VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in

Computer Science

SYLLABUS

Master of Science
(I-IV Semester)

With effect from
2021-22

VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in Computer Science

Programme: Master of Science (M.Sc.) in Computer Science

Duration: 2 Years (4 semesters)

Programme Overview:

Master of Science (M.Sc.) in Computer Science programme is designed to prepare students for a career in Industry, Government, Society and the Scientific community by introducing them to a wide range of new technologies in Computer Science disciplines. The programme aims to address research, solve real-world problems, participate in interdisciplinary research and its applications.

Programme Educational Objectives (PEOs):

After 3-4 years of completion of the programme the graduates will be able to:

1. Ability to apply the basic knowledge of database systems, computing, operating system, digital circuits, microcontroller, computer organization and architecture in the design of computer based systems.
2. Ability to specify, design and develop projects, application softwares and system softwares by using the knowledge of data structures, analysis and design of algorithm, programming languages, software engineering practices and open source tools.
3. Ability to debug, verify and validate the systems using various testing methods and tools.

Program Outcomes:

1. Computer knowledge: Apply the knowledge of mathematics, science and engineering fundamentals to the solution of complex problems.
2. Problem analysis: Identify, formulate, review research literature, and analyze complex problems reaching substantiated conclusions using principles of mathematics, natural sciences.
3. Design/development of solutions: Design solutions for complex problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern IT tools to complex problems with an understanding of the limitations.
5. Environment and sustainability: Understand the impact of the professional solution in

societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

6. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
7. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
8. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
9. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

Distribution of Courses/Papers in Postgraduate Programme as per Choice Based Credit System (CBCS) in

Computer Science

M.Sc. I - SEMESTER

Semester	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	21CSC1C1L	Data Structures and Algorithms	30	70	100	4	-	-	4	3
	DSC2	21CSC1C2L	JAVA Programming	30	70	100	4	-	-	4	3
	DSC3	21CSC1C3L	Computer Networks	30	70	100	4	-	-	4	3
	DSC4	21CSC1C4L	Discrete Mathematical Structures	30	70	100	4	-	-	4	3
	SEC1	21CSC1S1TP	Web Technologies	20	30	50	-	1	2	2	2
	DSC1P1	21CSC1C1P	Data Structure and Algorithms Lab	20	30	50	-	-	4	2	4
	DSC2P2	21CSC1C2P	JAVA Programming Lab	20	30	50	-	-	4	2	4
	DSC3P3	21CSC1C3P	Computer Networks Lab	20	30	50	-	-	4	2	4
Total Marks for I Semester						**600**				**24**	

M.Sc. II-SEMESTER

Semester	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	21CSC2C5L	Database Management Systems	30	70	100	4	-	-	4	3
	DSC6	21CSC2C6L	Python Programming	30	70	100	4	-	-	4	3
	DSC7	21CSC2C7L	Software Engineering	30	70	100	4	-	-	4	3
	DSC8	21CSC2C8L	Operating System	30	70	100	4	-	-	4	3
	SEC2	21CSC2S2TP	Advanced Web Programming	20	30	50	-	1	2	2	2
	DSC5P4	21CSC2C5P	Database Management Systems Lab	20	30	50	-	-	4	2	4
	DSC6P5	21CSC2C6P	Python Programming Lab	20	30	50	-	-	4	2	4
	DSC7P6	21CSC2C7P	Mini Project based on DBMS & Software Engineering	20	30	50	-		4	2	4
Total Marks for II Semester						**600**				**24**	

M.Sc. III-SEMESTER

Semester	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	Sem. Exam	Total	L	T	P		
THIRD	DSC9	21CSC3C9L	Multimedia & Animation	30	70	100	4	-	-	4	3
	DSC10	21CSC3C10L	Data Analytics	30	70	100	4	-	-	4	3
	DSE1	21CSC3E1AL	A. Data Mining	30	70	100	4	-	-	4	3
		21CSC3E1BL	B. Network Security								
		21CSC3E1CL	C. Artificial Intelligence								
	DSE2	21CSC3E2AL	A. Digital image processing	30	70	100	4	-	-	4	3
		21CSC3E2BL	B. Social networking and analysis								
		21CSC3E2CL	C. Software Testing								
	GEC1	21CSC3G1AL	A. Web Designing	20	30	50	1	1	-	2	2
		21CSC3G1BL	B. Computer Networks and Internet Technologies								
		21CSC3G1CL	C. Introduction to CProgramming.								
	SEC3	21CSC3S3LP	Research Methodology	20	30	50	1	-	2	2	2
	DSC9P7	21CSC3C9P	Multimedia & Animation Lab	20	30	50	-	-	4	2	4
	DSC10P8	21CSC3C10P	Data Analytics Lab	20	30	50	-	-	4	2	4
Total Marks for III Semester						**600**				**24**	

M.Sc. IV-SEMESTER

Semester	Category	Subject code	Title of the Paper	Marks			Teaching hours/week			Credit	Duration of exams (Hrs)
				IA	Sem. Exam	Total	L	T	P		
FOURTH	DSC11	21CSC4C11L	Internet of Things	30	70	100	4	-	-	4	3
	DSC12	21CSC4C12L	Machine Learning	30	70	100	4	-	-	4	3
	DSE3	21CSC4E3AL	A. Business Intelligence	30	70	100	4	-	-	4	3
		21CSC4E3BL	B. Information Security and Cryptography								
		21CSC4E3CL	C. Mobile Computing								
	DSE4	21CSC4E4AL	A. Pattern Recognition	30	70	100	4	-	-	4	3
		21CSC4E4BL	B. Soft computing								
		21CSC4E4CL	C. Digital Forensic and cyberLaws								
	GEC2	21CSC4G2AL	A. Multimedia & Animation	20	30	50	2	-	-	2	2
		21CSC4G2BL	B. Artificial Intelligence								
		21CSC4G2CL	C. R Programming.								
	DSC12P9	21CSC4C12P	Machine Learning Lab	20	30	50	-	-	4	2	4
	Project	21CSC4C1R	Major Project	30	70	100		-	8	4	4
Total Marks for IV Semester						**600**				**24**	

(I-IV semester)-Total Marks: 2400 and Total credits: 96

M.Sc. Computer Science First Semester

Course: Data Structure and Algorithms	**Course Code:** 21CSC1C1L
Teaching Hours/Week (L-T-P): 4 - 0 - 0	**No. of Credits:** 04
Internal Assessment: 30 Marks	**Semester End Examination:** 70 Marks

Course Objectives:

1. To impart the basic concepts of data structures and algorithms
2. To understand concepts about searching and sorting techniques
3. To understand basic concepts about stacks, queues, lists, trees and graphs

UNIT I **08Hrs**

Algorithm Specifications: Performance Analysis and Measurement (Time and space analysis of algorithms- Average, best and worst case analysis).

Introduction To Data Structure: Data Management concepts, Data types – primitive and non-primitive, Types of Data Structures- Linear & Non Linear Data Structures

UNIT II **12Hrs**

Linear Data Structure Array: Representation of arrays, Applications of arrays, sparse matrix and its representation., Stack: Stack-Definitions & Concepts, Operations On Stacks, Applications of Stacks, Polish Expression, Reverse Polish Expression And Their Compilation, Recursion, Tower of Hanoi, Queue: Representation Of Queue, Operations On Queue, Circular Queue, Priority Queue, Array representation of Priority Queue, Double Ended Queue, Applications of Queue, Linked List: Singly Linked List, Doubly Linked list, Circular linked list,Linked implementation of Stack, Linked implementation of Queue, Applications of linked list.

UNIT III **12Hrs**

Nonlinear Data Structure : Tree-Definitions and Concepts, Representation of binary tree, Binary tree traversal (Inorder, Postorder, preorder), Threaded binary tree, Binary search trees, Conversion of General Trees To Binary Trees, Applications Of Trees- Some balanced tree mechanism, eg. AVL trees, 2-3 trees, Height Balanced, Weight Balance, Graph-Matrix Representation Of Graphs, Elementary Graph operations,(Breadth First Search, Depth First Search, Spanning Trees, Shortest path, Minimal spanning tree).

UNIT IV **10Hrs**

SORTING and SEARCHING Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Sorting On SeveralKeys, List and Table Sort,Linear Search, Binary Search.

UNIT V **10Hrs**

Hashing And File Structures : Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques, File Structure: Concepts of fields, records and files, Sequential, Indexed and Relative/Random File Organization, Indexing structure for index files, hashing for direct files, Multi-Keyfile organization and access methods.

Reference Books:

1. An Introduction to Data Structures with Applications. by Jean-Paul Tremblay & Paul G. SorensonPublisher-Tata McGraw Hill 2nd Edition 2017.

2. Data Structures using C & C++ -By Ten Baum Publisher – Prenctice-Hall International 2nd Edition2018.

3. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 2ndedition.

4. Data Structures: A Pseudo-code approach with C -By Gilberg&Forouzan Publisher-Thomson Learning2014 2nd edition.

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

CO	Statement
1	Implements basic data structures such as stacks, queues and trees.
2	Apply algorithms and data structures in various real-life software problems.
3	Develop skills in implementations and applications of data structures.
4	Discuss the computational efficiency of the principal algorithms for sorting, searching.

Course: Java Programming	**Course Code:** 21CSC1C2L
Teaching Hours/Week (L-T-P): 4 - 0 - 0	**No. of Credits:** 04
Internal Assessment: 30 Marks	**Semester End Examination:** 70 Marks

Course Objectives:

1. To impart the basic concepts of Java
2. To understand concepts about classes, Objects and methods
3. To understand basic concepts about Polymorphism, Abstract classes and interfaces

UNIT I **10 Hrs**

Introduction to Java programming, The Java Virtual Machine, Variables and data types, Conditional andlooping constructs, Arrays.

UNIT II **10 Hrs**

Object-oriented programming with Java Classes and Objects, Fields and Methods, Constructors,Overloading methods, Garbage collection, Nested classes.

UNIT III **10 Hrs**

Inheritance, Overriding methods, Polymorphism, Making methods and classes final, Abstract classes andmethods, Interfaces.

UNIT IV **12 Hrs**

Exception handling with try-throw-catch-finally constructs, The Exception class Packages, Package access, Documentation comments. The Object class, Cloning objects, The JDK Linked List class, Strings, String conversions Working with types: Wrapper classes, Enumeration interface.

UNIT V **10 Hrs**

Applets, Configuring applets, Applet capabilities and restrictions, Basics of AWT and Swing, Layout Managers, Event Handling, The Action Listener interface, Panels, Classes for various controls, such as label, choice, list, , Checkbox, etc., Dialogs and frames, Using menus, Using the adapter classes, Graphics.

References:

1. Herbet Schildt and Dale Skrien, Java Fundamentals - A comprehensive Introduction, 2017,

McGrawHill Education.

2. P.J. Deitel and H.M. Deitel, Java for Programmers, 9th edition, Pearsoneducation

3. P.J. Deitel and H.M. Deitel, Java: How to Program, 2nd edition, PHI.

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

CO	Statement
1	Understand Java based software code of medium to high complexity
2	Identify classes, objects, members of a class and the relationships among them needed for a specificproblem.
3	Explain and write input – output programming in java and applications using Applets.
4	Apply the Java programming concepts and develop the applications with graphical user interface.

Course: Computer Networks	**Course Code:** 21CSC2C5L
Teaching Hours/Week (L-T-P): 4 - 0 - 0	**No. of Credits:** 04
Internal Assessment: 30 Marks	**Semester End Examination:** 70 Marks

Course Objectives:

1. Build an understanding of the fundamental concepts of data communication and computer networking.
2. Understand how errors detected and corrected that occur in transmission
3. Know about routing mechanisms and different routing protocols
4. Understand transport layer functions

UNIT-I **12Hrs**

Network Layer: Network-Layer Services: Packetizing, Routing and Forwarding Other Services. Network-Layer Performance: Delay, Throughput, Packet loss. Congestion Control.IPV4 **Addresses:** Address Space, Classfull Addressing, Classless Addressing, Dynamic Host Configuration Protocol (DHCP), Network Address Resolution (NAT). Forwarding of Ip Packets: Forwarding Based on Destination Address, Forwarding Based on Label, Routers as Packet Switches.

UNIT-II **10 Hrs**

Network Layer Protocols: Internet Protocol (IP): Datagram Format, Fragmentation, Options, Security ofIPv4 Datagrams.

Unicast Routing: Introduction: General Idea, Least-Cost Routing. Routing Algorithms: Distance-Vector Routing, Link-State Routing, Path-Vector Routing.

UNIT-III **10Hrs**

Unicast Routing Protocols: Internet Structure, Routing Information Protocol (RIP), Open Shortest Path First (OSPF), Border Gateway Protocol Version 4 (BGP4).

Multicast Routing: Multicasting Basics: Multicast Addresses, Delivery at Data-Link Layer, Collecting Information about Groups, Multicast Forwarding, Two Approaches to Multicasting.

UNIT IV **10 Hrs**

Intra domain Multicast Protocols: Multicast Distance Vector (DVMRP), Multicast Link State (MOSPF), Protocol Independent Multicast (PIM).

Next Generation IP: IPv6 Addressing: Representation, Address Space, Address Space Allocation, Auto configuration, Renumbering. The IPv6 Protocol: Packet Format, Extension Header, Transition From IPv4TO IPv6: Strategies, Use of IP Addresses.

UNIT V **10 Hrs**

Transport Layer Protocols: Introduction: Services, Port Numbers. User Datagram Protocol: User Datagram, UDP Services, UDP Applications. Transmission Control Protocol: TCP Services, TCP Features, Segment, A TCP Connection, State Transition Diagram, Windows in TCP, Flow Control, Error Control (except Sender and Receiver FSMs), TCP Congestion Control, TCP Timers.

References:

1. Behrouz A. Forouzan Data Communications and Networking, , McGrawHill, 5th Edition, 2017
2. James F Kurose and Keith W Ross Computer Networking, A Top-Down Approach, PearsonEducation, 6th Edition, 2017.
3. Larry L Peterson and Brusce S Davie, Computer Networks, ELSEVIER, 6th Edition, 2020.
4. Andrew S Tanenbaum, Computer Networks, Pearson Education, 5th Edition

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

CO	Statement
1	Apply the knowledge of Packet switching concepts in computer networking
2	Identify different categories of IP addresses and design subnets.
3	Analyze different Unicast and multicast routing mechanisms.
4	Analyze the transport-layer concepts and services -unreliable vs. reliable data transfer

Course: Discrete Mathematical Structures	**Course Code:** 21CSC1C4L
Teaching Hours/Week (L-T-P): 4 - 0 - 0	**No. of Credits:** 04
Internal Assessment: 30 Marks	**Semester End Examination:** 70 Marks

Course Objectives:

1. Understand sets, propositions and conditional.
2. Apply Principles of Mathematical induction.
3. Solve Different Graph Problems.

UNIT I **10 Hrs**

Sets and Logic: Sets, propositions, conditional propositions and logical equivalence, arguments and rulesof inference, quantifiers, nested quantifiers.

UNIT II **12 Hrs**

Proofs: Principles of Mathematical induction, Functions, Relations: relations, operations on relations, Properties of relations, equivalence relations, matrices of relations, Partially ordered sets, lattices, finite Boolean algebra, functions on Boolean algebra.

UNIT III **10 Hrs**

Graph Theory: Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs

UNIT IV **10 Hrs**

Trees: Terminology and characterizations of trees, spanning trees, minimal spanning trees, shortest-path algorithm, binary trees, tree traversals, decision trees, isomorphism of trees.

UNIT V **10 Hrs**

Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory.

References:

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, 8th edition, 2021 Tata McGraw Hill.
2. Deo N., Graph theory with application to Engineering and Computer Science, Prentice Hall of India.
3. Kolman, Busby, Ross, Discrete Mathematical Structures, Pearson Education, 6th edition, 2015.

Reference Books:

1. J.P. Tremblay and R. Manohar, Discrete Mathematical structures with applications to ComputerScience, Tata McGraw Hill, 1st edition, 2017.

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

CO	Statement
1	Understand sets, relations, functions and discrete structures.
2	Apply propositional logic and first order logic to solve problems.
3	Understand discrete mathematical structures.
4	Formulate and solve graph problems.

Course: Web Technologies	**Course Code: 21CSC1S1TP**
Teaching Hours/Week (L-T-P): 0 - 1 - 2	**No. of Credits:** 02
Internal Assessment: 20 Marks	**Semester End Examination:** 30 Marks

Course Objectives:

1. Understand the concepts of web design.
2. Understand the concepts of list and tables.
3. Using HTML, CSS in developing the website applications.

UNIT I **09 Hrs**

Introduction to WWW: Protocols and programs, secure connections, application and development tools, the web browser, What is server, choices, setting up UNIX and Linux web servers, 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 II **09 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 III **08 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”, Dremtech 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.
2	Analyze a web page and identify its elements and attributes.
3	Apply the knowledge of HTML, CSS in developing the website applications.
4	Build dynamic web pages using JavaScript (Client side programming).