT ORIENTED PROGRAMMING THROUGH JAVA

CO	Course Outcomes (COs)	Level
CO1	Define Introduction to OOP and concept of Inheritance.	L1
CO2	Understand about Interfaces, Packages, and Enumeration, Exceptions & Assertions.	L2
CO3	Explain about Multi-Threading and Applets.	L2
CO4	Describe the concept of Event Handling and Abstract Window Toolkit (AWT).	L1

COURSE 3- MCA-20203 DATABASE MANAGEMENT SYSTEMS

CO	Course Outcomes (COs)	Level
CO1	Understand the Introduction of Database System and Data Modeling Using the Entity-Relationship Model.	L2
CO2	Explain the Relational Data Model, Relational Database Constraints, and Relational Algebra.	L2
CO3	Discuss Relational Calculus, Schema Definition, Basic Constraints, and Queries.	L2
CO4	Describe Relational Database Design and Indexing Structures for Files.	L1

COURSE 4- MCA-20204FORMALLANGUAGES&AUTOMATATHEORY

CO	Course Outcomes (COs)	Level
CO1	Define the concept of Finite Automata and Regular Expressions, Regular sets & Regular Grammars.	L1
CO2	Explain the concept of Context-Free Grammars and Languages, Push-Down Automata.	L2
CO3	Understand about Turing Machines, Universal Turing Machines, and Undecidability in detail.	L2
CO4	Describe the concept of The Propositional Calculus and The Predicate Calculus.	L1

COURSE 5-MCA-20205 DATA MINING CONCEPTS AND TECHNIQUES

CO	Course Outcomes (COs)	Level
CO1	Understand the overview of Data Warehouse Basic Concepts, Data Warehouse Modelling, Pre-processing.	L2
CO2	Describe Introduction to Data Mining, Basic Statistical Descriptions of Data, Data Visualization, Measuring data Similarity and Dissimilarity.	L1
CO3	Explain the Concept Description, Generalization by AOI, Mining Frequent Patterns, Associations and Correlations, Mining Frequent Item set.	L2
CO4	Describe the Basic Concepts of Classification, Different Methods of Classification.	L2

COURSE 6.1- MCA-20206.1 ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS

CO	Course Outcomes (COs)	Level
CO1	Explain the basic concept of Artificial Intelligence.	L2
CO2	Solve the algorithms and logics in Artificial Intelligence.	L3
CO3	Describe the theories and functions related to Artificial	

	Intelligence.	**L1**
CO4	Understand the concept, characteristics, and applications of Expert Systems.	**L2**
CO5	Define Transaction Processing and Concurrency Control Techniques.	**L1**

COURSE 6.2-MCA-20206.2 INTERNET OF THINGS (IOT)

CO	Course Outcomes (COs)	Level
CO1	Define Introduction to Internet of Things, IoT Enabling Technologies, IoT Levels & Deployment Templates Domain Specific IoTs.	**L1**
CO2	Understand IoT & M2M, SNMP.	**L2**
CO3	Construct IoT Platforms Design Methodology.	**L3**
CO4	Discuss about IoT Physical Devices & Endpoints.	**L2**

COURSE 6.3-MCA-20206.3 IMAGE PROCESSING

CO	Course Outcomes (COs)	Level
CO1	Define Fundamentals of Image Processing, Basics of Histogram, Definition and Algorithm of Histogram Equalization.	**L1**
CO2	Describe about Image Transforms: A Detail Discussion On Fourier Transform, DFT, FFT, Image Enhancement.	**L2**
CO3	Explain EDGE Enhancement, Smoothening Filters in Frequency Domain. Butterworth Filter, Homomorphic Filters, Image Compression.	**L2**
CO4	Discuss about Image Segmentation, Morphology.	**L2**

COURSE 7-MCA-20207 OBJECT ORIENTED PROGRAMMING THROUGH JAVA LAB

CO	Course Outcomes (COs)	Level
CO1	Write programs in Java using OOP.	L6
CO2	Write programs related to real-life scenarios.	L6
CO3	Write code programs in Java using Inheritance and using Adapter classes.	L6

COURSE 8- MCA-20208 DATABASE MANAGEMENT SYSTEMS LAB

CO	Course Outcomes (COs)	Level
CO1	Define SQL queries using DDL, DML, and DCL commands.	L1
CO2	Describe SQL queries on aggregate and conversion functions.	L2
CO3	Discuss PL/SQL programs on exception handling and control structures.	L2
CO4	Explain PL/SQL programs on cursors, procedures, and triggers.	L2

COURSE 9- MCA-20209 SKILL DEVELOPMENT COURSE WITH PYTHON

CO	Course Outcomes (COs)	Level
CO1	Able to understand the basics of Python Programming language	L2
CO2	Able to use various functions and methods of Python Programming	L3
CO3	Able to compare Multithread Programming and GUI Programming	L4
CO4	Able to understand Web Programming and Database Programming	L2

SEMESTER -III

COURSE 1- MCA-20301 INFORMATION SECURITY AND CRYPTOGRAPHY

CO	Course Outcomes (COs)	Level
CO1	Understand the security approaches and techniques, Introduction to number theory.	L2
CO2	Define Symmetric key and Asymmetric key cryptographic algorithms.	L1
CO3	Discuss about User Authentication Mechanisms, System security.	L2
CO4	Explain Internet Security Protocols and Network Security.	L2

COURSE 2 –MCA-20302 BIGDATA ANALYTICS

CO	Course Outcomes (COs)	Level
CO1	Understand introduction to Big Data and Hadoop.	L2
CO2	Analyze Real-Time Analytics, Map Reduce Programming.	L4
CO3	Summarize Streaming in Spark, Machine Learning, Map Reduce Advanced Programming.	L5
CO4	Define Graph Representation in Map Reduce, Graph Analytics in Spark, Programming with RDDs-Basics, Spark SQL overview.	L1

COURSE 3-MCA-20303 OBJECT-ORIENTED SOFTWARE ENGINEERING

CO	Course Outcomes (COs)	Level
CO1	Describe Introduction to Object-Oriented Software Engineering, Object Orientation, Requirements Engineering.	L2
CO2	Construct Unified Modeling Language & Use Case Modeling, Class Design and Class Diagrams.	L3
CO3	Describe the Software Design and Architecture, Design Patterns.	L2
CO4	Analyze the Software Testing, Software Project Management, Software Process Models.	L4

COURSE 4- MCA20304 WEB TECHNOLOGIES

CO	Course Outcomes (COs)	Level
CO1	Explain the concept of Networking Protocols and OSI Model, Inter-networking Concepts, Devices, Basics, History, and Architecture.	L2
CO2	Describe TCP/IP and Electronic Commerce in detail.	L1
CO3	Analyze the concept of Web Technology and types of Web Pages.	L4
CO4	Understand the concept of Middleware and Component-based E-commerce Architectures, EDI, XML, and WAP.	L2

COURSE 5 –20305.1 BLOCK CHAIN TECHNOLOGY

CO	Course Outcomes (COs)	Level
CO1	Understand introduction to Blockchain, Basic Distributed System Concepts.	L2
CO2	Define Cryptography in Blockchain, Cryptography algorithms.	L1
CO3	Analyze Bitcoin-Cryptography, Hyperledger Fabric.	L4
CO4	Compare Use cases of Blockchain, Financial Service, healthcare, energy markets, media, Cyber Crime, e-Governance, Tax payments, land registry records, and blockchain in IoT.	L5

COURSE 5-MCA-20305.2 CLOUD COMPUTING

CO	Course Outcomes (COs)	Level
CO1	Describe Cloud Computing basics, Intranet and Cloud, Services and Business Applications, Salesforce.com, Organization and Cloud Computing.	L1
CO2	Explain about Hardware and Infrastructure, Overview of Software as a Service, Overview of Industries Software plus Services, Mobile device Integration.	L2
CO3	Understand Developing the Applications like Google, Microsoft, Intuit Quick Base, Local Clients and thin clients.	L2
CO4	Discuss Migrating the Cloud, Cloud Service.	L2

COURSE 9 – MCA 20305.3 MACHINE LEARNING & DEEP LEARNING

CO	Course Outcomes (COs)	Level
CO1	Understand the basic concepts and techniques of Machine Learning.	L2
CO2	Evaluate Decision Tree learning, Artificial Neural Networks.	L5
CO3	Define Bayesian learning, Instance-Based Learning.	L1
CO4	Analyze Genetic Algorithms, Learning Sets of Rules.	L4

COURSE 6-MCA-20306.1 BUSSINESS INTELLIGENCE AND VISUALIZATION

CO	Course Outcomes (COs)	Level
CO1	Able to understand about the Business intelligence	L2
CO2	Able to Discover the Knowledge	L3
CO3	Able to analyze the Efficiency measures	L4
CO4	Able to identify about the Business intelligence applications	L1

COURSE 6 –MCA-20306.2 ROBOTICS

CO	Course Outcomes (COs)	Level
CO1	Understand the basics of control systems and components.	L2
CO2	Analyze robot end effectors its Types, Tools as End Effectors, Gripper Selection and Design, Forward and Inverse Kinematics.	L4
CO3	Define machine vision, Sensor Characteristics, Image processing and Analysis, Robotic Applications.	L1
CO4	Understand robot programming, Motion Commands, program Control and Subroutines, Programming methods and Branching.	L2

COURSE 6 –MCA-20306.3 FOUNDATIONS OF DATA SCIENCE

CO	Course Outcomes (COs)	Level
CO1	Understand Key concepts in data science, including tools, approaches, and application scenarios.	L2
CO2	Summarize Topics in data collection, sampling, quality assessment, and repair.	L5
CO3	Define Topics in statistical analysis and machine learning.	L1
CO4	Evaluate State-of-the-art tools to build data-science applications for different types of data, including text and CSV data.	L5

COURSE 7-MCA-20307 WEB TECHNOLOGIE AND OOSE LAB

CO	Course Outcomes (COs)	Level
CO1	write SQL queries using DDL, DML, DCL commands.	L6
CO2	write SQL queries on aggregate and conversion functions.	L6
CO3	write PL/SQL programs on exception handling, control structures.	L6
CO4	write PL/SQL programs on cursors, procedures, triggers.	L6
CO5	Understand how to specify, visualize, construct, and document the artifacts of software systems.	L2
CO6	Understand how to use Rational Rose Enterprise Edition for modeling.	L2
CO7	Construct and Develop Software Project Management and Software Engineering activities specified can be customized according to the features of the project.	L6

COURSE 8 –MCA-20308 BIG DATA ANALYTICS LAB

CO	Course Outcomes (COs)	Level
CO1	Describe Implement data structures, generic types.	L2
CO2	Analyze Setup and install Hadoop.	L4
CO3	Explain Implementation file management tasks and programs in Hadoop.	L1

COURSE 9 –MCA-20309 INNOVATION INTEREPRENEURSHIP AND INTELECTUAL PROPERTY RIGHTS

CO	Course Outcomes (COs)	Level
CO1	Able to understand Role and importance Technology developments, Innovation in Current Environment	**L2**
CO2	Able to apply Entrepreneurship and Its Evolution	**L3**
CO3	Able to understand Intellectual Property Law	**L2**
CO4	Able to identify Patent Law –Rights and Limitations	**L1**