OUTLINES OF TESTS,

SYLLABI AND COURSES OF READINGS

CHOICE-BASED CREDIT SYSTEM

FOR

MCA (MASTER OF COMPUTER APPLICATIONS)

(SEMESTER SYSTEM)

MCA-I (Ist & IInd Semester)

[Batch 2022-23 & 2023-24]

MATA GUJRI COLLEGE

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SRI FATEHGARH SAHIB-140406

MATA GUJRI COLLEGE
SRI FATEHGARH SAHIB-140406
(An Autonomous College)
SYLLABUS, OUTLINES OF PAPERS AND TESTS
CHOICE-BASED CREDIT SYSTEM
M.C.A. (MASTER OF COMPUTER APPLICATIONS)
FIRST YEAR-FIRST SEMESTER EXAMINATION
Batch 2022-23 & 2023-24

CODE NO.	TITLE OF PAPER	Schedule of Teaching (Hours/Week)			Total Hours	Credits	Marks	
		L	T	P			Internal	External
MCA-111	Mathematical Foundation of Computer Science	4	0	0	4	4	50	50
MCA-112	Computer Organization and Architecture	4	0	0	4	4	50	50
MCA-113	Operating System	4	0	0	4	4	50	50
MCA-114	Object Oriented Programming Using C++	4	0	0	4	4	50	50
MCA-115	Programming Lab-I (Python Programming)	0	0	6	6	3	60	40
MCA-116	Programming Lab -II (Based on Paper MCA-114)	0	0	6	6	3	60	40
	Total	16	0	12	28	22	320	280

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CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during a semester. Both the tests will be counted for assessment.	:	50% of the total marks allotted for continuous assessment.
2.	Assignment/Quizzes	:	20% of the total marks allotted for continuous assessment.
3.	Attendance	:	20% of the total marks allotted for continuous assessment.
4.	Class Participation and behaviour	:	10% of the total marks allotted for continuous assessment.

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	MCQ/Viva/Program Execution will be conducted during a semester.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

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MCA-111: Mathematical Foundation of Computer Science

Maximum Marks: 100 **Maximum Time: 3 Hrs.**

Internal Assessment: 50

External Examination: 50

Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objectives:

The purpose of this course is to introduce the students to the basic mathematics concept and to enable them to apply the basic statistical techniques to analyse and solve real life problems.

Course outcomes:

After completing this course, the student must demonstrate the knowledge and ability to:

CO1: Apply logic expressions for a variety of applications.

CO2: Understand and be able to use the notions of propositions and predicate formulae and formal proof.

CO3: Utilize the knowledge of computing and mathematics appropriate to the discipline.

CO4: Understand the functions concepts and distinguish different types of functions.

CO5: Identify and describe various types of relations.

A) Instructions for paper-setter

The question paper will consist of three units I, II and III. Unit I and II will have four questions from each unit of the syllabus and will carry 10 marks each. Unit III will consist of questions from whole syllabus and will be of 2 marks each.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from unit I and II. Unit III is compulsory.
2. Use of scientific calculator is allowed.

UNIT-I

Set Theory: Sets, Power Sets, Set Operations, Inclusion –Exclusion Principal, Cartesian Product of sets.

Logic: Proposition, Implications, Translating English sentences into logical expressions, Propositional equivalences, Predicates and quantifiers. Principle of Mathematical Induction.

Relations: Relations and Digraphs, n-array relations and their applications, Properties of relations, Representing relations, Closure of relation, Equivalence of relation, operation on relations, Partial ordering.
Functions: Functions, One to One to functions, Onto functions, Inverse and Composition of functions.

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UNIT-II

Statistics: Introduction**,** importance and scope of statistics.

Measures of Central Tendency: Mean, Median, Mode and Quartile.

Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation. Correlation **Analysis:** Karl Pearson's coefficient of correlation, Spearman's rank correlation.

Regression Analysis: Introduction, utility, Methods of least squares, Coefficient of Regression, Standard error of estimate, Coefficient of Determination.

Text Books:

1. Discrete Mathematics Structure: Bernard Koleman C Busby, Sharon C. Ross4th Edition. Pearson education Asia.
2. Statistical Methods: S.P Gupta, Sultan Chand and Sons.
3 . Discrete Mathematics: Richard Johnsonbaugh, 5th edition Pearson Education Asia.
4. Rosen, K.H: Discrete Mathematics and Its Applications 5th Edition, TMH Publications.

References:

1. Elements of Discrete Mathematics: Second Edition Tata McGraw Hill.
2. Discrete Mathematics: SeymonLipschutz& Max Lans Lipson Tata McGraw Hill.
3. "Advanced Engineering Mathematics". E.Kreyszig, 8th edition, Wiley.
4. "Advanced Engineering Mathematics", R.K Jain & S.R.K. Lyenger, Wiley Eastern.

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Teaching Plan

Week-I	Set Theory: Sets, Power Sets, Set Operations, Inclusion –Exclusion Principal, Cartesian Product of sets.
Week-II	Logic: Proposition, Implications, Translating English sentences into logical expressions, Propositional equivalences, Predicates and quantifiers. Principle of Mathematical Induction.
Week-III	Relations and Digraphs, n-array relations and their applications, Properties of relations, Representing relations, Closure of relation,
Week-IV	Equivalence of relation, operation on relations, Partial ordering.
Week-V	Functions: Functions, One to One to functions, Onto functions, Inverse and Composition of functions.
Week-VI	Statistics: Introduction, importance and scope of statistics.
Week-VII	Measures of Central Tendency: Mean, Median, Mode and Quartile.
Week-VIII	Measures of Dispersion: Range, Quartile Deviation, Mean Deviation and Standard Deviation. Correlation
Week-IX	Analysis: Karl Pearson's coefficient of correlation, Spearman's rank correlation.
Week-X	Regression Analysis: Introduction, utility, Methods of least squares, Coefficient of Regression, Standard error of estimate, Coefficient of Determination.
Week-XI	Revision
Week-XII	Revision

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MCA-112: Computer Organisation and Architecture

Maximum Marks: 100 **Maximum Time: 3 Hrs.**

Internal Assessment: 50

External Examination: 50

Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objectives:

The objective of this course is to familiarize the students with the working of the control unit, memory, CPU and internal logic circuits of various components of a computer system.

Course Outcomes:

After course completion students will able to:

CO1: Understand the concepts of various components to design stable logic circuits.

CO2: Minimize the Boolean expression using Boolean algebra and design it using logic gates.

CO3: Analyse and design combinational circuits.

A) Instructions for paper-setter

The question paper will consist of three units I, II and III. Unit I and II will have four questions from each unit of the syllabus and will carry 10 marks each. Unit III will consist of questions from whole syllabus and will be of 2 marks each.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from unit I and II. Unit III is compulsory.
2. Use of scientific calculator is allowed.

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UNIT-I

Logic gates, Boolean Algebra & K-Maps. Combinational logic design: half-adder/subtractor, full adder/subtractor, parallel adder Multiplexer, Demultiplexer, Decoders, Encoders.

Sequential Circuit: (Flip flops- D, RS, JK, JK-Master-slave).

Counters (Ripple, Asynchronous, Synchronous, Mod 3, Mod 5, Decade, up/down)

Computer organization: Structure of Computer, Instruction Codes, Instruction formats (Three address, two address, one address and zero address), instruction cycle. Addressing modes.

Register Transfer and Micro operations: Register Transfer language, Arithmetic, Logic and shift micro-operations

UNIT-II

Control Memory: Design of control unit, Micro program sequencer, Micro programmed and Hardwired Control Unit. Program Interrupts, Features of RISC and CISC.

Modes of data transfer: Programmed – Initiated, Interrupt Initiated, DMA, DMA Controller, DMA transfer,

Memory system: Memory hierarchy, Main Memory, RAM and ROM chips, Memory Address map and Connection to CPU, Auxiliary memory (Memory Tape and Disk), Associative Memory, Virtual and cache memory and related mapping. Memory Management Hardware.

Text Books:

1. M.M. Mano "Computer System Architecture", PHI.
2. R.P.Jain "Modern Digital Electronics", Tata Mc Graw Hill.

References:

1. J.P.Hayes: Computer Architecture and Organizations", Mc Graw Hill

2. Stallings "Computer Organization and Architecture" PHI.

Teaching Plan

Week-I	Logic gates, Boolean Algebra & K-Maps
Week-II	Combinational logic design: half-adder/subtractor, full adder/subtractor, parallel adder Multiplexer, Demultiplexer, Decoders, Encoders
Week-III	Sequential Circuit: (Flip flops- D, RS, JK, JK-Master-slave).
Week-IV	Counters (Ripple, Asynchronous, Synchronous, Mod 3, Mod 5, Decade, up/down)
Week-V	Structure of Computer, Instruction Codes, Instruction formats (Three address, two address, one address and zero address), instruction cycle. Addressing modes.
Week-VI	Register Transfer language, Arithmetic, Logic and shift micro-operations
Week-VII	Design of control unit, Micro program sequencer, Micro programmed and Hardwired Control Unit.
Week-VIII	Programmed – Initiated, Interrupt Initiated, DMA, DMA Controller, DMA transfer,
Week-IX	Memory hierarchy, Main Memory, RAM and ROM chips, Memory Address map and Connection to CPU, Auxiliary memory (Memory Tape and Disk), Associative Memory
Week-X	Virtual and cache memory and related mapping. Memory Management Hardware.
Week-XI	Revision
Week-XII	Revision

MATAGURI COLLEGE

MCA-113: Operating System

Maximum Marks: 100 **Maximum Time: 3 Hrs.**

Internal Assessment: 50

External Examination: 50

Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objective:

The objective of this course is to help students become familiar with the fundamental concepts of operating systems and to provide understanding of how operating system allocates and manages the various resources of a computer system.

Course Outcome:

After Completion of the course the students will be able to:

CO1: Describe the role of operating system in the management of various computer resources.

CO2: Understand the process management policies and scheduling of processes by CPU.

CO3: Evaluate the requirement for process synchronization and coordination handled by operating system.

CO4: Describe and analyse the memory management and its allocation policies.

CO5: Identify use and evaluate the storage management policies with respect to different storage management technologies.

A) Instructions for paper-setter

The question paper will consist of three units I, II and III. Unit I and II will have four questions from each unit of the syllabus and will carry 10 marks each. Unit III will consist of questions from whole syllabus and will be of 2 marks each.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from unit I and II. Unit III is compulsory.
2. Use of scientific calculator is allowed.

MATA GUJRI COLLEGE

UNIT-I

Introduction: Operating System as a resource manager, operating system services.

Processor Management: Process overview, process states and state transition.

Process Synchronization: Critical section problem, semaphores, classical synchronization problems.

CPU scheduling: Basic concepts, Scheduling Criteria, Scheduling algorithms.

Memory Management: Logical versus Physical address space, Swapping, Partition, paging, segmentation.

Virtual memory: Demand paging, Page replacement algorithms, Allocation algorithms, Thrashing.

File Management: File concept, access methods, and Directory structure – single level, two level, tree structures, acyclic graph and general graph directory. Allocation methods: Contiguous, linked and index allocation, free space management.

UNIT-II

Deadlock: Deadlock characteristics, Prevention, Avoidance, Detection and Recovery.

Device management: Disk structure, disk scheduling, FCFS scheduling, SSTF scheduling, SCAN scheduling, C-SCAN scheduling, Selecting Disk Scheduling Algorithms.

Security: Authentication, Program Threats, System Threats and Encryption.

Introduction to distributed systems: Topology, Network types, Communication, Design Strategies.

Distributed file system: naming and transparency, remote file access.

Distributed co-ordination: event ordering, mutual exclusion, atomicity, concurrency control, deadlock handling.

Text Books:

1. Silberschatz, P.B.Galvin and G. Gagne, Operating System Concepts (6th ed.), John Wiley & Sons, Inc.

References:

1. A.S. Tanenbaum, Modern Operating Systems (2nd ed.), Prentice-Hall of India.
2. William Stallings, Operating Systems: Internals and Design Principles (5th ed.), Prentice-Hall of India.
3. Gary Nutt, Operating Systems: A Modern Approach (3rd ed.), Addison Wesley.
4. Infosys Campus Connect Foundation Program Volume:1 – 3, Education & Research Department, Infosys Technologies Ltd , Bangalore.

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Teaching Plan

Week-I	Introduction: Operating System as a resource manager, operating system services.
Week-II	Process Synchronization: Critical section problem, semaphores, classical synchronization problems.
Week-III	CPU scheduling: Basic concepts, Scheduling Criteria, Scheduling algorithms.
Week-IV	Memory Management: Logical versus Physical address space, Swapping, Partition, paging, segmentation.
Week-V	Virtual memory: Demand paging, Page replacement algorithms, Allocation algorithms, Thrashing.
Week-VI	File Management: File concept, access methods, and Directory structure – single level, two level, tree structures, acyclic graph and general graph directory. Allocation methods: Contiguous, linked and index allocation, free space management.
Week-VII	Deadlock: Deadlock characteristics, Prevention, Avoidance, Detection and Recovery.
Week-VIII	Device management: Disk structure, disk scheduling, FCFS scheduling, SSTF scheduling, SCAN scheduling, C-SCAN scheduling, Selecting Disk Scheduling Algorithms.
Week-IX	Security: Authentication, Program Threats, System Threats and Encryption.
Week-X	Introduction to distributed systems: Topology, Network types, Communication, Design Strategies. Distributed file system: naming and transparency, remote file access.
Week-XI	Distributed co-ordination: event ordering, mutual exclusion, atomicity, concurrency control, deadlock handling.
Week-XII	Revision

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MCA – 114: Object Oriented Programming Using C++

Maximum Marks: 100 **Maximum Time: 3 Hrs.**

Internal Assessment: 50

External Examination: 50

Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objective:

The objective of this course is to make the students understand how C++ improves C with object-oriented features and to make them learn the syntax and semantics of the C++ programming language.

Course Outcomes:

On completion of this course, the student will be able to:

CO1: Apply object-oriented paradigm for problem solving.

CO2: Select a suitable programming construct and in-built data structure for the given problem.

CO3: Design, develop, document and debug modular programs.

A) Instructions for paper-setter

The question paper will consist of three units I, II and III. Unit I and II will have four questions from each unit of the syllabus and will carry 10 marks each. Unit III will consist of questions from whole syllabus and will be of 2 marks each.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from unit I and II. Unit III is compulsory.

2. Use of scientific calculator is allowed.

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UNIT-I

Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming, concepts of an object and a class, implementation of a class, encapsulation, abstraction, inheritance, overloading, polymorphism.

Standard Input/output: Concept of streams, input/output using overloaded operators >> and << and formatting using manipulators- endl, dec, oct, hex, setbase, setw, setfill, setprecision.

Classes and Objects: Specifying a class, creating class objects, accessing class members, defining member functions, static data members, static member functions.

Constructors and Destructors: Need for constructors and destructors, parameterized constructors, constructor with default arguments, friend functions.

Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using *new* and *delete* operators.

UNIT-II

Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of unary and binary operators.

Inheritance: Introduction, defining derived classes, forms of inheritance- single inheritance, multilevel inheritance, hierarchical inheritance, multiple inheritance, hybrid inheritance.

Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions.

Exception Handling: Review of traditional error handling, exception handling mechanism-try, throw and catch constructs, multiple catch blocks, catch all exceptions.

Templates and Generic Programming: Template concepts, Function templates, overloading function templates, illustrative examples.

File handling: File streams, creating objects of ifstream, ofstream and fstream, reading and writing text files, file opening modes.

Text Books:

1. D. Ravichandran,"Programming with C++", TMH.
2. Herbert Schildt, C++ : The Complete Reference, Tata McGraw-Hill.
3. Paul Deitel and Harvey Deitel, C++ How to Program, Pearson Education.

References:

1. Robert Lafore, Object Oriented Programming in C++, Pearson Education.

2. Bjarne Stroustrup, The C++ Programming Language, Addition Wesley Publication Co.

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Teaching Plan

Week-I	Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming, concepts of an object and a class, implementation of a class, encapsulation, abstraction, inheritance, overloading, polymorphism.
Week-II	Standard Input/output: Concept of streams, input/output using overloaded operators >> and << and formatting using manipulators- endl, dec, oct, hex, setbase, setw, setfill, setprecision.
Week-III	Classes and Objects: Specifying a class, creating class objects, accessing class members, defining member functions, static data members, static member functions.
Week-IV	Constructors and Destructors: Need for constructors and destructors, parameterized constructors, constructor with default arguments, friend functions.
Week-V	Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory
Week-VI	Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of unary and binary operators.
Week-VII	Inheritance: Introduction, defining derived classes, forms of inheritance- single inheritance, multilevel inheritance, hierarchical inheritance, multiple inheritance, hybrid inheritance.
Week-VIII	Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions.
Week-IX	Exception Handling: Review of traditional error handling, exception handling mechanism-try, throw and catch constructs, multiple catch blocks, catch all exceptions.
Week-X	Templates and Generic Programming: Template concepts, Function templates, overloading function templates, illustrative examples.
Week-XI	File handling: File streams, creating objects of ifstream, ofstream and fstream, reading and writing text files, file opening modes.
Week-XII	Revision

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MCA-115: Programming Lab-I (Python Programming)

Maximum Marks: 100 **Maximum Time: 3 Hrs.**
Internal Assessment: 60
External Assessment: 40

Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objective
The objective of this course is to enable students to learn a new programming language which has high demand in industry. Students are expected to use Dictionary, Functions in effective manner in order to create a reliable and user friendly application.

Course Outcomes
CO1: To provide Basic knowledge of Python and to understand why Python is a useful scripting language for developers.
CO2: To learn how to design and program Python applications.

UNIT-I

Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Python IDLE, Indentation, Atoms, Identifiers and keywords, Literals.
Operators: Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment and Decrement operator
Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping, Conditional Statement, Exit function, Difference between break, continue and pass).
Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison, A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists.

UNIT-II

Tuples and Dictionary: Update and delete tuples, basic tuples operation, indexing and slicing tuples, Update and delete dictionary, properties of dictionary keys.
Functions: arguments, parameter pass by reference, default arguments, variable length arguments, return argument, scope of variables, Recursion, Stack diagrams for recursive functions, Anonymous function.
File handling: Introduction, Reading and writing text files.
Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries.
Exceptions: Handling an exception, except Clause, try-finally Clause, Raising an Exceptions

References :
1. T. Budd, Exploring Python, TMH, 1st Ed, 2011
2. How to think like a computer scientist : learning with Python / Allen Downey, Jeffrey Elkner, Chris Meyers. 1st Edition – Freely available online.

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Teaching Plan

Week-I	Introduction to Python: Python Interpreter, Using Python as calculator, Python shell, Python IDLE.
Week-II	Indentation, Atoms, Identifiers and keywords, Literals.
Week-III	Operators: Arithmetic operator, Relational operator, Logical or Boolean operator, Assignment, Operator, Ternary operator, Bit wise operator, Increment and Decrement operator
Week-IV	Creating Python Programs: Input and Output Statements, Control statements (Branching, Looping)
Week-V	Conditional Statement, Exit function, Difference between break, continue and pass.
Week-VI	Strings and Lists: String as a compound data type, Length, Traversal and the for loop, String slices, String comparison,
Week-VII	A find function, Looping and counting, List values, Accessing elements, List length, List membership, Lists and for loops, List operations, List deletion. Cloning lists, Nested lists.
Week-VIII	Tuples and Dictionary: Update and delete tuples, basic tuples operation, indexing and slicing tuples, Update and delete dictionary, properties of dictionary keys.
Week-IX	Functions: arguments, parameter pass by reference, default arguments, variable length arguments, return argument, scope of variables, Recursion, Stack diagrams for recursive functions, Anonymous function
Week-X	File handling:Introduction, Reading and writing text files. Object Oriented Programming: Introduction to Classes, Objects and Methods, Standard Libraries.
Week-XI	Exceptions: Handling an exception, except Clause, try-finally Clause, Raising an Exceptions
Week-XII	Revision of Syllabus

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MCA-116: Programming Lab-II (Based on Paper MCA-114)

Maximum Marks: 100 **Maximum Time: 3 Hrs.**
Internal Assessment: 60
External Examination: 40
Minimum Pass Marks: 40% **Practical sessions to be conducted: 45-55**

Course Objective:

The objective of this course is to provide the students hands on experience of "C++' programming and to enhance their logical skills based on what is learnt in theory session.

Course Outcomes:

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

CO1: Understand the difference between object oriented programming and procedural oriented language.

CO2: Recognize the fundamentals of object oriented concepts.

CO3: Program using C++ features such as composition of objects, Operator overloading, inheritance, Polymorphism etc.

This laboratory course will mainly comprise of exercises on what is learnt under the paper **MCA-114 (Object Oriented Programming Using C++)**

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SYLLABUS, OUTLINES OF PAPERS AND TESTS

CHOICE-BASED CREDIT SYSTEM

M.C.A. (MASTER OF COMPUTER APPLICATIONS)

FIRST YEAR-SECOND SEMESTER EXAMINATION

Batch 2022-23 & 2023-24

CODE NO.	TITLE OF PAPER	Schedule of Teaching (Hours/Week)			Total Hours	Credits	Marks	
		L	T	P			Internal	External
MCA-121	Database System	3	0	2	5	4	50	50
MCA-122	Programming in Java	4	0	0	4	4	50	50
MCA-123	Data Structures	4	0	0	4	4	50	50
MCA-124	Data Communication and Networking	4	0	0	4	4	50	50
MCA-125	Programming Lab-III (Based on Paper MCA-122)	0	0	6	6	3	60	40
MCA-126	Programming Lab-IV (Based on Paper MCA-123)	0	0	6	6	3	60	40
	Total	15	0	14	29	22	320	280

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CONTINUOUS ASSESSMENT (THEORY PAPERS)

1.	Two tests will be conducted during a semester. Both the tests will be counted for assessment.	:	50% of the total marks allotted for continuous assessment.
2.	Assignment/Quizzes	:	20% of the total marks allotted for continuous assessment.
3.	Attendance	:	20% of the total marks allotted for continuous assessment.
4.	Class Participation and behaviour	:	10% of the total marks allotted for continuous assessment.

CONTINUOUS ASSESSMENT (PRACTICAL LAB)

1.	MCQ/Viva/Program Execution will be conducted during a semester.	:	60% of the total marks allotted for continuous assessment.
2.	Lab Assignments	:	30% of the total marks allotted for continuous assessment.
3.	Attendance	:	10% of the total marks allotted for continuous assessment.

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MCA-121 Database System

Maximum Marks: 100 **Maximum Time: 3 Hrs.**

Internal Assessment: 50

External Examination: 50

Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objective:

The objective of this course is to impart comprehensive coverage of the problems involved in database design and in-depth coverage of data models. It also focuses on skill development that is appropriate for Database Administrators and DBMS developers.

Course Outcomes:

CO1: Students will be able to explain the features of database management systems and relational database.

CO2: Design conceptual models of a database using different modelling approaches.

A) Instructions for paper-setter

The question paper will consist of three units I, II and III. Unit I and II will have four questions from each unit of the syllabus and will carry 10 marks each. Unit III will consist of questions from whole syllabus and will be of 2 marks each.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from unit I and II. Unit III is compulsory.

2. Use of scientific calculator is allowed.

UNIT-I

Introduction to Database Systems, DBMS Architecture, Introduction to Data Modelling, ER Model, EER Model - Specialization/Generalization, Aggregation, Composition, Relational algebra operations, ER,EER to Relational Model.

Normalization – Informal Guidelines, Functional dependencies, decomposition algorithms , Normal Forms up to 5NF, Query Processing, Query optimization, Storage and File organization.

UNIT-II

SQL-SQL Fundamentals, DDL, DML, DCL, TCL, PL/SQL Concepts, Cursors, Stored Procedures, Stored Functions, Database Triggers.

Distributed Database - Concepts, advantages, types, functions, architecture, data allocation, fragmentation, replication, transparencies, Date's rules, transaction management, concurrency control, dead lock, recovery2PC, 3PC.

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Object Relational DBMS- Overview of Complex Data Types, ODBMS & ORDBMS, Structured Types and Inheritance in SQL, Table Inheritance, Object-Identity and Reference Types in SQL.

Multimedia Database- Multimedia sources, issues, Multimedia database applications , Multimedia database queries- LOB in SQL.

Text Book:

1. Thomas M. Connolly and Carolyn Begg, Database Systems: A Practical Approach to Design, Implementation, and Management, 2015, 6th Edition, Pearson India.

References:

1. Ramez Elmasri & B.Navathe: Fundamentals of database systems, 2014, 7th Edition, Addison Wesley.
2. S.K.Singh, Database Systems: Concepts, Design & Applications, 2011, 2nd Edition, Pearson education.
3. Raghu Ramakrishnan and Johannes Gehrke: Database Management Systems, 2003, 3rd Edition, McGraw Hill.
4. Joe Fawcett, Danny Ayers, Liam R. E. Quin: Beginning XML, 2012, 5th Edition, Wiley India Private Limited.
5. Abraham Silberschatz, S. Sudarshan, Henry F. Korth: Database System Concepts, 2011, 6th Edition, Tata McGraw - Hill Education.

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Teaching Plan

Week-I	Introduction to Database Systems, DBMS Architecture, Introduction to Data Modelling
Week-II	ER Model, EER Model -Specialization/Generalization, Aggregation, Composition.
Week-III	Relational algebra operations, ER, EER to Relational Model.
Week-IV	Normalization – Informal Guidelines, Functional dependencies, decomposition algorithms
Week-V	Normal Forms up to 5NF, SQL - Basic & Advanced Operations.
Week-VI	Query Processing, Query optimization, Storage and File organization.
Week-VII	Distributed Database - Concepts, advantages, types, functions, architecture, data allocation.
Week-VIII	Fragmentation, replication, transparencies, Date's rules, transaction management,
Week-IX	Concurrency control, dead lock, recovery2PC, 3PC.
Week-X	Object Relational DBMS- Overview of Complex Data Types, ODBMS & ORDBMS, Structured Types and Inheritance in SQL, Table Inheritance, Object-Identity and Reference Types in SQL.
Week-XI	Multimedia Database- Multimedia sources, issues, Multimedia database applications Multimedia database queries-LOB in SQL.
Week-XII	Revision

MATA GUJRI COLLEGE

MCA-122 Programming in Java

Maximum Marks: 100 **Maximum Time: 3 Hrs.**

Internal Assessment: 50

External Examination: 50

Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objective:

The aim of the course is to make students understand how to design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and control structures, string handling and functions. By the end of the course a student will be capable to design and develop different computer software applications in Java.

Course Outcomes:

CO1: Students will be able to implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.

CO2: Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to particular problem.

CO3: Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.

A) Instructions for paper-setter

The question paper will consist of three units I, II and III. Unit I and II will have four questions from each unit of the syllabus and will carry 10 marks each. Unit III will consist of questions from whole syllabus and will be of 2 marks each.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from unit I and II. Unit III is compulsory.
2. Use of scientific calculator is allowed.

UNIT-I

Java Fundamentals: Features of Java, OOPs concepts, Java virtual machine Byte code, Data types, variable, Differences between Java and C++, arrays, expressions, operators, and control structures, static, final and finally method Objects and classes. String Handling, Primitive Type Wrappers.

Inheritance: Basics, Using super, Creating Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with inheritance.

Packages and Interfaces: Defining a package, Finding packages CLASSPATH environment variables, Access Protection, Importing Packages, Defining an Interface, Implementing Interface, Nested Interface, Applying Interface and Variables in Interfaces.

Exception Handling: Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch, Multiple catch clauses, Nested try Statements, throw, throws, finally, Java's inbuilt Exceptions, Creating own Exception Subclasses, Chained Exceptions, Using Exceptions.

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UNIT-II

Multithreaded Programming: The java Thread Model, The Main Thread, Creating a thread, Creating Multiple Threads, Using Alive() and join (), Thread Priorities, Synchronization, Inter thread Communication, Suspending, Resuming, and Stopping Threads, Using Multithreading.

I/O Basics: Streams, Byte Streams, Character Streams, The Predefined Streams, Reading Console Input, Writing Console Output, The Print Writer Class, Reading and writing files

GUI: Introduction to AWT & Swing components, Layout managers and Menus. Event handling.

Database Connectivity: JDBC architecture Establishing connectivity and working with connection interface Working with statements Creating and executing SQL statements Working with Result Set.

Text Book:

1. Patrick Naughton and Herbert Schildt, "The Complete Reference Java 2", Tata McGraw Hill.

References:

1. Java Programming Language, Third Edition by Ken Arnold, James Gosling, David Holmes. Pearson Publications.

2. Infosys Campus Connect Foundation Program Volume:1 – 3, Education & Research Department, Infosys Technologies Ltd , Bangalore.

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Teaching Plan

Week-I	Java Fundamentals: Features of Java, OOPs concepts, Java virtual machine Byte code, Data types, variable, Differences between Java and C++,arrays, expressions, operators, and control structures, static, final and finally method Objects and classes.
Week-II	String Handling, Primitive Type Wrappers, Inheritance: Basics, Using super, Creating Multilevel Hierarchy, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, Using final with inheritance.
Week-III	Packages and Interfaces: Defining a package, Finding packages CLASSPATH environment variables, Access Protection, Importing Packages,
Week-IV	Defining an Interface, Implementing Interface, Nested Interface, Applying Interface and Variables in Interfaces, Exception Handling: Fundamentals, Exception Types, Uncaught Exceptions, Using try and catch,
Week-V	Multiple catch clauses, Nested try Statements, throw, throws, finally, Java's inbuilt Exceptions, Creating own Exception Subclasses, Chained Exceptions, Using Exceptions.
Week-VI	Multithreaded Programming: The java Thread Model, The Main Thread, Creating a thread, Creating Multiple Threads, Using Alive() and join (),
Week-VII	Thread Priorities, Synchronization, Inter thread Communication, Suspending, Resuming, and Stopping Threads, Using Multithreading.
Week-VIII	I/O Basics: Streams, Byte Streams, Character Streams, The Predefined Streams, Reading Console Input, Writing Console Output, The Print Writer Class, Reading and writing files
Week-IX	GUI: Introduction to AWT & Swing components
Week-X	Layout managers, Menus and Event handling.
Week-XI	JDBC architecture Establishing connectivity and working with connection interface
Week-XII	Revision

MATA GUJRI COLLEGE

MCA-123 Data Structures

Maximum Marks: 100 **Maximum Time: 3 Hrs.**

Internal Assessment: 50

External Examination: 50

Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objective:

The objective of this course is to help students become familiar with the fundamental concepts of Data Structures. Students will be exposed to use of different Data Structures like stacks, Queues, Linked Lists, Trees, Graphs etc.

Course Outcomes:

CO1: The students will be able to select appropriate data structures as applied to specified problem definition.

CO2: Implement operations like searching, insertion, and deletion, traversing mechanism etc.

CO3: Implement appropriate sorting/searching technique for given problem.

A) Instructions for paper-setter

The question paper will consist of three units I, II and III. Unit I and II will have four questions from each unit of the syllabus and will carry 10 marks each. Unit III will consist of questions from whole syllabus and will be of 2 marks each.

B) Instructions for candidates

1. Candidates are required to attempt two questions each from unit I and II. Unit III is compulsory.
2. Use of scientific calculator is allowed.

UNIT-I

Introduction: Data structures and their operations, mathematical notation and functions, algorithmic complexity and time space trade off.

Arrays: Arrays and its operations, merging two arrays, representation of one and multidimensional arrays in memory.

Linked Lists: Sequential representation versus linked representation, operations on linked lists concatenation of two linked lists, Circular linked lists, doubly linked lists, dynamic memory allocation and garbage collection.

Stacks: Sequential and linked representations, operations, Applications of stack: Conversion from infix to post fix form; evaluation of postfix expressions.

Queues: Sequential and linked representation, operations, circular queues, priority queues, dequeues.

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UNIT-II

Trees: Introduction to terminology of trees, binary tree, full binary tree, complete binary tree, sequential and linked representation of binary trees in memory, tree traversal: in-order, pre-order and post order, searching, insertion and deletion in binary trees, Introduction to AVL trees and B-Trees. Application of binary trees: binary search trees, creation of heap and heap sort.

Graphs: Graphs and their applications, sequential and linked representation of graph–adjacency matrix, operations on graph, Dijkstra's algorithm for shortest distance, DFS and BFS, Hashing.

Searching and Sorting: Linear and Binary search, Insertion sort, Selection sort, Shell sort, Merge sort, Radix sort, Bubble sort, Quick sort.

File organization: Processing and operations on Sequential file organization, direct file organization and

Indexed Sequential organization:

Note: Insertion, Deletion, Traversal, Count, Search operations are to be performed on all the data structures.

Text Books:

1. A. Tanenbaum, Y. Lanhgsam and A.J. Augenstein, "Data Structures Using C", Prentice Hall of India.
2. Mary E. S. Loomis, "Data Management and File Structures", PHI.
3. Vishal Goyal, LalitGoyal and Pawan Kumar, "Simplified Approach to Data Structures", Shroff Publications.
4. Shubhnandan S. Jamwal, Programming in C, Pearson Publications

Reference Books:

1. Seymour Lipschultz, "Theory and Practice of Data Structures", McGraw-Hill.
2. E. Horowitz and S. Sahni, "Data Structures with Pascal", Galgotia, 3rd Edition.
3. Robert Sedgewick, "Algorithms in C", Pearson Education.

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Teaching Plan

Week-I	Introduction: Data structures and their operations, mathematical notation and functions, algorithmic complexity and time space trade off.
Week-II	Arrays: Arrays and its operations, merging two arrays, representation of one and multidimensional arrays in memory.
Week-III	Linked Lists: Sequential representation versus linked representation, operations on linked lists concatenation of two linked lists,
Week-IV	Circular linked lists, doubly linked lists, dynamic memory allocation and garbage collection.
Week-V	Stacks: Sequential and linked representations, operations, Applications of stack: Conversion from infix to post fix form; evaluation of postfix expressions.
Week-VI	Queues: Sequential and linked representation, operations, circular queues, priority queues, dequeues. Trees: Introduction to terminology of trees, binary tree, full binary tree, complete binary tree,
Week-VII	Sequential and linked representation of binary trees in memory, tree traversal: in-order, pre-order and post order, searching, insertion and deletion in binary trees, Introduction to AVL trees & B-Trees. Application of binary trees: binary search trees, creation of heap
Week-VIII	Graphs: Graphs and their applications, sequential and linked representation of graph– adjacency matrix, operations on graph, Dijkstra's algorithm for shortest distance, DFS and BFS, Hashing.
Week-IX	Searching and Sorting: Linear and Binary search, Insertion sort, Selection sort, Shell sort,
Week-X	Merge sort, Radix sort, Bubble sort, Quick sort.
Week-XI	File organization: Processing and operations on Sequential file organization, direct file organization and Indexed Sequential organization:
Week-XII	Revision

MATA GUJRI COLLEGE

MCA-124 Data Communication and Networking

Maximum Marks: 100 **Maximum Time: 3 Hrs.**
Internal Assessment: 50
External Examination: 50
Minimum Pass Marks: 40% **Lectures to be delivered: 45-55**

Course Objective:
To show clear understanding of the basic concepts of data communications including the key aspects of networking and their interrelationship. Demonstrate the ability to unambiguously explain networking as it relates to the connection of computers, media, and devices (routing).
Course Outcomes: After Completing the course, students will be able to:
CO1: Understand the concept of reliable and unreliable transfer protocol of data and how TCP and UDP implement these concepts, to understand the client/server model and socket API with their implications.
CO2: Acquire skills to implement a network protocol based on socket programming.

A) Instructions for paper-setter
The question paper will consist of three units I, II and III. Unit I and II will have four questions from each unit of the syllabus and will carry 10 marks each. Unit III will consist of questions from whole syllabus and will be of 2 marks each.
B) Instructions for candidates
1. Candidates are required to attempt two questions each from unit I and II. Unit III is compulsory.
2. Use of scientific calculator is allowed.

UNIT-I

Introduction to Data Communications: Concepts & Terminology, Analog & Digital.
Data Transmission: Data Signals & Transmission, Transmission Impairments, Electromagnetic spectrum.
Transmission Media: Guided Transmission Media - twisted pair, coaxial cable, fibre optics, Unguided Transmission media - Terrestrial microwave, Satellite, microwave, Broad cast Radio, Infrared.
Data Encoding: Digital Data, Digital Signals: NRZ, Multilevel Binary, Biphase, Modulation Rate, Scrambling Technique, Digital Data, Analog Signals: ASK, FSK, PSK. Analog Data.
Digital Signals: PCM, DM. Analog Data, **Analog Signals**: Amplitude Modulation, FM, PM, QAM.

UNIT-II

Data Link Layer: Framing, Error control, Sliding window protocols (one bit, Go back n, selective repeat).
Medium Access Sub layer: Static and dynamic channel allocation, Multiple access protocols - ALOHA, CSMA, CSMA/CD, Collision Free protocol.
IEEE standards for LAN: Ethernet LAN (802.3), Token Bus (802.4), Token Ring (802.5), Wireless LAN(802.11, 802.15, 802.16).
Network Layer: Design Issues, Routing Algorithms –Shortest path routing, flooding, flow based routing, distance vector routing, Hierarchical routing.
Congestion Control Algorithms: Leaky bucket, Token bucket, Choke Packet, Load shedding.
Network Security: Security attacks and Preventions, Cryptography – principles, public key encryption and digital Signatures.

Text Books :
1. Tanenbaum A. S. “Computer Networks”, 3rd Edition, PHI publications.
2. Data Communications & Networking by Forouzan, Tata McGraw Hills.

References:
1. Infosys Campus Connect Foundation Program Volume:1 – 3, Education & Research Department, Infosys Technologies Ltd , Bangalore.
2. Comer Douglas E, “Computer Networks and Internet”, 2nd Edition, PH.

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Teaching Plan

Week-I	Introduction to Data Communications: Concepts & Terminology, Analog & Digital.
Week-II	Data Transmission: Data Signals & Transmission, Transmission Impairments, Electromagnetic spectrum.
Week-III	Transmission Media: Guided Transmission Media - twisted pair, coaxial cable, fibre optics, Unguided Transmission media - Terrestrial microwave, Satellite, microwave, Broad cast Radio,
Week-IV	Data Encoding: Digital Data, Digital Signals: NRZ, Multilevel Binary, Biphase, Modulation Rate, Scrambling Technique, Digital Data, Analog Signals: ASK, FSK, PSK. Analog Data.
Week-V	Digital Signals: PCM, DM. Analog Data, Analog Signals: Amplitude Modulation, FM, PM, QAM.
Week-VI	Data Link Layer: Framing, Error control, Sliding window protocols (one bit, Go back n, selective repeat).
Week-VII	Medium Access Sub layer: Static and dynamic channel allocation, Multiple access protocols - ALOHA, CSMA, CSMA/CD, Collision Free protocol.
Week-VIII	IEEE standards for LAN: Ethernet LAN (802.3), Token Bus (802.4), Token Ring (802.5), Wireless LAN(802.11, 802.15, 802.16).
Week-IX	Network Layer: Design Issues, Routing Algorithms –Shortest path routing, flooding, flow based routing, distance vector routing, Hierarchical routing.
Week-X	Congestion Control Algorithms: Leaky bucket, Token bucket, Choke Packet, Load shedding.
Week-XI	Network Security: Security attacks and Preventions, Cryptography – principles, public key encryption and digital Signatures.
Week-XII	Revision of Syllabus

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MCA-125 Programming Lab-III (Based on Paper MCA-122)

Maximum Marks: 100 *
Internal Assessment: 60
External Examination: 40
Minimum Pass Marks: 40%

Maximum Time: 3 Hrs.

Practical units to be conducted: 45-55

Course Objective:

The objective of the course is to build software development skills using Java programming for real world applications and to implement front end and back end of an application.

Course Outcomes:

CO1: Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
CO2: Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem.
CO3: Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.

This laboratory course will mainly comprise of exercises on what is learnt under the paper **MCA-122: Programming in Java.**

MATA GUJRI COLLEGE

MCA-126 Programming Lab-IV (Based on Paper MCA-123)

Maximum Marks: 100 *
Internal Assessment: 60
External Examination: 40 **Maximum Time: 3 Hrs.**
Minimum Pass Marks: 40% **Practical units to be conducted: 45-55**

Course Objective:

The objective of the course is to enable the students to solve the problems of Data Structures using programming technique and to implement them.

Course Outcomes:

CO1: Select appropriate data structures as applied to specified problem definition.
CO2: Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various data structures.
CO3: Students will be able to implement Linear and Non-Linear data structures.

This laboratory course will mainly comprise of exercises on what is learnt under the paper **MCA-123: Data Structures.**

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