Post Graduate Department of Computer Sciences, The University of Kashmir, Srinagar-190006

Proposed Scheme & Syllabus of MCA Programme

Eligibilty for 2- year MCA Programme

Passed BCA/B.Sc./B.E/B.Tech/B. Com/B. A/B.Voc. etc. with at least 50% marks in case of general category and 45% marks in case of reserved category shall be eligible to apply for admission to the MCA programme.

Provided that the candidates with no mathematical background at UG / +2 shall be required to pass the compulsory bridge course/s in Mathematics and Computer related subjects.

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PROGRAM EDUCATIONAL OBJECTIVES

PEO1: To prepare students to get employment, profession and/or to pursue post-graduation and research in Computer Applications discipline in particular and allied Computer Science fields in general.

PEO2: To prepare students to identify and analyze problems in the computing perspective an develop computer applications solutions using an iterative approach that involves defining, designing, quantifying, implementing, testing, deploying and review of the solution to the problem..

PEO3: To prepare students to plan, organize, schedule, execute and communicate effectively as an individual, a team member or a leader in problem solving environment.

PEO4: To provide to students, an academic environment that makes them aware of excellence in field of Computer Sciences in general and enables them to understand significance of lifelong learning in global perspective.

PROGRAM OUTCOMES (POs)

Computer Applications Masters will be able to:

1. Computing knowledge: Apply the knowledge of computing, mathematics and engineering fundamentals to the solution of complex software engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex computing problems reaching substantiated conclusions using first principles of computing, analytics, algorithms and software engineering sciences.

3. Design/development of solutions: Design computer application solution for complex computing problems and design software or processes that meet the specified needs with appropriate consideration for the public ethics, health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern software engineering and development tools including prediction and modeling to complex computing activities with an understanding of the limitations.

6. The software engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, ethical, legal and cultural issues and the consequent responsibilities relevant to the professional software development practice.

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7. Environment and sustainability: Understand the impact of the professional software engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the software engineering practice with most important stress on privacy.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex problem solving activities with the software engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the software 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.

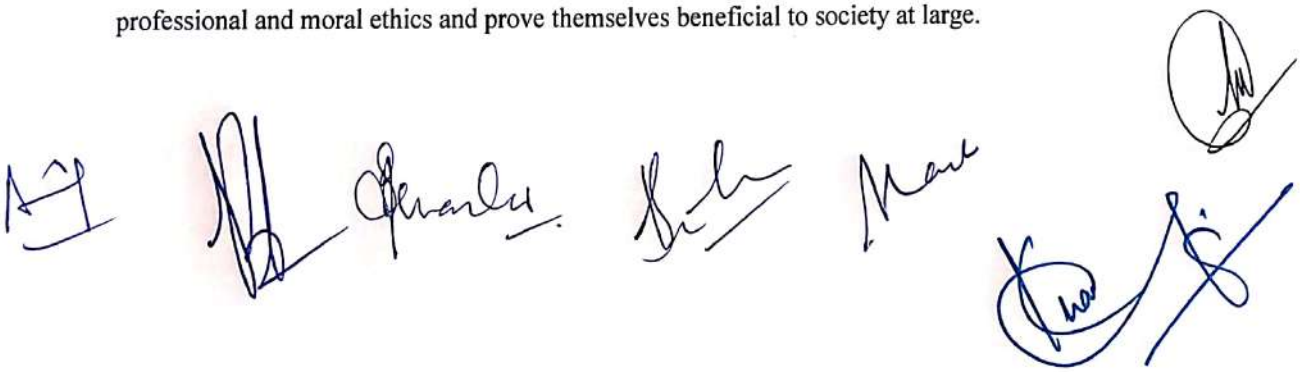
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes:

1. Masters should be creative, imaginative and proficient software engineers employable to serve in the industry, government and allied services.

2. Masters should be able to advance in academic and research pursuits in computing and allied disciplines.

3. Masters should take a lead in innovation and entrepreneurship activities with high standards of professional and moral ethics and prove themselves beneficial to society at large.



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SEMESTER I

Subject Code	Subject Name	Subject Category	Hours/Week			Credit Units
			L	T	P	
Core Courses (16 Credit Units)						
MCA24101CR	Programming with C++	Core	4	0	4	6
MCA24102CR	Database Systems	Core	4	0	4	6
MCA24103CR	Discrete Mathematics	Core	4	0	0	4
Discipline Centric Electives (8 Credit Units)						
MCA24104DCE	Computer Networks	DCE	4	0	0	4
MCA24105DCE	Computer Graphics	DCE	4	0	0	4
MCA24106DCE	Management Information System	DCE	4	0	0	4
MCA24107DCE	Software Engineering	DCE	4	0	0	4
MCA24108DCE	Artificial Intelligence	DCE	4	0	0	4
MCA24109DCE	Block Chain Technologies	DCE	4	0	0	4
MCA24110DCE	Computer Architecture & ALP	DCE	4	0	0	4
OE/GE (2 Credit Units) For Students of Other Departments						
MCA24001OE	Digital and Technological Solutions	OE	2	0	0	2
MCA24001GE	Data Processing using Spreadsheets	GE	2	0	0	2
Bridge Courses						
MCA24001BC	Foundational Mathematics	BC	2	0	0	0
MCA24002BC	Problem Solving Techniques	BC	2	0	0	0

SEMESTER II

Subject Code	Subject Name	Subject Category	Hours/Week			Credit Units
			L	T	P	
Core Courses (16 Credit Units)						
MCA24201CR	Data Structures Using C++	Core	4	0	4	6
MCA24202CR	Data Science with Python	Core	4	0	4	6
MCA24203CR	Operating Systems	Core	4	0	0	4
Discipline Centric Electives (8 Credit Units)						
MCA24204DCE	Cryptography and Network Security	DCE	4	0	0	4
MCA24205DCE	Digital Image Processing	DCE	4	0	0	4
MCA24206DCE	Decision Support Systems	DCE	4	0	0	4
MCA24207DCE	Software Project Management	DCE	4	0	0	4
MCA24208DCE	Machine Learning	DCE	4	0	0	4
MCA24209DCE	Cloud Computing	DCE	4	0	0	4
MCA24210DCE	Linux Programming	DCE	4	0	0	4
MCA24211DCE	Theory of Computation					
OE/GE (2 Credit Units) For Students of Other Departments						
MCA24002OE	Python Programming	OE	2	0	0	2
MCA24002GE	Problem Solving with C	GE	2	0	0	2

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SEMESTER III						
Subject Code	Subject Name	Subject Category	Hours/Week			Credit Units
			L	T	P	
Core Courses (16 Credit Units)						
MCA24301CR	Java Programming	Core	4	0	4	6
MCA24302CR	Web Programming	Core	4	0	4	6
MCA24303CR	Design and Analysis of Algorithms	Core	4	0	0	4
Discipline Centric Electives (8 Credit Units)						
MCA24304DCE	Ethical Hacking	DCE	4	0	0	4
MCA24305DCE	Computer Vision	DCE	4	0	0	4
MCA24306DCE	Enterprise Resource Planning	DCE	4	0	0	4
MCA24307DCE	Software Quality Assurance	DCE	4	0	0	4
MCA24308DCE	Deep Learning	DCE	4	0	0	4
MCA24309DCE	Internet of Things (IoT)	DCE	4	0	0	4
MCA24310DCE	Cyber Security and Digital Forensics	DCE	4	0	0	4
OE/GE (2 Credit Units) For Students of Other Departments						
MCA24003OE	Web Development	OE	2	0	0	2
MCA24003GE	Data Analytics	GE	2	0	0	2

SEMESTER IV						
Subject Code	Subject Name	Subject Category	Hours/Week			Credit Units
			L	T	P	
Core Courses (16 Credit Units)						
MCA24401CR	Project: Problem Identification & Analysis	Core	0	8	0	8
MCA24402CR	Project: Dissertation	Core	0	8	0	8
Discipline Centric Electives (8 Credit Units)						
MCA24403DCE	Project: Software Development	DCE	0	8	0	8
MCA24404DCE	Project: Research Component	DCE	0	8	0	8
OE/GE (2 Credit Units) For Students of Other Departments						
MCA24004OE	Latex	OE	2	0	0	2
MCA24004GE	AI Tools	GE	2	0	0	2

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Semester I

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COURSE TITLE: Programming with C++								
Course Code: MCA24101CR						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: 56						External	80	40
						Internal	20	10
Lecture (L):	4	Practical (P):	2	Tutorial (T):	-	Total Credits		6

Course Objectives

- To introduce students to the basic data types, variables, constants, and literals in C programming and to teach them how to use arithmetic, relational, logical, and bitwise operators.
- To teach students the various control structures, such as if-else, switch statements, and loops (while, do-while, for), and how to effectively use them to control the flow of a program.
- To enable students to understand and work with one-dimensional, two-dimensional, and multi-dimensional arrays, and to manipulate strings and character arrays using standard library functions.
- To develop students' ability to write functions, including prototypes and parameter passing, and to understand storage classes and identifier visibility. To teach recursive functions and their applications.
- To introduce students to advanced topics such as command-line arguments, file processing, structures and unions, and pointers. To explain the scope, lifetime, and multi-file programming.
- To provide a foundation in object-oriented programming with a focus on classes and objects, access specifiers, constructors, destructors, inheritance, polymorphism, and templates in C++. To introduce the concepts of abstraction, encapsulation, and exception handling.

Course Content	TEACHING HOURS
Unit I: Fundamentals of C Programming	**-14 Hrs**
Data Types, Identifiers, Variables Constants and Literals. Arithmetic Relational Logical and Bitwise. Basic input/output statements, Control structures: if-else statement, Nested if statement, Switch statement Loops: while loop, do while, for loop, Nested loops. Arrays: Declaration; initialization; 2-dimensional and 3-dimensional array, passing array to function, Strings and String functions, and character arrays. Functions; prototype, passing parameters, storage classes, identifier visibility, Recursive functions	
Unit II: Advanced C Programming Techniques	**-14 Hrs**
Command-line arguments. Variable scope, lifetime. Multi-file programming, Introduction to macros. File processing in C. Structures and unions: syntax and use, members, structures as function arguments passing structures and their arrays as arguments Pointers: variables, pointers and arrays, pointers to pointers, strings, pointer arithmetic, portability issues, pointers to functions, void pointers, pointer to structure. Introduction to object oriented programming, Abstraction, Encapsulation	
Unit III: Introduction to Object-Oriented Programming in C++	**-14 Hrs**
Introduction to classes and objects; Access specifiers, Constructor; destructor; Function overloading; Operator overloading; friend functions; Use of call-by-reference for efficiency. Copy constructor. Inheritance: Single, Multiple, and Multilevel Inheritance ,Virtual functions and Polymorphism/Dynamic binding vs Static binding; Virtual Destructors.	
Unit IV: Advanced Object-Oriented Programming Concepts	**- 14Hrs**

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Pure virtual function; concrete implementation of virtual functions, Templates: Function Templates, Class Templates, Member Function Template and Template Arguments, namespaces, Exception Handling Concepts, Input and Output: Streams classes, Stream Errors, Disk File I/O with streams.

Textbooks

1. Herbert Schildt , "C++ The complete Reference", 4th Edition, 2017

Reference Books

1. Brian W. Kernighan / Dennis Ritchie, "The C Programming Language", 2nd Edition, 2015
2. Bjarne Stroustrup, "The C++ programming language", 4th Edition, 2022
3. E.Balagurusamy , "Object Oriented Programming with C++" 8th Edition, 2020
4. Reema Thareja, "Programming in C 3e", 3rd edition, 2023
5. E. Balaguruswamy, "Programming in ANSI C", 7th Edition, 2017
6. S.K.Srivastava/Deepali Srivastava, "C In Depth", 2009

Lab Manual: Programming with C++

Week 1

- Write a program to demonstrate the use of Output statements that draws any object of your choice e.g. Christmas Tree using '*'
- Write a program that reads in a month number and outputs the month name.
- Write a program that demonstrate the use of various input statements like getchar(), getch(), scanf().
- Write a program to demonstrate the overflow and underflow of various datatype and their resolution?

Week 2

- Write a program to demonstrate the precedence of various operators.
- Write a program to generate a sequence of numbers in both ascending and descending order.
- Write a program to generate pascals triangle.
- Write a program to reverse the digits of a given number. For example, the number 9876 should be returned as 6789.

Week 3

- Write a program to convert an amount (upto billion) in figures to equivalent amount in words.
- Write a program to find sum of all prime numbers between 100 and 500.
- Create a one dimensional array of characters and store a string inside it by reading from standard input.
- Write a program to input 20 arbitrary numbers in one-dimensional array. Calculate Frequency of each number. Print the number and its frequency in a tabular form.

Week 4

- Write a C function to remove duplicates from an ordered array. For example, if input array contains 10,10,10,30,40,40,50,80,80,100 then output should be 10,30,40,50,80,100.
- Write a program which will arrange the positive and negative numbers in a one-dimensional array in such a way that all positive numbers should come first and then all the negative numbers will come without changing original sequence of the numbers. Example: Original array contains: 10-15,1,3,-2,0,- 2,-3,2,-9 Modified array: 10,1,3,0,2-15,-2,-2,-3,-9

- Write a program to compute addition multiplication and transpose of a 2-D array.
- Implement a program ,which uses multiple files for holding multiple functions which are compiled separately, linked together and called by main(). Use static and extern variables in these files.

Week 5

- Implement a function which receiver a pointer to a Student struct and sets the values of its fields.
- Write a program which takes five arguments on command line, opens a file and writes one argument per line in that file and closes the file.
- Write a program which creates Student (struct) objects using malloc and stores their pointers in an array. It must free the objects after printing their contents.
- Write a function char* stuff(char* s1,char* s2,int sp, intrp) to stuff string s2 in string s1 at position sp, replacing rp number of characters (rp may be zero).

Week 6

- Write a program to input name, address and telephone number of 'n' persons (n<=20). Sort according to the name as a primary key and address as the secondary key. Print the sorted telephone directory.
- Write a program to find the number of occurrences of a word in a sentence?
- Write a program to concatenate two strings without using the inbuilt function?
- Write a program to check if two strings are same or not?
- Write a program to check whether a string is a palindrome or not?
- Write a program to find the number of vowels and consonants in a sentence?

Week 7

- Write a program that reverse the contents of a string.
- Write a program to demonstrate the array indexing using pointers.
- Write a program to pass a pointer to a structure as a parameter to a function and return back a pointer to structure to the calling function after modifying the members of the structure?

Week 8

- Write a program to demonstrate the use of pointer to a pointer.
- Write a program to demonstrate the use of pointer to a function.
- Write a program to demonstrate the swapping the fields of two structures using pointers?
- Write a program in C++ to define class complex which having two data members viz real and imaginary part?
- Write a program in C++ to define class Person which having multiple data members for storing the different details of the person e.g. name,age, address, height etc.

Week 9

- Write a program to instantiate the objects of the class person and class complex?
- Write a C++ program to add member function that displays the contents of class person and class complex?
- Write a C++ program to demonstrate the use of scope resolution operator?
- Write a program in C++ which creates objects of Student class using default, overloaded and copy constructors.

Week 10

- Write a program to demonstrate the use of different access specifiers.
- Write a C++ program to demonstrate the use of inline, friend functions and this keyword.
- Write a C++ program to show the use of destructors.
- Write a program in C++ demonstrates the use of function overloading.
- Write a C++ program to overload the '+' operator so that it can add two matrices.

Week 11

- Write a C++ program to overload the assignment operator.
- Write a C++ program to overload comparison operator operator== and operator! =
- Write a C++ program to overload the unary operator.
- Write a program in C++ which creates a single-inheritance hierarchy of Person, Employee and Teacher classes and creates instances of each class using new and stores them in an array of Person *

Week 12

- Write a program in C++ which creates a multiple-inheritance hierarchy of Teacher classes derived from both Person, Employee classes. Each class must implement a Show () member function and utilize scope-resolution operator.
- Write a program in C++ demonstrates the concept of function overriding?
- Write a C++ program to show inheritance using different levels?
- Write a C++ program to demonstrate the concepts of abstract class and inner class?

Week 13

- Write a C++ program to demonstrate the use of virtual functions and polymorphism?
- Write a C++ program to demonstrate the use of pure virtual functions and virtual destructors? Write a C++ program to swap data using function templates.
- Write a C++ program to create a simple calculator which can add, subtract, multiply and divide two numbers using class template.

Week 14

- Write a C++ program to demonstrate the concept of exception handling.
- Write a C++ program to create a custom exception. Define a class with appropriate data members and member functions which opens an input and output file, checks each one for being open, and then reads name, age, salary of a person from the input file and stores the information in an object, increases the salary by a bonus of 10% and then writes the person object to the output file. It continues until the input stream is no longer good.

COURSE OUTCOMES (CO):

CO1: Students will demonstrate proficiency in using basic data types, control structures, and input/output statements to develop efficient C programs.
CO2: Students will develop complex programs involving arrays, strings, and functions, including recursive functions and multi-dimensional arrays.
CO3: Students will apply advanced C programming concepts such as command-line arguments, file processing, and the use of pointers, structures, and unions to solve real-world problems.

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CO4: students will implement object-oriented programming principles in C++, including the creation and management of classes and objects, and applying inheritance, polymorphism, and virtual functions.
CO5: Students will be able to utilize function and class templates, namespaces, and exception handling to enhance program robustness and reusability.
CO6: Students will be able to perform input and output operations using stream classes, handle stream errors, and manage disk file I/O operations effectively.

LEVEL OF CO-PO MAPPING TABLE

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	2	-	3	-	-	-	2	1	-	2
2	3	3	3	2	3	-	-	-	2	1	-	2
3	3	3	3	2	3	2	2	-	-2	2	2	3
4	3	3	3	2	3	2	2	2	2	2	2	3
5	3	3	3	2	3	2	2	2	2	2	2	3
6	3	3	3	2	3	2	2	-	2	2	2	3

COURSE TITLE: Database Systems								
Course Code: MCA24102CR						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: 56						External	80	40
						Internal	20	10
Lecture (L):	4	Practical (P):	2	Tutorial (T):	-	Total Credits	6	

Course Objectives

- Grasp the basic concepts of data, information, and knowledge, and the need for and evolution of databases and DBMS. Analyze the characteristics, advantages, and disadvantages of the DBMS approach.
- Describe data models, schemas, and instances, and compare various database models. Understand the Three Schema Architecture, data independence, database languages, interfaces, and DBMS classifications.
- Gain an overview of data modeling and create entity-relationship (ER) models to represent data structures and relationships effectively.
- Understand the basic concepts, characteristics, and constraints of the relational data model. Apply relational algebra operations, including unary, set theory, and binary operations, to manipulate relational data.
- Apply the criteria for good database design. Use functional dependencies and normalization techniques (1NF, 2NF, 3NF, BCNF) to design efficient and reliable database schemas that ensure data integrity and minimize redundancy.
- Learn SQL syntax and functionalities, including data definition, manipulation, and transaction control. Handle constraints, joins, views, synonyms, indexes, subqueries, and locks in SQL. Understand the basics of transaction processing, concurrency control, schedules, serializability, and recovery mechanisms to ensure database consistency and reliability.

Course Content	TEACHING HOURS
UNIT 1: Introduction to Database Systems	**14 Hrs**
Introduction to Data, Information and Knowledge. Database basics – Need and evolution, Database andDBMS. Characteristics of Database Approach, Advantages and disadvantages of DBMS Approach. Database System Concepts and Architecture – Data Models, Schemas, and Instances, Database Modelsand Comparison Three Schema Architecture and Data Independence. Database Languages and Interfaces. DBMS architectures. DBMS Classification. Data Modeling: Overview of Data Modeling, Entity-Relationship (ER) Modeling.	
UNIT 2: Relational Data Model and Database Design	**14 Hrs**
Relational Data Model –Basic Concepts and Characteristics, Model Notation, Model Constraints and Database Schemas, Constraint Violations. Relational Algebra – basic concepts, Unary Relational Operations, Algebra Operations from Set Theory,Binary Operations, Additional Relational Operations Criterion for Good Database Design. Database Design through Functional Dependencies & Normalization: Functional Dependencies, Lossless Join, Normal Forms: 1NF, 2NF, 3NF, BCNF.	
UNIT 3: SQL and Advanced Data Definition	**14 Hrs**

Introduction to SQL, Data Types, Data Definition Language, Data Manipulation Language, Specifying Constraints in SQL, Transaction Control Language, SQL Functions, Set Operators and Joins, View, Synonym and Index, Sub Queries and Database Objects, Locks and SQL Formatting Commands.	
UNIT 4: Transaction Processing and Database Recovery	**14 Hrs**
Transaction Processing –Transaction Processing Basics, Concurrency Control, Transaction and SystemsConcepts, Desirable properties of Transactions. Characterizing Schedules and Recoverability, Schedules and Serializability. Concurrency Control - TwoPhase Locking, Timestamp Ordering. Database Recovery – Concepts, Transaction Rollback, Recovery based on Deferred and Immediate Update, Shadow Paging	

Textbooks

1. Elmasri and Navathe, Fundamentals of Database Systems, 7/e, Pearson, 2017

Reference Books

1. Silberschatz, Korth, & Sudarshan, Database System Concepts, McGraw-Hill, 7/e, 2011.
2. Bayross I. SQL, Pl/SQL: The Programming Language of Oracle, BPB Publications, 2009
3. Michael J. Hernandez, Database Design for Mere Mortals®: A Hands-on Guide to Relational Database Design, Third Edition, Addison-Wesley Professional, 2013

Lab Manual

Week 1

- List various users, functions and constraints of the database system for Library Management.
- List various users, functions and constraints of the database system for Banking System.

Week 2

- Identify the various tables and draw a diagrammatic schema to represent the database of Library management system.
- Identify the various tables and draw a diagrammatic schema to represent the database of University system.

Week 3

- Draw ER Model for the database of Library management system.
- Draw ER Model for the database of University management system.

Week 4

- Consider the following schema: Suppliers (sid, sname, address) Parts (pid, pname, color) Catalog (sid, pid, cost)

Write relational algebra queries to

- Find the name of suppliers who supply some red parts.
- Find the sids of suppliers who supply some red or green parts.
- Find the sids of suppliers who supply some red part or are at Srinagar.
- Find the sids of suppliers who supply some red and some green part.
- Find the sids of suppliers who supply every part.
- Find the sids of suppliers who supply every red part.
- Find the sids of suppliers who supply every red or green part.

Week 5

- Consider a schema R(A,B,C,D) and functional dependencies A->B and C->D. Check the decomposition of R into R1(AB) and R2(CD) for lossless join and dependency preservation.
- R(A,B,C,D) is a relation. Which of the following does not have a lossless join, dependency preserving BCNF decomposition?

1. A->B, B->CD 2. A->B, B->C, C->D
3. AB->C, C->AD 4. A ->BCD

Week 6

- Using a sample schema and data, demonstrate the use of 1NF, 2NF, 3NF and BCNF.

Week 7

- CreatetableStudentwithfollowingattributesandperformthefollowingoperations?

Attribute Name	ST_ROLLNO	ST_NAME	ST_ADDRESS	ST_TELNO
Date Type	Number	Varchar	Char	Varchar2
Size	6	30	35	15

- AddnewattributesCity,Street,CountrywithDatatypeVarcharandlength30?
- Modifyfield ST_ROLLNOand change thesize to5?
- RemovecolumnST_ADDRESS?
- DescribetheTableStudent?
- DropTableStudent?
- CopyStructureof onetableto another

Week 8

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- Create Users user1, user2,user3 and perform the following operations
  - Grant Session Privilege to the newly created users?
  - Grant privileges for creating and manipulation tables?
  - Grant data manipulation privileges to various users on tables?
  - Grant privileges with grant option.
  - Revoke privileges.

Week 9

- Create Object ADDRESS and use the object in a Table DDL?
- Create table Student with following attributes and perform the following operations.

Attribute Name	ST_ROLLNO	ST_NAME	ST_STREET	ST_CITY	ST_State	ST_Country	DTE_REG
Date Type	Number	Varchar	Char	Char	Varchar2	Varchar2	Date
Size	6	30	35	30	30	30	

  - Insert 10recordsinthetable.
  - Perform various Project Operations using Select Query.
  - Perform various restrict operations using Select Query.
  - Update records in the table.
  - Delete records in the table.
  - Create another table with same structure as existing table without copying the data.
  - Create another table along with the structure and data from existing table.

Week 10

- Create table Student with ST_ADDRESS as Object Type with following attributes and

Attribute Name	ST_ROLLNO	ST_NAME	ST_ADDRESS				DT_REG
			ST_STREET	ST_CITY	ST_State	ST_Country	
DateT ype	Number	Varchar	Char	Char	Varchar 2	Varchar2	Date
Size	6	30	35	30	30	30	

  - Insert 10 records.
  - Perform various Project Operations using Select Query.
  - Perform various restrict operations using Select Query.
  - Update records in the table
  - Delete records in the table

- Create table STUDENT with following attributes and perform the following operations?

Attribute Name	ST_ROLLNO	ST_NAME	ST_STREET	ST_CITY	ST_State	ST_Country	DTE_REG	
Date Type	Number	Varchar	Char	Char	Varchar 2	Varchar 2	Date	
Size	6	30	35	30	30	30		

- Insert 10 records in the table.
- Perform various Project Operations using Select Query.
- Perform various restrict operations using Select Query using various arithmetic and Logical Operators like
    - Less Than
    - Greater Than
    - Less Than or Equal to
    - Greater Than or Equal To
    - Equal to
    - Not Equal To
    - Perform restrict operations using various datatypes like numeric,Characters,Date.
    - Perform Update operations using various Arithmetic and Logical Operators on Table STUDENT
- Perform Delete operations using various Arithmetic and Logical Operators on Table STUDENT
- Use Insert and Select Commands together with Arithmetic and Logical Operators.

Week 11

- Perform following Transaction Control Operations on the above table
    - Perform various data manipulation operations the table .
    - Create Five Savepoints from S1 to S5.
    - Rollback to Various savepoints and observe the changes in the table.
    - Perform various DDL operations the table and observe its effect on Savepoint and Rollback on the table.
    - Try to abnormally terminate the application to observe whether data is saved or not.
    - Use Commit and Commit Work commands to save the data permanently.
- Create table STUDENT with following attributes and perform various DML operations to verify domain constraint

Attribute Name	ST_ROLLNO	ST_NAME	ST_ADDRESS
Date Type	Number	Varchar2	Varchar
Size	6	30	35
Constraint	NOTNull	NotNULL	NOTNULL

Week 12

- Create table STUDENT with following attributes and perform various DML operations to verify Validity Integrity.

Attribute Name	ST_ROLLNO	ST_NAME	ST_ADDRESS
Date Type	Number	Varchar2	Varchar
Size	6	30	35

Constraint	CHECK (ROLLNO >20001 and ROLLNO<30001	NotNULL	NOTNULL

- Create table STUDENT with following attributes and perform various DML operations to verify Entity Integrity using Primary and Unique Keys?

Attribute Name	ST_ROLLNO	ST_NAME	ST_ADDRSS
Date Type	Number	Varchar2	Varchar
Size	6	30	35
Constraint	Primary/UniqueKeys	NotNULL	NOTNULL

Week 13

- Create table STUDENT with following attributes and perform various DML operations to verify Referential Integrity using given tables (employee and department)?

Attribute Name	EMP_ID	EMP_NAME	ST_ADDRESS	DEPT_ID
Date Type	Number	Varchar2	Varchar	Number
Size	6	30	35	4
Constraint	PrimaryKey	NotNULL	NOTNULL	Foreign Key

Attribute Name	DID	NAME	Address
Date Type	Number	Varchar2	Varchar
Size	4	30	100
Constraint	Primary Key	NotNULL	NOTNULL

Week 14

- Write SQL queries to demonstrate use of Join and various SQL functions

COURSE OUTCOMES (CO):

CO1: Demonstrate the ability to understand the fundamentals of data, information, and knowledge. Evaluate the need, evolution, and characteristics of databases and DBMS, including their advantages and disadvantages.

CO2: Describe and apply various database system concepts and architectures, including data models, schemas, instances, and the Three Schema Architecture. Understand and use database languages, interfaces, and DBMS classifications.

CO3: Create effective data models using entity-relationship (ER) modeling. Apply relational data model principles and relational algebra operations. Design and normalize database schemas using functional dependencies and various normal forms (1NF, 2NF, 3NF, BCNF).

CO4: Utilize SQL for defining, manipulating, and controlling data. Handle constraints, joins, views, subqueries, and database objects. Understand and apply transaction processing concepts, concurrency control mechanisms, and database recovery techniques to ensure database consistency and reliability.

LEVEL OF CO-PO MAPPING TABLE

To be effective from year 2024

COs	POs											
	1	2	3	4	5	6	7	8	9	10	11	12
1	3	2	-	-	-	-	-	-	2	-	-	-
2	3	2	2	-	-	-	-	-	2	1	-	-
3	3	3	3	-	2	-	-	-	2	-	2	-
4	3	3	3	2	2	-	-	-	2	-	2	-

COURSE TITLE: Discrete Mathematics								
Course Code: MCA24103CR						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: -						External	80	-
						Internal	20	-
Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits	4	

Course Objectives

- Understand and apply fundamental concepts of propositional logic, truth tables, and logical equivalence.
- Demonstrate proficiency in handling predicates, quantifiers, and operations on sets, including cardinality.
- Utilize various methods of proof, including direct proof, indirect proof, and mathematical induction, to solve problems and prove the correctness of algorithms.
- Apply counting techniques such as permutations, combinations, and the Pigeonhole Principle to solve problems in discrete mathematics
- Analyze and apply principles of discrete probability, including advanced counting techniques like the inclusion-exclusion principle and solving recurrence relations.
- Interpret and analyse relations, digraphs, and basic graph theory concepts, including connectivity, paths, circuits, and graph colouring, using appropriate mathematical tools and representations.

Course Content	TEACHING HOURS
UNIT 1: Foundations of Discrete Mathematics	**14 Hrs**
Proposition, Logic, Truth tables, Propositional Equivalence, Logical Equivalence, Predicates and Quantifiers; Sets: operations on sets, Computer representation of sets, Cardinality of a Set Functions: Domain, Range, One-to-One, Onto, Inverses and Composition, Sequences and summations, Growth of functions. Methods of Proof: Direct Proof, Indirect Proof, Mathematical Induction for proving algorithms; Counting techniques – Permutations, Combinations, The Pigeonhole Principle.	
UNIT 2: Probability, Counting, and Relations	**14 Hrs**
Discrete Probability, Advanced Counting Techniques: Inclusion-Exclusion, Applications of Inclusion exclusion principle, recurrence relations, solving recurrence relation. Relations: Relations and their properties, Binary Relations, Equivalence relations, Diagraphs, Matrix representation of relations and digraphs. Computer representation of relations and digraphs; Transitive Closures, Warshall's Algorithm, Problem solving on Warshall's Algorithm.	
UNIT 3: Ordered Sets and Graph Theory	**14 Hrs**
Partially Ordered Sets (Posets), External elements of partially ordered sets, Hasse diagram of partially ordered set, isomorphic ordered set, Lattices: Properties of Lattices, complemented Lattices. Graph theory: Introduction to graphs, Graph Terminology Weighted graphs, Representing Graphs, Connectivity of Graphs: Paths and Circuits, Eularian and Hamiltonian Paths, Matrix representation of graphs. Graph Coloring and its applications.	
UNIT 4: Trees, Boolean Algebra, and Groups	**14 Hrs**

Trees: Rooted trees, Application of trees: Binary Search Trees, Decision Trees, Prefix Codes, Tree traversal, trees and sorting, spanning trees, minimal spanning trees. Finite Boolean algebra, Functions on Boolean algebra, Boolean functions as Boolean polynomials. Groups and applications: Subgroups, Semigroups, Monoids Isomorphism, Homomorphism.	

Textbooks

1. KENNETH H. ROSEN "Discrete Mathematics and Its Applications", 7th Edition, 2017 , Tata McGraw Hill

Reference Books

1. LIU, "Elements of Discrete Mathematics", 4th Edition, 2017, Tata McGraw Hill
2. SCHAUMS Outlines, "Discrete Mathematics", 3rd Edition, 2017, Tata McGraw Hill.
3. KOLMAN/REHMAN, "Discrete Mathematical Structures", 6th Edition, 2015, Pearson Education
4. NICODEMI "Discrete Mathematics",2002, CBS

COURSE OUTCOMES(CO):

CO1: Ability to Apply Logical Reasoning and Proof Techniques: Students will demonstrate proficiency in using propositional and predicate logic to construct valid arguments and proofs. They will apply methods such as direct proof, indirect proof, and mathematical induction to solve problems and analyze algorithms.

CO2: Competence in Counting and Probability Analysis: Students will be able to apply counting techniques such as permutations, combinations, and the Pigeonhole Principle to solve discrete probability problems. They will analyze recurrence relations and apply advanced counting principles like the Inclusion-Exclusion Principle.

CO3: Understanding and Application of Graph Theory and Relations: Students will acquire knowledge of graph theory, including graph representations, connectivity, paths, cycles, and graph coloring. They will understand properties of relations, matrix representations of relations and digraphs, and algorithms like Warshall's Algorithm for transitive closure.

CO4: Proficiency in Structural Analysis and Algebraic Concepts: Students will demonstrate proficiency in analyzing structures such as partially ordered sets (Posets), lattices, trees, and Boolean algebra. They will apply concepts of functions, groups, and monoids to solve problems in various applications, including decision trees, sorting, and Boolean functions.

LEVEL OF CO-PO MAPPING TABLE

	Pos											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	3	2	2	2	1	2	3	2	2	3
2	2	2	1	1	1	-	-	1	2	1	1	2
3	3	3	2	2	2	2	1	2	3	2	2	3
4	2	2	2	2	2	2	-	2	2	2	2	2

COURSE TITLE: Computer Networks								
Course Code: MCA24104DCE						Examination Scheme	T	P
Total number of Lecture Hours:56 Total number of Practical Hours: -						External	80	-
						Internal	20	-
Lecture (L):	4	Practical's (P):	-	Tutorial (T):	-	Total Credits	4	

Course Objectives

- To gain a comprehensive understanding of the core principles of computer networking, including protocol design, protocol layering, algorithm design, and performance evaluation.
- To acquire detailed knowledge of the OSI model and TCP/IP protocol suite and understand the design issues and protocols used in the data link layer and MAC sublayer.
- To Understand the design issues of the network layer, including various routing algorithms and congestion control mechanisms.
- To learn about the protocols used in the transport and application layers, including their design and functionality.

Course Content	TEACHING HOURS
UNIT 1:	**-14 Hrs**
Introduction: Network, Uses of Networks, Types of Networks, Reference Models: TCP/IP Model, The OSI Model, and Comparison of the OSI and TCP/IP reference model. Architecture of Internet. **Physical Layer:** Guided transmission media, Wireless transmission media, Radio Transmission, Microware Transmission, Infrared Transmission and Light Transmission, Digital Modulation and Multiplexing, Switching. **Cellular Networks:** Cells, Handoff, Paging, Different Generation of Cellular Networks, GSM, Cable Networks, Communication Satellites and Policy at the Physical Layer.	
UNIT 2:	**-14 Hrs**
Data Link Layer: Design issues, Error Detection & Correction, Elementary Data Link Layer Protocols, Sliding window protocols and SONET **Medium Access Control Sub layer:** The Channel Allocation problem and Multiple Access Protocols, Ethernet. Multiple Access Protocols - ALOHA, CSMA,CSMA/CD, CSMA/CA, Collision free protocols, Ethernet- Physical Layer, Ethernet Mac Sub layer, Data link layer switching: Use of bridges, learning bridges, spanning tree bridges, repeaters, hubs, bridges, switches, routers and gateways.	
UNIT 3:	**-14 Hrs**
Network Layer: Network Layer Design issues, store and forward packet switching connection less and connection oriented networks-routing algorithms-optimality principle, shortest path, flooding, Distance Vector Routing, Link State Routing, Path Vector Routing, Hierarchical Routing; Congestion control algorithms, IP addresses, CIDR, Subnetting, SuperNetting, IPv4, Packet Fragmentation, IPv6 Protocol, Transition from IPv4 to IPv6, ARP, RARP, OSPF , BGP and Traffic Prioritization.	
UNIT 4:	**-14 Hrs**
Transport Layer: Services provided to the upper layer's elements of transport protocol addressing connection establishment, Connection release, Error Control & Flow Control, Crash Recovery. The Internet Transport Protocols: UDP, Introduction to TCP, The TCP Service Model, The TCP Segment Header, The Connection Establishment, The TCP Connection Release, The TCP Sliding Window, The TCP Congestion Control Algorithm, Socket Programming. **Application Layer**: Introduction, providing services, Applications layer paradigms: Client server model, HTTP, E-mail, WWW, TELNET, DNS.	

To be effective from year-2024

Textbooks

Andrew Tanenbaum, "Computer Networks", 6th Edition by Pearson, 2022

Reference Books

Behrouz A. Foruzan - Data communication and Networking, 6th edition, TMH, 2022

COURSE OUTCOMES (CO):

Upon successful completion of this course, learners will be able to:

CO1: List the functionalities of different layers in both the OSI and TCP/IP reference models.

CO2: Analyze complex networking problems, including the concepts of internetworking, and the differences between connection-oriented and connection-less approaches.

CO3: Describe the principles of switching and routing algorithms used in computer networks.

CO4: Distinguish between TCP and UDP formats and procedures, understanding their respective uses and characteristics.

CO5: Identify, formulate, and analyze complex networking issues, applying principles and concepts learned throughout the course.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	3	3	3	2	2	1	-	2	-	-
2	3	2	2	2	-	2	1	1	-	-	-	-
3	3	2	2	2	1	1	1	1	-	1	-	2
4	3	2	1	1	1	0	1	1	-	1	1	1

COURSE TITLE: Computer Graphics									
Course Code: MCA24105DCE						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: -						External	80	-
						Internal	20	-
Lecture (L):	4	Practical(P):	-	Tutorial (T):	-	Total Credits	4	

Course Objectives:

- Understand key concepts, graphic display devices, and 2D/3D transformations.
- Develop skills in line and circle drawing, clipping, filling, and hidden surface removal.
- Apply mathematical techniques like splines and Bezier methods for complex graphical models.
- Explore multimedia concepts, file formats, storage solutions, and introductory AR/VR technologies.

Course Content	TEACHING HOURS
UNIT 1:	**14Hrs**
Introduction to Computer Graphics, Applications of Computer Graphics, Graphic Display Devices: Refresh Cathode Ray Tubes, Raster-scan Displays, Random-Scan displays, Color CRT Monitors, Concept of Double Buffering, Lookup tables. 2-D Graphics: Cartesian and Homogeneous Coordinate Systems, Line drawing algorithms (Bressenham's and DDA), Circle and Ellipse Drawing Algorithms.	
UNIT 2:	**14Hrs**
2-Dimensional Transformations, Concepts of Window & Viewport, Window to Viewport Transformations, Normalization transformation (3L) Composite Transformations: General pivot point rotation, General fixed point scaling, reflection w.r.t line $y=x$, reflection w.r.t line $y=x$ (4L) Transformation between coordinate systems, affine transformations, Raster methods for transformations (3L)	
UNIT 3:	**14Hrs**
Filling techniques: Boundary and Flood-fill algorithms (2L) Clipping, Line Clipping Algorithms (Cohen-Sutherland Algorithm), 3-D Graphics, Projections: perspective and parallel projection transformations. (5L) 3-Dimensional Transformations, Hidden Surface Removal Techniques, Z-Buffer Algorithm, Back Face Detection (3L)	
UNIT 4:	**14Hrs**
Curves and Surfaces: Spline specification, Interpolated& Approximated Splines. spline representation, cubic spline interpolation methods, Bezier Splines, Bezier Curves, Cubic Bezier Curves, Bezier Surfaces. (3LIntroduction to multimedia elements: Images (BMP, PCX), sound (WAV, MP3) Multimedia storage formats: CDs and DVDs). Introduction to virtual reality (VR) and augmented reality (AR) technologies.	
Textbooks	

1. Hearn and Baker, "Computer Graphics with OpenGL": 4th Edition (2022), Donald Hearn, M. Pauline Baker, Warren Carithers, Pearson
2. Ze-Nian Li and Mark S. Drew, "Fundamentals of Multimedia": 3rd Edition (2021), Springer.
3. W.M. Newman and Sproull, "Principles of Interactive Computer Graphics" McGraw-Hill Education; 3rd Edition, 2023.

Reference Books

1 **Steven Harrington, "Computer Graphics: A Programming Approach"** McGraw-Hill Education; 2nd Edition, 2021.
2 **Plastock and Kelley, "Schaum's Outline of Theory and Problems of Computer Graphics"** McGraw-Hill Education; 2nd Edition, 2022.
3 **David F. Rogers and J. Alan Adams, "Procedural Elements of Computer Graphics"** McGraw-Hill Education; 3rd Edition, 2021.
4 **David F. Rogers and J. Alan Adams, "Mathematical Elements of Computer Graphics"** McGraw-Hill Education; 3rd Edition, 2022.
5 **James D. Foley, Andries van Dam, et al., "Computer Graphics: Principles and Practice"** Pearson; 4th Edition, 2023.
6 **Sinha and Udai, "Computer Graphics"** Tata McGraw-Hill Education; 2nd Edition, 2022

COURSE OUTCOMES (CO):

CO1: Apply Graphics Principles: Understand and apply core concepts of computer graphics and transformations.
CO2: Implement Algorithms: Develop and execute line drawing, clipping, and filling algorithms.
CO3: Create Curves and Surfaces: Design and manipulate graphical models using spline and Bezier techniques.
CO4: Manage Multimedia: Integrate and manage multimedia elements and file formats.
CO5: Explore AR/VR: Apply basic concepts of augmented reality and virtual reality technologies.

LEVEL OF CO-PO MAPPING TABLE

	POs											
COs	1	2	3	4	5	6	7	8	9	10	11	12
1	3	3	-	-	3	-	-	-	-	-	-	3
2	3	3	3	-	3	-	-	-	-	-	-	3
3	3	3	3	-	3	-	-	-	-	-	-	3
4	3	3	3	-	3	2	-	-	2	2	-	3
5	3	3	3	2	3	2	-	2	2	2	2	3

COURSE TITLE: Management Information Systems								
Course Code: MCA24106DCE						Examination Scheme	T	P
Total number of Lecture Hours: 56 Total number of Practical Hours: -						External	80	-
						Internal	20	-
Lecture (L):	4	Practical (P):	-	Tutorial (T):	-	Total Credits	4	

Course Objectives

- To describe the role of information technology and decision support systems in business and record the current issues with those of the firm to solve business problems.
- To introduce the fundamental principles of computer-based information systems analysis and design and develop an understanding of the principles and techniques used.
- To enable students, understand the various knowledge representation methods and different expert system structures as strategic weapons to counter the threats to business and make business more competitive.
- 4. To enable the students to use information to assess the impact of the Internet and Internet technology on electronic commerce and electronic business and understand the specific threats and vulnerabilities of computer systems.

Course Content	TEACHING HOURS
UNIT 1: Basic Concepts of Information System	**-14 Hrs**
Role of data and information, Organization structures, Business Process, Systems Approach and introduction to Information Systems. Resources and components of Information System, integration and automation of business functions and developing business models. Role and advantages of Transaction Processing System, Management Information System, , Executive Support Systems and Strategic Information Systems.	
UNIT 2: Architecture & Design of IS and Decision Making Process	**-14 Hrs**
Architecture, development and maintenance of Information Systems, Centralized and Decentralized Information Systems, Factors of success and failure, value and risk of IS. Programmed and Non- Programmed decisions, Decision Support Systems, Models and approaches to DSS	
UNIT 3: Introduction to Enterprise Management technologies	**-14 Hrs**
Business Process Reengineering, Total Quality Management and Enterprise Management System viz. ERP, SCM, CRM and Ecommerce. An Overview of Enterprise an Overview of Enterprise; Integrated Management Information; Business Modeling; ERP for Small Business	
UNIT 4: : Security and Ethical Challenges	**-14 Hrs**

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