

NEW SCHEME FOR MASTER OF COMPUTER APPLICATIONS (M.C.A.) COURSE
SEMESTER - II (MCA) Applicable From Jan 2019 onwards

SR. NO.	SUBJECT NO.	NAME OF THE SUBJECT	TEACHING SCHEME			EXAMINATION SCHEME						TOTAL	
			THEORY Hr	TUTO Hr.	PRACT. Hr.	SESSIONAL M.	HR.	THEORY M.	HR	PRACT. M	H		T.W. MARKS
1.	MCA121	ADVANCED PROGRAMMING CONCEPTS	4	-	3	25	2	50	3	50	3	25	150
2.	MCA122	OBJECT ORIENTED CONCEPTS & PROGRAMMING	4	-	3	25	2	50	3	50	3	25	150
3.	MCA123	COMPUTER ORIENTED NUMERICAL METHODS	4	-	3	25	2	50	3	50	3	25	150
4.	MCA124	RELATIONAL DATABASE MANAGEMENT SYSTEMS -II	4	-	3	25	2	50	3	50	3	25	150
5.	MCA125	WEB APPLICATION DEVELOPMENT	4	-	3	25	2	50	3	50	3	25	150
TOTAL			20		12	125	-	250	-	250		125	750

Gujarat University

Syllabus

MCA -II

Course Name: Advanced Programming Concepts

Course Code: MCA121

Objectives: The main objective of this course is to enable students to

- learn how to structure data efficiently
- know and understand the concept of pointer and its applications in programming.
- learn how to allocate and free memory dynamically, and to control dynamic arrays of any type of data in general and structures in particular.
- store and manage data in files
- understand and create and manipulate linked lists

Prerequisites: Fundamentals of Programming

Contents:

1. Pointers [25%]

Need of pointer, Types and uses of pointer, pointer arithmetic, Array and Pointers, Pointers and strings, Pointer to Pointer, Pointers and functions, other aspect of Pointers. Use of pointers, Advantages of using pointers.

2. User Defined Data Types [25%]

Structures, Declaring structures and structure variables, Accessing the members of a structure, Initialization of structures , Copying and comparing structures, Typedef and its use in structure Declarations, Nesting of structures, Arrays of structures, Initializing arrays of structures, Arrays within the structure , Structures and pointers, Structures and functions, Union and its usage, Declaring a union and its members, Accessing and initializing the members of a union , Structure versus Union , Enumeration types, Bitfields

3. Files [25%]

Types of files, using files in c, Working with text, Working with binary files , Direct file input and output, Sequential versus random file access , files of records, Working with files of records, Random access to files of records, Other file management functions - Deleting a file, Renaming a file , Command line arguments.

4. Dynamic Memory Allocation [10%]

Introduction to dynamic memory allocation, Allocating memory dynamically, resizing and releasing dynamically allocated memory

5. Linked List [25%]

Creating linked structures, Singly link list, Operations on singly link list.

Main Reference Book(s):

1. **Programming in C**, by Pradip Dey & Manas Ghosh, Publisher – Oxford

Suggested Additional Reading :

1. **Computer Science: A Structured Programming Approach Using C**, by Behrouz A. Forouzan & Richard F. Gilberg, Publisher – Thomson Education.
2. **Programming in ANSI C**, by Balagurusamy, Publisher - Tata McGraw Hill.
3. **Programming with ANSI and Turbo C**, by Ashok N Kamthane, Publisher – Pearson Education.
4. **Mastering C**, by Venugopal & Prasad, Publisher – Tata McGraw Hill.
5. **C: The Complete Reference**, by Herbert Schildt, Publisher – Tata McGraw Hill.
6. **Let us C**, by Yashwant Kanitkar, Publisher – BPB Publication
7. **Schaum's Outline of Programming with C**, By: Byron Gottfried, Publisher Shaum Series.

Accomplishments of the student after completing the course:

After completion of the course students will be able to develop structured, modular and memory efficient programs in 'C' with an eye on executional efficiency using structured data types, functions, pointers and data files.

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Syllabus

MCA -II

Course Name: Object Oriented Concepts and Programming

Course Code: MCA122

Objectives:

The programming for small devices like mobile phones, networking devices like routers, coding for graphics and multimedia, requires efficient coding as well as object oriented programming. The C++ language fits perfectly as a tool for this type of work. How this important language is to be mastered and how to use this knowledge in building efficient and flexible code is one of the prime requirements today. The course presented here is targeting to enable the student to master such skills. Aim of the course is to enable students to

1. Differentiate between procedural and object oriented programming.
2. Learn C++ as a language and various features of it.
3. Learn Object Oriented principles and their application using C++.

Prerequisites:

1. Knowledge of C language
2. Programming concepts including algorithm building and logic

Contents :

1. Introduction to C++, Overview of Core C++ Language, Classes and Objects [10%]

Identifiers and constants (Literals), Keywords, Data Types, The Operators, New Casting Operators, typeid and throw, The Conditional structures and Looping Constructs, , The Difference between struct and class in C++,The difference between Union and Class, Static Data members of a class, Pointer to objects and pointer to members of class, The local classes, Assigning Objects

2. Functions [10%]

Introduction, The inline function, Default Arguments to the function,Functions with object as parameters,Call by reference and return by reference, Prototyping and Overloading, Friend functions, Const and Volatile functions, Static functions, Private and Public functions, Function

Pointers, Adding C functions to the C++ program

3. Constructors and Destructors [10%]

Introduction to constructors, The explicit constructors, Parameterized constructors, Having multiple constructors, Constructors with default arguments, Dynamic Initialization, Constructor with dynamic allocation, copy constructors, The member initialization list, destructors

4. Operator Overloading and User Defined Conversions [10%]

Introduction, Unary Operators, Binary Operators, Using Friends as operator functions, Overloading other Operators, The need for user defined conversion, Four different cases where user defined conversions are needed, Comparison of both the methods of conversion

5. Templates [5%]

Function Templates, Non Generic (Non Type) Parameters in Template functions, Template function and specialization, Overloading a template function, Using Default Arguments, Class Templates, Classes with multiple generic data types, Static data members, Primary and Partial Specialization, The Export Keyword, The other use of typename

6. Inheritance [15%]

The need, Defining derived class using single base class, Derivation using public, private and protected access modifiers, The implementation of inheritance in the C++ object model, The Access Control, The Access Declaration, The multiple-inheritance, Abstract classes, Composite objects (container objects)

7. Runtime polymorphism by virtual functions [10%]

Compile Time and Runtime Polymorphism, Pointers to Objects, This pointer, Compatibility of Derived and base class pointers, The subobject concept, Virtual functions, Static invocation of virtual function, Default arguments to virtual functions, Virtual destructors, Pure virtual functions

8. IO Streams [5%]

Need for streams, Advantages of using C++ I/O over C IO, The C++ Predefined streams, Formatting IO, Formatting using ios members, Manipulators, Creating our own manipulator

9. Using Files for IO [10%]

Why IO is special, Text and binary streams, Opening and closing files, Dealing with text files Dealing with binary files, Providing Random Access using seek, IO Modes, Handling Errors

10. Namespaces [5%]

Introduction and need, Use the using syntax, Defining namespaces, Extending the namespace, Unnamed namespaces, Nested Namespaces, Namespace aliases, The std namespace, The Koenig lookup, Overhead with namespaces

11. The Standard Template Library [5%]

The STL (Standard Template Library) Introduction, Generic Programming , Generic Software

Components, Generic Algorithms, Iterators, Containers, Algorithms

Main Reference Book:

1. Programming with ANSI C++ by Bhushan Trivedi, Oxford University Press

Suggested Additional Reading:

1. C++ FAQs by Pearson Education
2. C++ Primer by Stanley Lippmann Pearson Education
3. The C++ Programming Language by Bjarne Stroustrup, Pearson Education
4. Effective C++ by Scott Meyer Addison Wesley
5. Complete Reference C++ by Herbert Schildt McGraw Hill Publications

Chapter-wise coverage from main reference book :

Chapters : 1,2,3,4,5,6,7,9,10,12,13,14,16.

Accomplishments of the student after completing the course :

1. He/She should be able to understand and appreciate the Object Oriented approach of programming
2. He/She should be aware of the working and architectural model of C++.
3. He/She should be able to solve problems given to him/her using C++ with keeping balance between efficiency and flexibility

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Syllabus

MCA -II

Course Name: Computer Oriented Numerical Methods

Course Code: MCA123

Objectives:

With the current deployment of computer technology and tools, it is very important to develop efficient algorithms for solving problems in science, engineering, technology, insurance & banking. Thus, the objective of this course is to enable students to obtain an intuitive and working understanding of numerical methods for the basic problems of numerical analysis and gain experience in the implementation of numerical methods using a computer. They would also gain an appreciation of the concept of error in these methods and the need to analyze and predict it.

Prerequisites:

Basic knowledge of functions, logarithmic, trigonometric and exponential functions, graph of a function, polynomials, and roots of a polynomial, differentiation and integration.

Contents:

1. Introduction to Numerical Methods

[10%]

Characteristic of Numerical Methods, Different Sources of Errors, Iterative Methods, Types of Errors, Quantification of Errors, Stopping Criterion in iterative methods

2. Iterative Methods for finding roots of an equation $f(x) = 0$

[20%]

Bisection, False Position, Secant, Newton Raphson and Successive Approximation Method, Descarte's rule of sign, Budan's Theorem, Birge Vieta Method

3. Polynomial Interpolation

[20%]

Lagrange, forward difference, backward difference, divided difference interpolation, Error Estimates, Cubic spline interpolation

4. Least Square Approximation

[15%]

Least square Curve fitting: Linear Regression and Nonlinear Regression, Approximation of Functions by Taylor series, Chebyshev Approximation, Chebyshev Economization.

5. Numerical Differentiation & Integration

[20%]

Differentiation, Numerical Integration – Newton Cotes formulas, Trapezoidal, Simpson's 1/3 & 3/8 rules, Gauss Quadrature formulas

6. Solution of Ordinary Differential Equations

[15%]

Taylor series, Euler, Runge-Kutta 2nd order and 4th order, Predictor Corrector methods: Milne Simpson & Adam's Moulton

Main Reference Books:

1. Numerical Methods for Engineers by Steven C Chapra & Raymond P Canale, Fifth Edition, Tata McGraw Hill Publication, Special Indian Edition
2. Computer Oriented Numerical Methods by Dr. N Datta, Vikas Publication.

Suggested Additional Reading:

1. Numerical Methods with Programs in C by T Veerarajan & T Ramachandran, Second Edition, Tata McGraw Hill Publication.
2. Numerical Methods by V. Rajaraman, Third Edition, Prentice-Hall India Pvt. Ltd.
3. Numerical Methods with C++ Programming by RM Somasundaram & RM Chandrasekaran, Prentice-Hall India Pvt. Ltd.
4. Applied Numerical Analysis by C F Gerald & P O Wheatley, Seventh Edition, Pearson Education Asia, New Delhi
5. Numerical Methods by Dr. V. N. Vedamurthy & Dr. N.Ch. S.N. Iyengar, Vikas Publication.
6. Numerical Analysis by Richard L. Burden, J. Douglas Faires, Cengage Publication.
7. Numerical Methods Using MATLAB by John H. Mathews, Kurtis D. Fink, Fourth Edition, Pearson Education

Accomplishments of the student after completing the course:

- Solve linear and non-linear algebraic equations, perform operations of calculus, fit curves, and solve differential equations using a computer
- Appreciate problems due to rounding errors and convergence

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Syllabus

MCA -II

Course Name: Relational Database Management Systems –II

Course Code: MCA124

Objectives:

This course is intended to give students knowledge of how RDBMS is managed. It will prepare a theoretical as well as practical background of RDBMS

Prerequisites:

Database designing and retrieving using SQL

Contents:

1. Query Processing and Optimization [25%]

Overview, Query interpretation, Equivalence of expressions, Join strategies for parallel processing, Algorithm for executing query operations, Heuristics of Query Optimization cost estimation of queries, Basic query optimization strategies: Selection operation, Sorting, Join operation, Overview of Indexing and Hashing

2. Transaction Processing and Concurrency control [30%]

Transaction concepts: Transaction execution and Problems, Transaction execution and control with SQL, Transaction properties, Transaction log, Concurrency control, Locking methods for concurrency control, Timestamp methods for concurrency control, Optimistic methods for concurrency control (Read phase, validation phase, Write phase), Deadlock handling - detection and resolution

3. Database backup and Recovery [25%]

Need of Database backup, Database backup techniques, Types of Database failures, Types of Database recovery (Forward recovery, backward recovery and Media recovery), Recovery techniques (Deferred Update, Immediate update, Shadow Paging, Checkpoints), Buffer management.

4. Implementing Security in Databases [10%]

Security & integrity threats, Defense mechanisms, Statistical database auditing & control, Granting/revoking of privileges using SQL

5. Introduction to Other Databases

[10%]

Overview of parallel databases, Overview of Distributed databases, Overview of Object oriented databases.

6. Procedural SQL Practical only

Understanding the main features of PL/SQL,PLSQL Architecture, advantages of using procedures, Implementing Indexing in MySQL , Basic code structure, variables, conditional statements, looping (loop statements, while loops, for loops, Cursor FOR loops) PL/SQL Stored procedures (functions, Cursors, Transactions and triggers

Main Reference Book(s):

- 1) Database System Concept- Silberschatz, Korth, Sudarshan , McGraw Hill
- 2) PL/SQL - MySQL 5 for Professionals-by Ivan Bayross
- 3) Database Management Systems, Ramakrishnan, Gehrke, McGraw Hill
- 4) SQL, PL/SQL – The programming Language Oracle-by Ivan Bayross
- 5) MySQL Reference manual: MySQL Documentation (Triggers and Packages)

Suggested Additional Reading:

- 1) Database Management Systems, Ramakrishnan, Gehrke, Third edition, McGraw Hill
- 2) SQL, PL/SQL – The programming Language Oracle-by Ivan Bayross
- 3) Database System Concept- Silberschatz, Korth, Sudarshan , Fifth Edition, McGraw Hill
- 4) Fundamentals of Database Systems, Elmasri Navathe, Third edition, Addison Wesley
- 5) Database Systems: Design , Implementation and Management , seventh edition , Peter Rob, Carlos Coronel, Thomson Course technology
- 6) MySQL Documentation : MySQL Reference manual

Chapter wise Coverage from the main reference book(s):

- Book No. 1 : Chapters -13 ,14,15,16,17 ,20
Book No. 2 : Chapter – 17 (Introduction) , Chapter 18
Book 3 : Chapter 21
Book 4 : Triggers

Accomplishments of the student after completing the course:

- Knowledge of handling multiple transactions effectively, Designing Stored procedures, utilization of triggers/cursors to control and retrieve data efficiently.

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Syllabus

MCA - II

Subject Name: Web Application Development

Subject Code: MCA125

Objectives:

Students will learn the platform neutral fundamentals of secure, dynamic web application development. Students will also learn how to implement a web application using one specific set of open sources server-side tools: PHP and MySQL.

Contents:

1. PHP Crash Course

Accessing PHP, Embedding PHP in HTML, Adding dynamic Content, Accessing Form Variables, Understanding Identifiers, Examining Variable Types, Declaring and Using Constants, Understanding Variable Scope, Using Operators, Using Variable Functions, Making Decision with Conditionals, Repeating Actions through Iteration, Using Declare

2. Storing and Retrieving Data

Saving Data for Later, Processing Files, Opening a File, Writing to a File, Closing a File, Reading from File, Using other Useful File Functions, Locking Files

3. Using Arrays

What is an array?, Numerically Indexed Arrays, Arrays with Different Indices, Array Operators, Multidimensional Arrays, Sorting Arrays, Sorting Multidimensional Arrays, Reordering Arrays, Loading Arrays from Files, Performing other array Manipulations

4. String Manipulation and Regular Expressions

Format Strings, Joining and Splitting Strings with String Functions, Compare Strings, Matching and Replacing Substrings with String Functions, Regular Expressions

5. Reusing Code and Writing Functions

The advantages of Reusing Code, Using require() and include (), Using Functions in PHP, Defining your own functions, Passing by Reference and Passing By Value, Implementing Recursions

6. Object-Oriented PHP

Understanding Object-Oriented Concepts, Creating Classes, Attributes and Operations in PHP, Implementing Inheritance in PHP, Understanding Advanced Object-Oriented Functionality in PHP

7. Error and Exception Handling

Exception Handling Concepts, The Exception Class, User-Defined Exceptions, Exceptions and PHP's Other Error Handling Mechanism

8. Designing Your Web Database

Relation Database Concepts, Designing Your Web Database, Web Database Architecture

9. Creating Your Web Database

Using the MySQL Monitor, Logging in to MySQL, Creating Databases and Users, Setting Up Users and Privileges, Introduction to MySQL's Privilege System, Setting Up a user for the Web, Creating Database Tables, Understanding MySQL Identifiers, Choosing Column DataTypes

10. Working with Your MySQL Database

What is SQL, Inserting data into the Database, Retrieving Data from the Database, Updating Records in the Database, Altering Tables After Creation, Deleting Records from the Database, Dropping Tables, Dropping a Whole Database

11. Accessing Your MySQL Database from the Web with PHP

How Web Database Architecture Work?, Querying a Database from the Web, Putting new information in the Database, Using Prepared Statements, Using Other PHP-Database Interfaces

12. Interacting with the File System and the Server

Uploading Files, Using Directory Functions, Interacting with the File System, Using Program Execution Functions

13. Managing the Date and Time

Getting the Date and Time from PHP, Converting Between PHP and MySQL Date Formats, Calculating Dates in PHP, Calculating Dates in MySQL, Using Microseconds, Using the Calendar Functions

14. Using Session Control in PHP

What is Session Control?, Understanding Basic Session Functionality, Implementing Simple Sessions, Creating a simple session, Configuring Session control, Implementing Authentication with Session Control

Main Reference Book(s):

1. Luke Welling, Laura Thomson: PHP and MySQL Web Development, Pearson, 4th Edition, ISBN: 9788131729878

Suggested Additional Reading:

1. W. Jason Gilmore: “Beginning PHP and MySQL 5 From Novice to Professional”, Apress, ISBN: 9781590595527
2. Elizabeth Naramore, Jason Gerner, Yann Le Scouarnec, Jeremy Stolz, Michael K. Glass: “Beginning PHP5, Apache, and MySQL Web Development”, Wrox, ISBN: 9780764579660
3. Robin Nixon: “Learning PHP, MySQL, and JavaScript”, O'Reilly Media

Chapter wise Coverage from the main reference book(s):

Book # 1: Chapters: 1 – 11, 19, 21, 23

Accomplishments of the student after completing the course:

Upon completion of the course, students will be able to efficiently continue to expand their web development knowledge on their own with the solid foundation gained in the course.
