VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in Computer Science

SYLLABUS

Master of Computer Applications

(I-II Semester)

With effect from

2022-23

I-SEMESTER

Semester No.	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	Sem. Exam	Total	L	T	P		
FIRST	DSC1	22MCA1C1L	Data Structures with Algorithms	30	70	100	4	-	-	4	3
	DSC2	22MCA1C2L	Object Oriented Programming using JAVA	30	70	100	4	-	-	4	3
	DSC3	22MCA1C3L	Computer Networks	30	70	100	4	-	-	4	3
	DSC4	22MCA1C4L	Mathematics for Computer Applications	30	70	100	4	-	-	4	3
	SEC1	22MCA1S1L	Web Technologies	20	30	50	1	-	2	2	1
	DSC1P1	22MCA1C1P	Data Structure with Algorithms Lab	20	30	50	-	-	4	2	4
	DSC2P2	22MCA1C2P	Object Oriented Programming using JAVA Lab	20	30	50	-	-	4	2	4
	DSC3P3	22MCA1C3P	Computer Networks lab	20	30	50	-	-	4	2	4
Total Marks for I Semester						**600**				**24**	

Data Structures with Algorithms

Subject Code: 22MCA1C1L **Contact Hours/Week: 04**
Credits: 04 **Total Lecture Hours: 52**
MARKS: 70

UNIT 1	**Teaching Hours**
INTRODUCTION TO DATA STRUCTURES: Basic concepts: Introduction to data structures, classification of data structures, operations on data structures; Searching techniques: Linear search and Binary search; Sorting techniques: Bubble sort, selection sort, insertion sort and comparison of sorting techniques	**08 Hours**
UNIT 2	
LINEAR DATA STRUCTURES: Stacks: Primitive operations, implementation of stacks using Arrays, applications of stacks, arithmetic expression conversion and evaluation; Queues: Primitive operations; Implementation of queues using Arrays, applications of linear queue, circular queue and double ended queue (dequeue).	**12 Hours**
UNIT 3	
LINKED LISTS: Linked lists: Introduction, singly linked list, representation of a linked list in memory, Types of linked lists: Single linked lists Circular linked lists, doubly linked lists; operations on a single linked list; Applications of linked lists: Polynomial representation and sparse matrix manipulation.	**12 Hours**
UN IT 4	
NON LINEAR DATA STRUCTURES: Trees: Basic concept, binary tree, binary tree representation, array and linked representations, binary tree traversal, binary tree variants, application of trees; Graphs: Basic concept, graph terminology, graph implementation, graph traversals, Application of graphs, Priority Queue.	**10 Hours**
UNIT 5	
Binary search tree and HASHING: Binary search trees, properties and operations; Balanced search trees: AVL trees; Introduction to M-Way search trees, B trees; Hashing and collision: Introduction, hash tables, hash functions, collisions, applications of hashing.	**10 Hours**

References:

1. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition,2008.
2. D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition,2004.

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Apply Algorithm for solving problems like sorting, searching of data.
2	Understand basic data structures such as arrays, stacks and queues.
3	Understand basic data structures such as types of linked list.
4	Solve problem involving graphs, trees.
5	Describe the hash function and concepts of collision.

Object Oriented Programming using JAVA

Subject Code: 22MCA1C2L
Credits: 04
MARKS: 70

Contact Hours/Week: 04
Total Lecture Hours: 52

UNIT 1	**Teaching Hours**
Java Programming Fundamentals: The Java Language, The Key Attributes of Object-Oriented Programming, The Java Development Kit, A First Simple Program, The Java Keywords, Identifiers in Java, The Java Class Libraries. Introducing Data Types and Operators: Java's Primitive Types, Literals, A Closer Look at Variables, The Scope and Lifetime of Variables, operators, Shorthand Assignments, Type conversion in Assignments, Using Cast.	**12 Hours**
UNIT 2	
A Closer Look at Methods and Classes: Controlling Access to Class Members, Pass Objects to Methods, How Arguments are passed, Returning Objects, Method Overloading, Overloading Constructors, Recursion, Understanding Static, Introducing Nested and Inner Classes.	**10 Hours**
UNIT 3	
Inheritance: Inheritance Basics, Member Access and Inheritance, Constructors and Inheritance, Using super to Call Super class constructors, Using super to Access Super class Members, Creating a Multilevel Hierarchy, When are Constructors Executed, Super class References and Subclass Objects, Method Overriding, Overridden Methods support polymorphism.	**10 Hours**
UNIT 4	
Interfaces: Interface Fundamentals, Creating an Interface, Implementing an Interface, Using Interface References, Implementing Multiple Interfaces, Constants in Interfaces. Packages: Package Fundamentals, Packages and Member Access, Importing Packages, Static Import.	**10 Hours**
UNIT 5	
Exception Handling : The Exception Hierarchy, Exception Handling Fundamentals, The Consequences of an Uncaught Exception, Exceptions Enable you to handle errors gracefully, using Multiple catch clauses, Catching subclass Exceptions, try blocks can be nested, Throwing an Exception, A Closer look at Throw able, using finally, using throws, Java's Built- in Exceptions, New Exception features added by JDK19, Creating Exception Subclasses.	**10 Hours**

Reference Books:

1. Java Programming by Hari Mohan Pandey, Pearson Education, 2012.
2. Java6 Programming, Black Book, Dreamtech Press, 2012.
3. Java2 Essentials, Cay Hortsmann, second edition, Wiley.

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Understand the basic concepts of Java Programming.
2	Understand the concepts of Methods and Class.
3	Demonstrate the implementation of Inheritance
4	Implementation of Interface and Packages.
5	Demonstrate and implementation of Exception Handling.

Computer Networks

Subject Code: 22MCA1C3L
Credits: 04

Contact Hours/Week: 04
Total Lecture Hours: 52
MARKS: 70

UNIT 1	**Teaching Hours**
Introduction to Computer Networks: Basics of Computer Networks - Problems associated with computer networks: Communication problems, Identification problems, and Connection problems – Network protocol basics – Service identification – MAC Address - IPv4 Addressing System, Subnetting and Super netting, IPv6 Addressing System - Network requirements: Network interface card (NIC), Media, and Networking devices – Hub, Switch, and Routers.	**12 Hours**
UNIT 2	
Network Topologies and Network Architectures: Network Topologies – Bus, Star, Ring, Mesh – Network Architectures – Client/Server Architecture, Peer-To-Peer Architecture - Open System Interconnect (OSI) Reference Model - TCP/IP Model - TCP Operation - UDP Operation – Flow Control – Congestion Control.	**10 Hours**
UNIT 3	
Local Area Networks: LAN components – Packet Switching and Forwarding – LAN Technologies - Ethernet, Token Bus, Token Ring, Wireless LAN – Multiple Access Protocols – Error-Detection and Correction Techniques.	**10 Hours**
UNIT 4	
Wide Area Networks: WAN Components – WAN Technologies - WAN Encapsulation - Routing: Static Routing and Dynamic Routing - Routed Protocols (IP and IPX) - Routing Protocols.	**10 Hours**
UNIT 5	
Protocols: Address Resolution Protocol (ARP) Protocol - Dynamic Host Configuration Protocol (DHCP)- Domain Name System (DNS) – Internet Protocol (IP) – Internet Control Message Protocol (ICMP) - Hypertext Transfer Protocol (HTTP) - File Transfer Protocol (FTP) - Simple Mail Transfer Protocol (SMTP), Remote Administration Protocols: Telnet and Secure Shell (SSH).	**10 Hours**

Reference Books:

1. Behrouz A. Forouzan Data Communications and Networking, , McGraw Hill Forouzan Networking Series, 5th Edition.
2. James F Kurose and Keith W Ross Computer Networking, A Top-Down Approach, Pearson Education, Sixth edition 2017.
3. Larry L Peterson and Brusce S Davie Computer Networks, ELSEVIER, 6th Edition.
4. Andrew S Tanenbaum Computer Networks, Pearson Education, 5th Edition.
5. Mayank Dave Computer Networks, Cengage Learning, 5th Edition.

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Understand the basic Computer Network Terminologies.
2	List the functionalities of networking layers available in both OSI reference model and TCP/IP model.
3	Describe available LAN Technologies.
4	Describe available WAN Technologies.
5	Describe the available application protocols and networking services.

Mathematical Foundation for Computer Applications

Subject Code: 22MCA1C4L
Credits: 04
MARKS: 70

Contact Hours/Week: 04
Total Lecture Hours: 52

UNIT 1	**Teaching Hours**
Set Theory and Matrices: Sets, Operations on sets, Cardinality of sets, inclusion-exclusion principle, pigeonhole principle, matrices, finding Eigen values and Eigen vectors, Cayley Hamilton theorem(Statement), Problems on Cayley Hamilton theorem.	**10 Hours**
UNIT 2	
Mathematical Logic: Propositional Logic, Applications of Propositional Logic, Propositional Equivalences Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs.	**10 Hours**
UNIT 3	
Recurrence Relations: Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions, The method of Characteristic Roots, Solution of Inhomogeneous Recurrence Relations.	**10 Hours**
UN IT 4	
Random variable and probability distribution: Concept of random variable, discrete probability distributions, continuous probability distributions, Mean, variance and co-variance and co-variance of random variables. Binomial and normal distribution, Exponential and normal distribution with mean and variables and problems	**12 Hours**
UNIT 5	
Graph Theory : Graphs and Graphs models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring	**10 Hours**

Reference Books:

1. Richard A Johnson and C.B Gupta “Probability and statistics for engineers” Pearson Education.
2. J.K Sharma “Discrete Mathematics”, Mac Millian Publishers India, 3rd edition,2011.2015.

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Understand the concepts of Set Theory and Matrices.
2	Apply propositional logic to solve problems.
3	Understand Recurrence Relations and Solving problems.

4	Understand the concepts of Random variable and Probability distributions.
5	Formulate and solve graph problems.

Web Technologies

Subject Code: 22MCA1S1T
Credits: 02

Contact Hours/Week: 02
Total Lecture Hours: 26
MARKS: 50

UNIT 1	**05 Hrs**
Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, What is server, choices, Logging users, dynamic IP Web Design: Web site design principles, planning the site and navigation. Introduction to HTML: The development process, Html tags and simple HTML forms, web site structure	
UNIT 2	**04 Hrs**
Introduction to XHTML: XML, Move to XHTML, Meta tags, Character entities, frames and frame sets, inside browser. Style sheets : Need for CSS, introduction to CSS, basic syntax and structure, using CSS, background images, colors and properties, manipulating texts, using fonts, list, tables, borders and boxes, margins, padding lists, positioning using CSS, CSS2.	
UNIT 3	**04 Hrs**
Javascript: Client side scripting, What is Javascript, How to develop Javascript, simple Javascript, variables, functions, conditions, loops and repetition.	

Reference Books:

1. Web Technologies, Black Book, Dreamtech Press, 2018.
2. Steven Holzner, "HTML Black Book", Dreamtech press, 2000.
3. Internet and World Wide Web How to program, P.J. Deitel & H.M. Deitel Pearson, 4th edition, 2012.

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Understand the concepts of WWW protocols and HTML basics.
2	Apply the knowledge of XHTML, CSS in developing the website applications.
3	Build dynamic web pages using JavaScript (Client side programming).

II-SEMESTER

Semester No.	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	Sem. Exam	Total	L	T	P		
SECOND	DSC5	22MCA2C5L	Database Management Systems	30	70	100	4	-	-	4	3
	DSC6	22MCA2C6L	Data Mining	30	70	100	4	-	-	4	3
	DSC7	22MCA2C7L	Internet of Things **(MOOC/ Swayam/ Classroom)**	30	70	100	4	-	-	4	3
	DSC8	22MCA2C8L	Software Engineering	30	70	100	4	-	-	4	3
	SEC2	22MCA2S2L	Python Programming	20	30	50	1	-	2	2	1
	DSC5P4	22MCA2C5P	Database Management Systems Lab	20	30	50	-	-	4	2	4
	DSC6P5	22MCA2C6P	Data Mining Lab	20	30	50	-	-	4	2	4
	DSC7P6	22MCA2C7P	Mini Project	20	30	50	-		4	2	4
Total Marks for II Semester						**600**				**24**	

Database Management Systems

Subject Code: 22MCA2C5L **Contact Hours/Week: 04**
Credits: 04 **Total Lecture Hours: 52**
MARKS: 70

UNIT 1	**Teaching Hours**
Introduction to DBMS: Historical perspective, File Versus a DBMS, Advantages of DBMS, Describing and storing data in DBMS, Architecture of a DBMS, Different Data Models. Entity Relationship(ER) model : Features of ER model, conceptual design using ER model, design for large enterprises; Relational model– structure and operations, Integrity constraints over relations.	**10 Hours**
UNIT 2	
Query languages: Relational Algebra, Relational Calculus and SQL– Queries, Constraints, Form of SQL query, UNION, INTERSECT and EXCEPT, Nested queries, Aggregate Operators, Null values, Complex Integrity constraints in SQL, triggers and Embedded SQL.	**12 Hours**
UNIT 3	
Database Design: Mapping ER model to Relational form; Functional Dependency– Closer of functional dependencies, closer of attributes, canonical cover and Properties of Decompositions; Normalization process – 1NF, 2NF, 3NF and BCNF.	**10 Hours**
UN IT 4	
Transaction Management: ACID properties, transactions, schedules and concurrent execution of transactions; Concurrency control – lock based protocol, Serializability, recoverability, dealing with deadlocks and Concurrency control without locking.	**10 Hours**
UNIT 5	
Overview of Query Evaluation, operator evaluation; Algorithms for relational operations– Selection operation, General selection condition, Projection operation, Join operation, set operation and aggregate operation, Evaluation of relational operations.	**10 Hours**

Reference Books:

1. Elamsri, Navathe, Somayajulu and Gupta, Fundamentals of Database Systems, 6thEdition, Pearson Education, 2011.
2. Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, 3nd Edition, McGraw Hill, 2003.
3. Silberschatz, Korth and Sudharshan, Database System Concepts, 6rd Edition, McGrawHill, 2010.

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Understand the fundamentals of DBMS and importance of ER Model .
2	Implementation of Query language.
3	Analyze functional dependency and concepts of Normalization.
4	Apply Properties of Transaction management and understand Concurrency control techniques.
5	Implementation of Query evaluation.

Data Mining

Subject Code: 22MCA2C6L
Credits: 04
MARKS: 70

Contact Hours/Week: 04
Total Lecture Hours: 52

UNIT 1	**Teaching Hours**
Data mining – Motivation – Importance - DM Vs KDD - DM Architecture - Data Types – DM Tasks –DM System Classification - Primitives of DM - Data Mining Query Language - DM Metrics - DM Applications - DM Issues – Social Implications of DM	**10 Hours**
UNIT 2	
Data Preprocessing: Summarization - Data cleaning - Data Integration and Transformation - Data Reduction - Discretization and Concept Hierarchy Generation	**12 Hours**
UNIT 3	
Mining Frequent Patterns – Frequent Item set Mining Methods. Classification: Classification by Decision Tree Induction – Bayesian Classification – Rule based Classification - Prediction– Accuracy and Error Measures	**10 Hours**
UN IT 4	
Cluster Analysis – Types of Data in Cluster Analysis – Categorization of clustering Methods – Partition Methods - Outlier Analysis – Mining Data Streams – Social Network Analysis – Mining the World Wide Web	**10 Hours**
UNIT 5	
Data Warehousing: OLTP Vs OLAP - Multidimensional Data Model -DW Architecture Efficient Processing of OLAP queries - Metadata repository – DWH Implementation – OLAM	**10 Hours**

Reference Books:

1. JiaweiHan, Micheline amber, "Data Mining: Concepts and Techniques", 3rd Edition, Elsevier India Private Limited, 2012.
2. Margaret H. Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education, 2012.
3. K.P.Soman, ShyamDiwakar, V.Ajay, “Insight into Data Mining Theory & Practice, Prentice
4. Hall India, 2012 5. G.H.Gupta, “Introduction to Data Mining with Case Studies”, 2nd Edition, PHI.
5. Ralph Kimball, Margy Ross “The Data Warehouse Toolkit: The Complete Guide to Dimensional Modeling”, 3rd Edition ,wiley, Jul 2013

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Understand what Is Data Mining, what kinds of data can be mined, what kinds of patterns can be mined, and what kinds of applications are targeted.
2	Apply Data preprocessing techniques.
3	How to mine Data Patterns using Classification techniques.
4	Understand Cluster Analysis.
5	Implementing OLAP in Data Warehousing.

Internet of Things

Subject Code: 22MCA2C7L **Contact Hours/Week: 04**
Credits: 04 **Total Lecture Hours: 52**
MARKS: 70

UNIT 1	**Teaching Hours**
What is IoT, Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT Functional Stack, IoT Data Management and Compute Stack.	**10 Hours**
UNIT 2	
Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.	**12 Hours**
UNIT 3	
IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods.	**10 Hours**
UN IT 4	
Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics, Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT and OT Security Practices and Systems Vary.	**10 Hours**
UNIT 5	
IoT Physical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, Installing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and Endpoints - RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: Hardware Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi.	**10 Hours**

Reference Books:

1. Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN: 978-8173719547)
2. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Understand the importance of IOT
2	Analysis about objects, things used in IOT.
3	Understand how network layers are related to IOT.
4	Analysis of data using IOT.
5	Understand the configuration of Arduino and Raspberry-Pi.

Software Engineering

Subject Code: 22MCA2C8L
Credits: 04
MARKS: 70

Contact Hours/Week: 04
Total Lecture Hours: 52

UNIT 1	**Teaching Hours**
INTRODUCTION AND SOFTWARE PROCESSES: Introduction, Role and importance of software engineering, Professional and ethical responsibility. Software processes: Software process models, Process iteration, Process activities, The Rational Unified Process, Computer-aided Software Engineering.	**10 Hours**
UNIT 2	
SOFTWARE REQUIREMENT: Software requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, The software requirements document. Requirement engineering processes: Feasibility studies, Requirement elicitation and analysis, Requirements validation, Requirements management.	**12 Hours**
UNIT 3	
SOFTWARE DESIGN: Design concepts: Design with the context of software engineering, The design process, Design concepts, The design model. Architectural design: Software architecture, Architectural genres, Architectural styles, Architectural design, Assessing alternative architectural designs, Architectural mapping using data flow	**10 Hours**
UN IT 4	
SOFTWARE VERIFICATION AND VALIDATION Verification and Validation: Planning verification and validation, Software inspections, Automated static analysis, Verification and formal methods. Software Testing: System Testing, Component Testing, Test case design, Test automation.	**10 Hours**
UNIT 5	
SOFTWARE MANAGEMENT Managing people: Selecting staff, Motivating people, Managing groups, The People Capability Maturity model. Software Cost Estimation: Software productivity, Estimation techniques, Algorithmic cost modeling, Project duration and staffing.	**10 Hours**

Reference Books:

1. Roger S Pressman Software Engineering McGraw-Hill
2. SWEBOK-IEEE notes Guide to Software Engineering Body of Knowledge IEEE.

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Explain the importance of Software Engineering and Software Process.
2	Analyze and Evaluate Software Requirements.
3	Implement Software Design and Architecture.
4	Evaluate the verification and validation of software product.
5	Improve the software management skills.

Python Programming

Subject Code: 22MCA2S2L
Credits: 02
MARKS: SEE :- 30
IA :- 20

Contact Hours/Week: 02
Total Lecture Hours: 26

UNIT 1	**Teaching Hours**
INTRODUCTION TO PYTHON PROGRAMMING: Python interpreter and interactive mode; values and types variables, expressions, statements, tuple assignment, Order of operations, comments, debugging;	**04 Hours**
UNIT 2	
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, range, break, continue, pass; recursion; Strings: string slices, string functions and methods, string module; Lists as arrays.	**05 Hours**
UNIT 3	
LISTS, TUPLES, DICTIONARIES: Lists: Traversing a List, list operations, list slices, list methods. Dictionaries: operations and methods; Tuples: tuple assignment, tuple as return value.	**04 Hours**

Reference Books:

Course Outcomes (CO): After completion of this course student able to

CO	Statement
1	Understand the basic concepts of python programming.
2	Understand the different types of statements in python programming.
3	Understand the different types of data types.