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 the Academic Year

2024-25

Department of Studies in Computer Science

Programme: Master of Computer Applications (MCA)

Duration: 2 Years (4 semesters)

Programme Overview:

Master of Computer Applications (MCA) 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.

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	24MCA1C1L	Data Structures	30	70	100	4	-	-	4	3
	DSC2	24MCA1C2L	Object Oriented Programming using JAVA	30	70	100	4	-	-	4	3
	DSC3	24MCA1C3L	Computer Networks	30	70	100	4	-	-	4	3
	DSC4	24MCA1C4L	Mathematics for Computer Applications	30	70	100	4	-	-	4	3
	SEC1	24MCA1S1LP	Web Stack Technologies	20	30	50	1	-	2	2	1
	DSC1P	24MCA1C1P	Data Structure with Algorithms Lab	20	30	50	-	-	4	2	4
	DSC2P	24MCA1C2P	Object Oriented Programming using JAVA Lab	20	30	50	-	-	4	2	4
	DSC3P	24MCA1C3P	Computer Networks lab	20	30	50	-	-	4	2	4
Total Marks for I Semester						**600**				**24**	

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	24MCA2C5L	Relational Database Management Systems	30	70	100	4	-	-	4	3
	DSC6	24MCA2C6L	Data Mining	30	70	100	4	-	-	4	3
	DSC7	24MCA2C7L	C# & ASP.Net	30	70	100	4	-	-	4	3
	DSC8	24MCA2C8L	Software Engineering	30	70	100	4	-	-	4	3
	SEC2	24MCA2S2LP	PHP Programming	20	30	50	1	-	2	2	1
	DSC5P	24MCA2C5P	Relational Database Management Systems Lab	20	30	50	-	-	4	2	4
	DSC6P	24MCA2C6P	Data Mining Lab	20	30	50	-	-	4	2	4
	DSC7P	24MCA2C7P	C# & ASP.Net Lab	20	30	50	-		4	2	4
Total Marks for II Semester						**600**				**24**	

I Semester

Course: Data Structures	Course Code: 24MCA1C1L
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. Sorenson Publisher-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 Learning 2014 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: 24MCA1C2L
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, Conditional and looping constructs, Arrays. 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 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, McGraw Hill Education.
2. P.J. Deitel and H.M. Deitel, Java for Programmers, 9th edition, Pearson education
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: 24MCA2C3L
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: Mathematics for Computer Applications	Course Code: 24MCA1C4L
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. Understand the concepts of Probability Distribution
4. Solve Different Graph Problems

	Teaching Hours
UNIT 1	
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. **Mathematical Logic:** Propositional Logic, Applications of Propositional Logic	**13 Hours**
UNIT 2	
Propositional Equivalences Predicates and Quantifiers, Nested Quantifiers, Rules of Inference Introduction to Proofs. **Recurrence Relations:** Generating Functions of Sequences, Calculating Coefficients of Generating Functions, Recurrence Relations, Solving Recurrence Relations by Substitution and Generating Functions	**13 Hours**
UNIT 3	
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	**13 Hours**
UN IT 4	
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	**13 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.

Course: Web Stack Technologies	Course Code: 24MCA1S1LP
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 Stack Technologies Lab	Course Code: 24MCA1S1LP
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 Structures Lab	Course Code: 24MCA1C1P
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 datastructure ·
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 usingdynamic memory allocation.
7. Program to implement doubly linked list perform Search, Insert and Delete operation usingdynamic 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 dynamicmemory 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: Object Oriented Programming using JAVA Lab	**Course Code:** 24MCA1C2P
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 markwhich 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 anybutton, the background color must be change.

8. **Servlets**:

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

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

Course: Computer Networking Lab	Course Code: 24MCA1C3P
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

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	24MCA2C5L	Relational Database Management Systems	30	70	100	4	-	-	4	3
	DSC6	24MCA2C6L	Data Mining	30	70	100	4	-	-	4	3
	DSC7	24MCA2C7L	C# & ASP.Net	30	70	100	4	-	-	4	3
	DSC8	24MCA2C8L	Software Engineering	30	70	100	4	-	-	4	3
	SEC2	24MCA2S2LP	PHP Programming	20	30	50	1	-	2	2	1
	DSC5P	24MCA2C5P	Relational Database Management Systems Lab	20	30	50	-	-	4	2	4
	DSC6P	24MCA2C6P	Data Mining Lab	20	30	50	-	-	4	2	4
	DSC7P	24MCA2C7P	C# & ASP.Net Lab	20	30	50	-		4	2	4
Total Marks for II Semester						**600**				**24**	

Course Title: Relational Database Management Systems	Course Code: 24MCA2C5L
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 based, 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

Course Title: Data Mining	Course Code: 24MCA2C5L
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 hrs.
Summative Assessment Marks: 70	

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.

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, Data Preprocessing: Summarization - Data cleaning	**13 Hours**
UNIT 2	
Data Integration and Transformation - Data Reduction - Discretization and Concept Hierarchy Generation, Mining Frequent Patterns – Frequent Item set Mining Methods. Classification: Classification by Decision Tree Induction – Bayesian Classification	**13 Hours**
UNIT 3	
Rule based Classification - Prediction– Accuracy and Error Measures, 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	**13 Hours**
UN IT 4	
Data Warehousing: OLTP Vs OLAP - Multidimensional Data Model -DW Architecture Efficient Processing of OLAP queries - Metadata repository – DWH Implementation – OLAM	**13 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 Title: C# & ASP.Net	Course Code: 24MCA2C7L
Total Contact Hours: 52	Course Credits: 04
Formative Assessment Marks: 30	Duration of ESA/Exam: 03 hrs.
Summative Assessment Marks: 70	

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

CO	Statement
1	Able to explain how C# fits into the .NET platform.
2	Describe the utilization of variables and constants of C#
3	Use the implementation of object-oriented aspects in applications.
4	Analyze and Set up Environment of .NET Core.
5	Evaluate and create a simple project application.

UNIT 1	Teaching Hours
Introduction to C#: Understanding C#, .NET, overview of C#, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, implicit and explicit casting. Constants, Arrays, Array Class, Array List, String, String Builder, Structure, Enumerations, boxing and unboxing.	13 Hours
UNIT 2	
Object Oriented Concepts-I: Class, Objects, Constructors and its types, inheritance, properties, indexers, index overloading, polymorphism.	13 Hours
UNIT 3	
Object Oriented Concepts-II: Sealed class and methods, interface, abstract class, abstract and interface, operator overloading, delegates, events, errors and exception, Threading.	13 Hours
UN IT 4	
Introduction to .NET FRAMEWORK: Assemblies, Versoning, Attributes, reflection, viewing meta data, remoting, security in .NET, Environment Setup of .NET Core and create a small project. Teaching-Learning Process Active learning	13 Hours

Course Title: Software Engineering	Course code: 24MCA2C7L
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.

Course Title: PHP Programming	Course Code: 24MCA2S2LP
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

Course Title: PHP Programming	**Course Code:** 24MCA2S2LP
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.

Course Title: Relational Database Management Systems Lab	Course code: 24MCA2C5P
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.

Course Title: Data Mining Lab	Course Code: 24MCA2C6P
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. Implement various machine learning algorithms, including FIND-S, Candidate-Elimination, k-Means, and EM.
2. Demonstrate the ability to preprocess and analyze datasets, including reading from CSV files and discretization techniques.
3. Evaluate machine learning models using performance metrics such as confusion matrices, entropy, and Gini index.
4. Understand different clustering algorithms, enhancing their understanding of data structures.
5. Apply Bayesian networks for medical diagnosis, applying theoretical concepts to real-world healthcare data.

1. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file.

2. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.

3. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program .

4. Analyze discretization by considering data as ages and find the bin values.

5. Write a machine learning program to print a confusion matrix.

6. Write a program to implement Bayes classifier by considering input as fruit and calculate the entropy and gini.

7. Write a program to implement k-Nearest Neighbor algorithm to classify the iris data set. Print correct predictions. Java/Python ML library classes can be used for this problem.

8. Implement the non-parametric Locally Weighted Regression algorithm to fit data points.

9. Write a program to implement Multiple Regression algorithm to print correct predictions. Python ML library classes can be used for this problem.

10. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.

Course Title: C# & ASP.Net Lab	Course Code: 24MCA2C7P
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:

- Demonstrate the knowledge of .NET Framework and the fundamentals of developing modular application by using C# programming.
- Design and Develop Solutions for real time problems using object oriented principles.
- Analyse and evaluate user requirements for software functionality and create new applications.
- Demonstrate Component Services and develop Windows based application.
- Implement interactive executable web applications using Network Programming and Remoting.
- Create database driven applications using ADO.NET.
- Design and Develop client /server side model and mobile application using ASP.NET 8. Apply .NET progamming in industry based application.

1. Develop a C# program to simulate simple arithmetic calculator for Addition, Subtraction, Multiplication, Division and Mod operations. Read the operator and operands through console.

2. Develop a C# program to print Armstrong Number between 1 to 1000.

3. Develop a C# program to list all substrings in a given string. [Hint: use of Substring() method]

4. Develop a C# program to demonstrate Division by Zero and Index Out of Range exceptions.

5. Develop a C# program to generate and printPascal Triangle using Two Dimensional arrays.

6. Develop a C# program to generate and print Floyds Triangle using Jagged arrays.

7. Develop a C# program to read a text file and copy the file contents to another text file.

8. Develop a C# C# Program to Implement Stack with Push and Pop Operations [Hint: Use class, get/set properties, methods for push and pop and main method

9. Design a class "Complex" with data members, constructor and method for overloading a binary operator '+'.

10. Develop a C# program to read Two complex number and Print the results of addition.

11. Develop a C# program to create a class named shape. Create three sub classes namely: circle, triangle and square, each class has two member functions named draw () and erase ().

12. Demonstrate polymorphism concepts by developing suitable methods, defining member data and main program.

13. Develop a C# program to create an abstract class Shape with abstract methods calculateArea() and calculatePerimeter(). Create subclasses Circle and Triangle that extend the Shape class and implement the respective methods to calculate the area and perimeter of each shape.

14. Develop a C# program to create an interface Resizable with methods resizeWidth(int width) and resizeHeight(int height) that allow an object to be resized. Create a class Rectangle that implements the Resizable interface and implements the resize methods

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 all 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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