VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY
JNANASAGARA CAMPUS, BALLARI-583105

Department of Studies in

Computer Science

SYLLABUS

Master of Science
in
Computer Science
(I-II Semester)

With effect from the Academic Year
2024-25

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	24CSC1C1L	Data Structures	30	70	100	4	-	-	4	3
	DSC2	24CSC1C2L	Object Oriented Programming using Java	30	70	100	4	-	-	4	3
	DSC3	24CSC1C3L	Computer Networks	30	70	100	4	-	-	4	3
	DSC4	24CSC1C4L	Discrete Mathematical Structures	30	70	100	4	-	-	4	3
	SEC1	24CSC1S1LP	Web Stack Technologies	20	30	50	-	1	2	2	1
	DSC1P	24CSC1C1P	Data Structures Lab	20	30	50	-	-	4	2	4
	DSC2P	24CSC1C2P	Object Oriented Programming using Java Lab	20	30	50	-	-	4	2	4
	DSC3P	24CSC1C3P	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	24CSC2C5L	Relational Database Management Systems	30	70	100	4	-	-	4	3
	DSC6	24CSC2C6L	Python Programming	30	70	100	4	-	-	4	3
	DSC7	24CSC2C7L	Data Analytics	30	70	100	4	-	-	4	3
	DSC8	24CSC2C8L	Software Engineering	30	70	100	4	-	-	4	3
	SEC2	24CSC2S2LP	PHP Programming	20	30	50	-	1	2	2	2
	DSC5P	24CSC2C5P	Relational Database Management Systems Lab	20	30	50	-	-	4	2	4
	DSC6P	24CSC2C6P	Python Programming Lab	20	30	50	-	-	4	2	4
	DSC7P	24CSC2C7P	Data Analytics Lab	20	30	50	-		4	2	4
Total Marks for II Semester						**600**				**24**	

I Semester

M.Sc. Computer Science First Semester

Course: Data Structures	**Course Code:** 24CSC1C1L
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	**Teaching hours**
Introduction To Data Structure: Data Management concepts, Data types – primitive and non- primitive, Types of Data Structures- Linear & Non Linear Data Structures. Linear Data Structure Array: Representation of arrays, Applications of arrays, sparse matrix and its representation.	13
Unit-II	
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.	13
Unit-III	
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).	13
Unit-IV	
SORTING and SEARCHING Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Sorting on Several Keys, List and Table Sort, Linear Search, Binary Search. Hashing And File Structures : Hashing: The symbol table, Hashing Functions, Collision-Resolution Techniques	13

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 Edition 2018.
3. S. Lipschutz, “Data Structures”, Tata McGraw Hill Education, 1st Edition, 2008.
4. D. Samanta, “Classic Data Structures”, PHI Learning, 2nd Edition,2004.
5. Fundamentals of Computer Algorithms by Horowitz, Sahni, Galgotia Pub. 2001 2nd edition.

6. 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: Object Oriented Programming using Java	**Course Code:** 24CSC1C2L
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	**Teaching hours**
Introduction to Java programming, The Java Virtual Machine, Variables and data types, Bit manipulation Conditional and looping constructs, Arrays, 2D Array, Object-oriented programming with Java Classes and Objects Fields and Methods, Constructors, Overloading methods, Garbage collection, Nested classes.	13
Unit-II	
Inheritance, Overriding methods, Polymorphism. Making methods and classes final, Abstract classes and methods, Interfaces. Exception handling with try-throw-catch-finally constructs	13
Unit-III	
The Exception class Packages, Package access, Documentation comments. The Object class, Cloning objects, The JDK Linked List class, Strings, String builders, String conversions Working with types: Wrapper classes, Enumeration interface.	13
Unit-IV	
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.	13

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 will be 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 neededfor a specific problem.
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:** 24CSC1C3L
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 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.	**13 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.	**13 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. Wide Area Networks: WAN Components – WAN Technologies - WAN Encapsulation	**13 Hours**
UNIT 4	
Routing: Static Routing and Dynamic Routing - Routed Protocols (IP and IPX) - Routing Protocols. 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).	**13 Hours**

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 1	**Teaching Hours**
Sets and Logic: Sets, propositions, conditional propositions and logical equivalence, arguments and rules of inference, quantifiers, nested quantifiers. Proofs: Principles of Mathematical induction, Functions, Relations: relations, operations on relations.	**13 Hours**
UNIT 2	
Properties of relations, equivalence relations, matrices of relations, Partially ordered sets, lattices, finite Boolean algebra, functions on Boolean algebra. Graph Theory: Simple Graph, Multigraph, Weighted Graph, Paths and Circuits	**13 Hours**
UNIT 3	
Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs. Trees: Terminology and characterizations of trees, spanning trees, minimal spanning trees, shortest-path algorithm	**13 Hours**
UNIT 4	
Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory.	**13 Hours**

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.
4. J.P. Tremblay and R. Manohar, Discrete Mathematical structures with applications toComputer Science, 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 Stack Technologies	**Course Code:** 24CSC1S1LP
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 1	**Teaching Hours**
Introduction to Web Concepts: Internet – Client/Server Model, Web browsers, web servers, MIME, URL, HTTP Introduction to HTML & XHTML5 tags, Basic syntax and structure, text markups, images, lists, tables, progress, Media tags-audio and video ,forms, frames.	**08 Hours**
UNIT 2	
Scripting Language: Introduction to scripting Language, Memory concepts, Arithmetic Decision making. Java Script Control Structures, Java Script Functions, Program units in Java Script, Functions, Scope Rules, Recursion Java Script global functions, Java Script Arrays, Date object, DOM	**09 Hours**
UNIT 3	
Introduction to CSS: Inline Styles, Creating Style Sheets with the style element, conflicting Styles, Linking External Style Sheets, Positioning Elements, Backgrounds, Element Dimensions, and the CSS Box Model, User Style Sheets.	**09 Hours**

References:

1. DT Editorial Services HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery) 2nd Edition 2016 Dreamtech Press.
2. Frank Zammetti Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker 1st Edition 2020 APRES
3. Chris Bates Web Programming 3rd Edition 2007 Wiley Publications
4. Kogent Learning Solutions Inc HTML5 Black Book 2nd Edition Dreamtech
5. Chris Northwood The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer 1st edition 2018 Apress Publications
6. Laura Lemay, Rafe Colburn & Jennifer Kyrnin Mastering HTML, CSS & Javascript Web Publishing 1st Edition 2016 BPB Publications

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

CO	Statement
1	Create Small Web Page using different tags of HTML & also using XHTML.
2	Create Dynamic Web Pages using Java Script and CSS.
3	Design websites using appropriate security principles, focusing specifically on the vulnerabilities inherent in common web implementations.

Course: Web Technologies Lab	**Course Code: 24CSC1S1LP**
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. Students will be able to Make own Web page and how to host own web site on internet.
2. Students will also learn about the protocols involved in internet technology.

Practical List:

1. Design a static web portal using HTML5 semantic elements, style using CSS
2. Design a web page to demonstrate, customization of Bootstrap classes using CSS
3. Develop an event countdown timer using HTML5, CSS/Bootstrap and JavaScript
4. Design a JS program to show the stack implementation using Arrays
5. Write a JS program to demonstrate any 4 methods of a. String object b. Date object c. Number Object
6. Write a JS program to illustrate the following concepts considering appropriate scenario a. Different ways of creating objects and nested objects b. Different kinds of DOM events

Course: Data Structure Lab	**Course Code:** 24CSC1C1P
Teaching Hours/Week (L-T-P): 0 - 0 - 4	**No. of Credits:** 02
Internal Assessment: 20 Marks	**Semester End Examination:** 30 Marks

Course Objectives: At the end of this lab session,

1. The student will be able to design and analyze the time and space efficiency of the data structure ·
2. Be capable to identity the appropriate data structure for given problem ·
3. Have practical knowledge on the applications of data structures

Practical List:

1. Program to find factorial of a given number using recursion function.
2. Design, develop and implement a menu driver program in c for the following array operations.
   a) creating array of N integers elements, b) display of array element with suitable headings, c) inserting an element at a given valid position, d) deleting a element at a givenvalid position, e) exit
3. Program to demonstrate use of sequential search.
4. Program to demonstrate use of binary search.
5. Program to search for a student information using rollno as a key.
6. Program to implement singly linked list perform Search, Insert and Delete operation using dynamic memory allocation.
7. Program to implement doubly linked list perform Search, Insert and Delete operation using dynamic memory allocation.
8. Program to implement stack using array implementation.
9. Program to implement stack using linked list, using dynamic memory allocation.
10. Reverse a string using dynamic memory allocation.
11. Program to convert infix to postfix expression using stack, using dynamic memory allocation.
12. Program to evaluation of postfix expression using stack dynamic memory allocation.
13. Program to implement queue to perform enqueue and dequeue operations using dynamic memory allocation.
14. Program to implement queue to perform enqueue and dequeue expression using array operation.
15. Program to implement Double Ended Queue.
16. Program to implement priority queue.
17. Program to implement Tower of Hanoi using recursion.
18. Program to implement Fibonacci series using recursion.
19. Program to implement binary tree traversal.
20. Program to implement Hash Table with open addressing.

Course: Java Programming Lab	**Course Code:** 24CSC1C2P
Teaching Hours/Week (L-T-P): 0 - 0 - 4	**No. of Credits:** 02
Internal Assessment: 20 Marks	**Semester End Examination:** 30 Marks

Course Objectives:

1. To impart hands on experience with java programming
2. To write programs for solving real world problems using java
3. To write multithreaded programs
4. To write programs on applets and servlets.

Practical List:

1. Classes and Objects:

a. Write a program in java with class Rectangle with the data fields width, length, area and color. The length, width, area are of double type and color is string type. The methods are set_length(), set_width(), set_color and find_area(). Create two objects of Rectangle and compare their area and color. If area and color both are same for the objects then display "Matching rectangles" otherwise display "Non matching rectangles".

b. Write a java program to overload constructor and method.

2. Inheritance and Polymorphism:

a. Write a program in java to create player class. Inherit the classes Cricket_player, Football_Player and Hockey_player from Player class.

b. Consider the trunk calls of a telephone exchange. A trunk call can be ordinary, urgent or lightning. The charges depend on the duration and type of the call. Write a program using the concept of polymorphism to calculate the charges.

3. String Operations:

a. Write a Java program to perform String operations.

b. Write a Java program to check whether the given string is Anagram or not.

4. Package and Interface:

a. Write a program to make a package Balance in which has account class with display_balance method in it. Import balance package in another program to access Display_balance method of account class.

b. Create the dynamic stack by implementing the interfaces that defines Push() and Pop() methods.

5. Exception Handling:

a. On a single track two vehicles are running. As vehicles are going on same direction there is no problem. If the vehicles are running in different direction there is a chance of collision. To avoid collision write a java program using Exception handling.

6. Multithreading:

a. Write a program in java to create five java threads with different priorities. Send two

threads of higher priority to sleep state. Check the aliveness of the threads and mark which thread is long lasting.

b. Write a Multi_threaded java program to implement producer-consumer problem.

7. Applets and Event handling:

a. Write a Java Program to create an applet to handle all mouse events.

b. Design an applet which uses Card Layout with 3 Buttons. When the user clicks on any button, the background color must be change.

8. Servlets:

a. Write a Servlet program to accept username, address and display them in a web page by passing parameters.

b. Write a Program to request server information viz Request Method, URL, Protocol and remote address.

Course: Computer Networking Lab	**Course Code:** 24CSC1C3P
Teaching Hours/Week (L-T-P): 0 - 0 - 4	**No. of Credits:** 02
Internal Assessment: 20 Marks	**Semester End Examination:** 30 Marks

Course Objectives:

1. To get practical knowledge of working principles of various communication protocols
2. Analyze structure and formats of TCP/IP layer protocols using network tools

Practical List:

1. Write a program to display IP Address and the name of the computer that you are currently working on.
2. Write a program to print the IP Address of "www.vskub.ac.in" in all IP Address of it.
3. Write a program to print all network interfaces of "local host".
4. Write a program to check if IP Address is IPV4 or IPV6 Address.
5. Write a program to implement the Simple Version of "nslookup" utility.
6. Write a program to display all parts of URL.
7. Write a Program to list all ports hosting a TCP Server in a Specified host..
8. Write a Program to Display Server's data and time details at the client end server.
9. Implement an FTP server using socket programming.
10. Implement a chat server using socket programming.
11. Write a Java program to check whether the given DNS is found in the internet or not.

II Semester

II Semester

VIJAYANAGARA SRI KRISHNADEVARAYA UNIVERSITY

Department of Studies in Computer Science

Jnana Sagara, Ballari - 583105

Distribution of Courses/Papers in Postgraduate Programme II Semester as per Choice Based Credit System (CBCS) Proposed for PG Programs

With Practical

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	24CSC2C5L	Relational Database Management Systems	30	70	100	4	-	-	4	3
	DSC6	24CSC2C6L	Python Programming	30	70	100	4	-	-	4	3
	DSC7	24CSC2C7L	Data Analytics	30	70	100	4	-	-	4	3
	DSC8	24CSC2C8L	Software Engineering	30	70	100	4	-	-	4	3
	SEC2	24CSC2S2LP	PHP Programming	20	30	50	-	1	2	2	1
	DSC5P	24CSC2C5P	Relational Database Management Systems Lab	20	30	50	-	-	4	2	4
	DSC6P	24CSC2C6P	Python Programming Lab	20	30	50	-	-	4	2	4
	DSC7P	24CSC2C7P	Data Analytics Lab	20	30	50	-		4	2	4
Total Marks for II Semester						**600**				**24**	

Dept Name: Dept. of Studies in Computer Science
Semester-II
DSC5: Relational Database Management Systems

Course Title: Relational Database Management Systems	Course code: 24CSC2C5L
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 hrs.
Summative Assessment Marks: 70	

Course Outcomes (CO's):

At the end of the course, students will be able to:

CO	Statement
1	Understand the significance of databases, types of databases, merits and limitations of different DBMS.
2	Explain and apply the concept of normalization for database design
3	Understand and apply concurrency control and transaction processing mechanisms.
4	Learn the characteristics implementation of object oriented and distributed database management systems and their architecture.
5	Understand the design techniques used in RDBMS, extension techniques in RDBMS, standards for OODBMS, products and applications.

Unit	Description	Hours
1	Introduction and data models: Problem with File-based systems. Introduction to Database and Database Management systems, objectives of database management, Overview of DBMS, Database administrator, Database Designers, End users. The three-level architecture, components of DBMS, advantages and disadvantages of DBMS. Data associations, data model classification, Entity-Relationship model. Different types of keys (Primary key, Secondary key, Candidate key, Foreign key and Alternate key).	13
2	The Relational Model: Relational database, relational algebra, relational calculus SQL- Data definition, relational database manipulation using SQL, DDL, DML, DCL, TCL, DQL, views, embedded data manipulation. Relational Database Design: Anomalies in a database, functional dependency.	13
3	Normalization – 1NF, 2NF, 3NF, BCNF and 4NF. Limitations of 4NF and BCNF. Files, indexing and transaction management: File organization and storage, secondary storage devices, RAID technology, operations in file, heap files and sorted files, hashing techniques, B-trees and B+ trees.	13
4	Recovery management and concurrency control: Schedules and recoverability, serializability of schedules concurrency control, locking techniques, time stamp ordering multi version concurrency control, granularity of data items. Database recovery techniques, ARIES recovery algorithm.	13

References:

1. Elmasri and Navathe, Fundamentals of Database Systems, AddisonWesley, 5th edition, 2018.
2. Bipin C Desai, An Introduction to Database Systems, Galgotia Publications, 2012.
3. Silberschatz A, Korth H.F and Sudarshan S, Database System Concepts, Tata McGraw Hill
4. S K Singh, Database Systems-Concepts, Design and Applications, Pearson Education.
5. Date, C. J., An Introduction to Database Systems, Addison-Wesley.

DSC6: Python Programming

Course Title: Python Programming	Course code: 24CSC2C6L
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 hrs.
Summative Assessment Marks: 70	

Course Outcomes (CO's):
At the end of the course, students will be able to:

1. Explain basic principles of Python programming language
2. Implement object oriented concepts
3. Implement database and GUI applications.
4. Explain basic principles of Python programming language

Unit	Description	Hours
1	INTRODUCTION TO PYTHON PROGRAMMING: Python interpreter and interactive mode; values and types variables, expressions, statements, tuple assignment, Order of operations, comments, debugging; modules and functions: function Calls, adding new functions, Definitions and Uses, flow of execution, parameters and arguments, Fruitful functions. 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, immutability, string functions and methods, string module; Lists as arrays.	13
2	LISTS, TUPLES, DICTIONARIES: Lists: Traversing a List, list operations, list slices, list methods, Map, Filter and Reduce, list loop, mutability, aliasing, cloning lists, list parameters; Dictionaries: operations and methods; advanced list processing - list comprehension; Tuples: tuple assignment, tuple as return value.	13
3	FILES, MODULES, PACKAGES: Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages: PANDAS, NUMPY, SCIKIT-LEARN	13
4	CLASSES AND OBJECTS: Introduction, Defining Classes, Creating Objects, Data Abstraction and Hiding through Classes, Class method and self argument, Class Constructor (init() Method), Data Members, Calling a Class Method from another Class Method, Class Methods and Static Methods, Inheritance, Types of Inheritance, Abstract Classes and Interfaces, Operator Overloading, Overriding Methods.	13

References:

1. Allen B. Downey, Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, Shroff/O Reilly Publishers, 2016.
2. Guido van Rossum and Fred L. Drake Jr, An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. John V Guttag, Introduction to Computation and Programming Using Python,

Revised and expanded Edition, MIT Press , 2013.

4. Robert Sedgewick, Kevin Wayne, Robert Dondero, Introduction to Programming in Python: An Inter- disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.

DSC7: Data Analytics

Course Title: Data Analytics	Course code: 24CSC2C7L
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 Hours
Summative Assessment Marks: 70	

Course Outcomes (CO's):

At the end of the course, students will be able to:

1. A brief methodological description and some descriptive statistics of data.
2. Concerning data quality issues.
3. Converting data to different scales or scale types and reducing data dimensionality.
4. Understand the concept of Clustering and Classification techniques.

Unit	Description	Hours
1	**Introductory:** Introduction to Data, Big Data and Data Science, Big Data Architectures, Small Data, What is Data? A Short Taxonomy of Data Analytics, Examples of Data Use, A Project on Data Analytics, KDD Process, CRISP-DM Methodology. Descriptive Statistics: Scale Types, Descriptive Univariate Analysis, Descriptive Bivariate Analysis.	**13 Hours**
2	**Multivariate Analysis:** Multivariate Frequencies, Multivariate Data Visualization, Multivariate Statistics, Infographics and Word Clouds. **Data Quality and Preprocessing:** Data Quality, Missing Values, Redundant Data, Inconsistent Data, Noisy Data, Outliers, Converting to a Different Scale Type, Converting to a Different Scale, Data Transformation, Dimensionality Reduction., Principal Component Analysis.	**13 Hours**
3	**Clustering:** Distance Measures, Clustering Validation, Clustering Techniques, K-means, Centroid and Distance Measures, DBSCAN, Agglomerative Hierarchical Clustering. **Frequent Pattern Mining:** Frequent Itemsets, Apriori, Association Rules, Behind Support and Confidence, Other Types of Pattern.	**13 Hours**
4	**Regression:** Predictive Performance Estimation, Finding the Parameters of the Model, Technique and Model Selection. **Classification:** Binary Classification, Predictive Performance Measures for Classification, Distance-based Learning Algorithms (K-nearesr Neighbor Algorithm), Probabilistic Classification Algorithms (Naïve Bayes Algorithm).	**13 Hours**

References:

1. A General Introduction to Data Analytics, Joao Mendes Moreira, Andre C P L F de Carvallo, Tomas Horvath, Wiley, 2019.
2. Anil Maheshwari, "Data Analytics", 1st Edition, McGraw Hill Education, 2017. ISBN-13: 978-9352604180.
3. Data Analytics: Principles, Tools, and Practices by Dr. Gaurav Aroraa, Chitra Lele, Dr. Munish Jindal.

DSC8: Software Engineering

Course Title: Software Engineering	Course code: 24CSC2C8L
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 hrs.
Summative Assessment Marks: 70	

Course Outcomes (CO's):

At the end of the course, students will be able to:

1. Analyze the process model chosen for the development of software and its merits and demerits
2. Identify the clear, correct and consistent requirements for the project
3. Design suitable data, architecture and user interface that copes with the requirements
4. Estimate the cyclomatic complexity and design the corresponding test cases.
5. Conduct various integration testing approaches and note down pit falls in requirements, design

Unit	Description	Hours
1	THE NATURE OF SOFTWARE: The Nature of Software, The Changing Nature of Software SOFTWARE ENGINEERING: Defining the Discipline, The Software Process, Software Engineering Practice, Software Development Myths. THE SOFTWARE PROCESS STRUCTURE: A Generic Process Model, Defining a Framework Activity, Identifying a Task set, Process Patterns	13
2	AGILE DEVELOPMENT: What is Agility, Agility and the Cost of Change, What is an Agile Process, Extreme Programming, Scrum. UNDERSTANDING REQUIREMENTS: Requirements Engineering, Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Building the Analysis Model, Negotiating Requirements and Validating Requirements.	13
3	REQUIREMENTS MODELING: SCENARIOS and CLASS BASED METHODs: Requirements Analysis, Scenario-Based Modeling, Identifying Analysis Classes, Specifying Attributes, Defining Operations, Class Responsibility-Collaborator Modeling, Association and Dependencies. DESIGN CONCEPTS: Design within the Context of Software Engineering, The Design Process, Design Concepts, The Design Model. USER INTERFACE DESIGN: The Golden Rules, User interface Analysis and Design.	13
4	SOFTWARE TESTING STRATEGIES: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object Oriented Software, Validation Testing, System Testing and The Art of Debugging. TESTING CONVENTIONAL APPLICATIONS: Software Testing Fundamentals, Internal and External Views of Testing, White-Box Testing, Basis Path Testing, Control Structure Testing and Black-Box Testing.	13

References:

1. Roger S Pressman Software Engineering - A Practitioner's Approach, 8th Edition, TMH publication, 2014.
2. Ian Sommerville Software Engineering, Pearson Education limited, 8th Edition 2007.
3. Pankaj Jalote, An Integrated Approach to Software Engineering, Narosa Publications, 3rd Edition 2005.
4. Rajib Mall Fundamentals of Software Engineering, PHI India Publications. 5th Edition, 2018.

SEC 2: PHP Programming

Course Title: PHP Programming	Course code: 24CSC2S2LP
Total Contact Hours: 0 - 1 - 2	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 01 hr.
Summative Assessment Marks: 30	

Course Outcomes (COs):

At the end of the course, students will be able to:

1. Define and understand the basic concepts of PHP.
2. Apply PHP to improve accessibility of a web document.
3. Implement responsive web Sites using PHP by connecting to the My-SQL database

Unit	Description	Hours
1	Introduction to PHP: PHP Intro, PHP Install, PHP Syntax, PHP Variables, PHP Echo / Print, PHP Data Types, PHP Strings, PHP Constants, PHP Operators	08
2	Html Form with PHP: PHP Form Handling, PHP Form Validation, PHP Form Required, PHP Form URL/E-mail, PHP Form Complete. Decisions and Loop: Making Decisions, Doing Repetitive task with looping Mixing Decisions and looping with Html	08
3	PHP If, Else and Elseif, PHP Switch, PHP While Loops, PHP For Loops Database connectivity: Database Operations with PHP, Connecting to My-SQL (or any other database), Selecting a db, Building & Sending Query, Retrieving, Updating	10

References (indicative)

1. The Joy of PHP Programming, Fifth Edition, Alan Forbes, Plum Island
2. Programming the World Wide Web – Robert W. Sebesta, 4th Edition, Pearson Education, 2008.
3. Internet & World Wide Web How to Program – M. Deitel, P.J. Deitel, A. B. Goldberg, 3rd Edition, Pearson Education / PHI, 2004.
4. Web Programming Building Internet Applications – Chris Bates, 3rd Edition, Wiley India, 2006
5. The Web Warrior Guide to Web Programming – Xue Bai et al, Thomson, 2003
6. https://www.tutorialspoint.com/restful/index.html (REST Web Services topics are referred to this link)
7. https://www.w3schools.com/php/php_forms.asp

DSC5P: Relational Database Management Systems Lab

Course Title: Relational Database Management Systems Lab	Course code: 24CSC2C5P
Teaching Hours/Week (L-T-P): 0 - 0 - 4	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 04 hrs.
Summative Assessment Marks: 30	

Course Outcomes (COs):
At the end of the course, students will be able to:

1. Design database schema for a given application and apply normalization
2. Acquire skills in using SQL commands for data definition and data manipulation.
3. Develop solutions for database applications using procedures and triggers.

DBMS Laboratory

A. Consider the following schema for a Library Database:

BOOK (Book_id, Title, Publisher_Name, Pub_Year)
BOOK_AUTHORS (Book_id, Author_Name)
PUBLISHER (Name, Address, Phone)
BOOK_COPIES (Book_id, Branch_id, No-of_Copies)
BOOK_LENDING (Book_id, Branch_id, Card_No, Date_Out, Due_Date)
LIBRARY_BRANCH (Branch_id, Branch_Name, Address)

Write SQL queries to
1. Retrieve details of all books in the library – id, title, name of publisher, authors, number of copies in each branch,etc.

2. Get the particulars of borrowers who have borrowed more than 3 books, but from Jan 2017 to Jun2017

3. Delete a book in BOOK table. Update the contents of other tables to reflect this data Manipulation operation.

4. Partition the BOOK table based on year of publication. Demonstrate its working with a simple query.

5. Create a view of all books and its number of copies that are currently available in the Library.

B. Consider the following schema for Order Database:

SALESMAN (Salesman_id, Name, City, Commission)
CUSTOMER (Customer_id, Cust_Name, City, Grade, Salesman_id)
ORDERS (Ord_No, Purchase_Amt, Ord_Date, Customer_id, Salesman_id)

Write SQL queries to
1. Count the customers with grades above Bangalore's average.

2. Find the name and numbers of all salesmen who had more than one customer.

3. List all salesmen and indicate those who have and don't have customers in their cities (Use UNION operation.)

4. Create a view that finds the salesman who has the customer with the highest order of a day.

5. Demonstrate the DELETE operation by removing salesman with id 1000. All his orders must also be deleted.

C. Consider the schema for Movie Database:

ACTOR (Act_id, Act_Name, Act_Gender)
DIRECTOR (Dir_id, Dir_Name, Dir_Phone)
MOVIES (Mov_id, Mov_Title, Mov_Year, Mov_Lang, Dir_id)
MOVIE_CAST (Act_id, Mov_id, Role)
RATING (Mov_id, Rev_Stars)

Write SQL queries to
1. List the titles of all movies directed by 'Hitchcock'.

2. Find the movie names where one or more actors acted in two or mor emovies.

3. List all actors who acted in a movie before 2000 and also in a movie after 2015 (use JOIN operation).

4. Find the title of movies and number of stars for each movie that has at least one rating and find the highest number of stars that movie received. Sort the result by movie title.

5. Update rating of all movies directed by 'Steven Spielberg' to 5.

D. Consider the schema for College Database:

STUDENT (USN, SName, Address, Phone, Gender)
SEMSEC (SSID, Sem, Sec)
CLASS (USN, SSID)
SUBJECT (Subcode, Title, Sem, Credits)
IAMARKS (USN, Subcode, SSID, Test1, Test2, Test3, FinalIA)

Write SQL queries to
1. List all the student details studying in fourth semester 'C' section.

2. Compute the total number of male and female students in each semester and in each section.

3. Create a view of Test1 marks of student USN '1BI15CS101' in all subjects.

4. Calculate the FinalIA (average of best two test marks) and update the corresponding table for all students.

5. Categorize students based on the following criterion: If

Final IA = 17 to 20 then CAT ='Outstanding'

If Final IA = 12 to 16 then CAT = ‘Average’ If

Final IA< 12 then CAT = ‘Weak’

Give these details only for 8th semester A, B, and C section students.

E. Consider the schema for Company Database:

EMPLOYEE (SSN, Name, Address, Sex, Salary, SuperSSN, DNo)
DEPARTMENT (DNo, DName, MgrSSN, MgrStartDate)
DLOCATION (DNo,DLoc)
PROJECT (PNo, PName, PLocation, DNo)
WORKS_ON (SSN, PNo, Hours)

Write SQL queries to
1. Make a list of all project numbers for projects that involve an employee whose last name is ‘Scott’, either as a worker or as a manager of the department that controls the project.

2. Show the resulting salaries if every employee working on the ‘IoT’ project is given a 10 percent raise.

3. Find the sum of the salaries of all employees of the ‘Accounts’ department, as well as the maximum salary, the minimum salary, and the average salary in this department

4. Retrieve the name of each employee who works on all the projects controlled by department number 5 (use NOT EXISTS operator).

5. For each department that has more than five employees, retrieve the department number and the number of its employees who are making more than Rs. 6,00,000.

DSC6P: Python Programming Lab

Course Title: Python Programming Lab	Course code: 24CSC2C6P
Teaching Hours/Week (L-T-P): 0 - 0 - 4	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 04 hrs.
Summative Assessment Marks: 30	

Course Outcomes (COs):
At the end of the course, students will be able to:

1. To write, test, and debug simple Python programs.
2. To implement Python programs with conditionals and loops.
3. Use functions for structuring Python programs.
4. Represent compound data using Python lists, tuples, dictionaries

Python Laboratory

1. Compute the GCD of two numbers.
2. Find the square root of a number.
3. Exponentiation (power of a number).
4. Find the maximum of a list of numbers.
5. Linear search and Binary search.
6. Selection sort, Insertion sort.
7. Program to create, slice, change, delete and index elements using Tuple.
8. Find first n prime numbers.
9. Program to create, slice, change, add, delete and index elements using list.
10. Program that take command line arguments (word count).
11. Write a program to reverse the string.
12. Program to change, delete, add and remove elements in Dictionary.
13. Find the most frequent words in a text read from a file.
14. Simulate elliptical orbits in Pygame.
15. Simulate bouncing ball using Pygame.

DSC7P: Data Analytics Lab

Course Title: Data Analytics Lab	Course code: 24CSC2C7P
Teaching Hours/Week (L-T-P): 0 - 0 - 4	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 04 hrs.
Summative Assessment Marks: 30	

Course Outcomes (COs):
At the end of the course, students will be able to:

1. Demonstrate proficiency in creating and manipulating data structures using pandas, including DataFrames created from dictionaries and lists.
2. Ability to visualize data effectively using libraries such as Matplotlib and Seaborn
3. Create various types of plots, including histograms, pie charts, scatter plots, and count plots, to interpret and present data insights clearly.
4. Understand importing, cleaning, and preprocessing real-world datasets (e.g., CSV files)
5. Students will learn to compute and interpret key statistical metrics.

1.	Do the following analysis by creating dataframe using pandas. a. Create a dataframe using the dictionary data Structure. b. Calculate the statistics of the dataset created. c. Create another dataframe using the list method. d. Calculate the max, min, average of the price column.
2.	Do the following analysis by creating a dataframe using pandas. a. Create a dataset with columns 'Contact','Max temp (∘C)','Weight (kg)','Height (cm)','Gender','Company' with 10 rows b. Calculate absolute frequency for the given dataset c. Calculate relative frequency for the column in given dataset d. Draw histogram for the gender column e. Draw pie chart for the gender column
3.	Do The Following Analysis on The DataSet(“Lab1.csv”) a. Import The DataSet b. Display The Properties Of The DataSet c. Find The Max,Min,Medium Values For Particular Column d. Draw a Histogram For The Particular Column
4.	Do the following analysis on (“lab2.csv”) a. Import dataset " lab2.csv " into Jupyter notebook b. Print the data with the null values c. Replace null values with NaN d. Find the max, min, median values for particular Column. f. Draw the scatter plot for total_sqft and price
5.	Do the following analysis on (“lab3.csv”) a. Import the dataset b. Describe the strategy of the dataset c. Display the information about dataset d. Draw a Scatter graph between petal length and petal width e. Draw histogram for sepal length
6.	Do The Following Analysis on The DataSet (Lab4.CSV) a. Load the dataset b. Display the information of datasets

	c. Drop the columns id, description d. Sort the dataset according to imdb_score e. Delete the NAN values from dataset f. Draw a scatter plot for the movies and its release year
7.	Do the following Analysis on the DataSet("Lab5.csv") a. Import the dataset b. Display the column names of the dataset c. Sort the dataset according to gender d. Display the statistics of the dataset e. Draw the histogram for male or female having anxiety
8.	Do the following Analysis on the DataSet("Lab6.csv") a. Import the dataset b. Change the names of the Dataset Columns c. Describe the data in dataset d. Calculate the max, min, average BMI from the given dataset e. Draw a distribution plot for cfunction
9.	Do the following Analysis on the DataSet("Lab7.csv") a .Import the dataset into the jupyter notebook b. Drop the column named '0' from the dataset c. Replace the values from results column (0 as 'fail' and 1 as 'pass') d. Count the total students which are passed e. Draw a Distribution graph for the Total Column
10.	Do the following analysis on the ("lab10.csv") a. Import the dataset b. Create a histogram using seaborn for total_bill column c. Create a countplot for the sex column d. Draw a catplot for the day and the total_bill columns e. Draw a scatter plot for the tip vs total_bill

SEC2: PHP Programming

Course Title: PHP Programming	Course code: 24CSC2S2LP
Teaching Hours/Week (L-T-P): 0 - 0 - 2	Course Credits: 02
Formative Assessment Marks: 20	Duration of ESA/Exam: 01 hrs.
Summative Assessment Marks: 30	

Course Outcomes (COs):
At the end of the course, students will be able to:

1. Design and develop dynamic web pages with good aesthetic sense of designing.
2. Understand the concepts of Web Application Terminologies, Internet Tools other Web services.
3. Design and develop pages using the JavaScript, XML, CSS, PHP.

PHP Programming Laboratory

1. Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
2. Write a PHP program to display a digital clock which displays the current time of the server.
3. Write the PHP programs to do the following:
   a) Implement simple calculator operations.
   b) Find the transpose of a matrix.
   c) Multiplication of two matrices.
   d) Addition of two matrices.
4. Write a PHP program to sort the student records which are stored in the database using selection sort.

CBCS Question Paper Pattern for PG Semester End Examination with Effect from the AY 2024-25

Disciplines Specific Core (DSC) and Discipline Specific Elective (DSE)

Paper Code: **Paper Title:**
Time: 3 Hours **Max. Marks: 70**

Part A:
Answer any ten questions. Each question carries 2 marks. **2x10=20**

1. a)
b)
c)
d)
e)
f)
g)
h)
i)
j)
k)
l)

Part B:
Answer any five of the following questions. **10x5=50**

2.
3.
4.
5.
6.
7.
8.

Note: Question No. 2 to 5, *one question from each unit* i.e. (Unit I, Unit II, ….). The Questions may be a whole or it may consists of sub questions such as a,b, c etc…

Q6. 10Marks
Note: Question No.6, *shall be from Unit I and II,* the Question may be a whole or it may consists of sub questions such as a,b, c etc…

Q7. 10 Marks
Note: Question No.7*, shall be from Unit III and IV*, the Question may be a whole or it may consists of sub questions such as a,b, c etc…

Q8. 10 Marks
Note: Question No-8 shall be from *any of the unit*, the Question may be a whole or it may consists of sub questions such as a,b, c etc…

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Skill Enhancement Courses (SECs)

Paper Code: **Paper Title:**

Time: 1 Hours **Max. Marks: 30**

There shall be Theory examinations of Multiple Choice Based Questions [MCQs] with Question Paper set of A, B, C and D Series at the end of each semester for SECs for the duration of One hour (First Fifteen Minutes for the Preparation of OMR and remaining Forty-Five Minutes for Answering thirty Questions). The Answer Paper is of OMR (Optical Mark Reader) Sheet.

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