MCA 112 : Accounting and Financial Management

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Unit I (6 Sessions)

Overview: Accounting concepts, conventions and principles; Accounting Equation, International Accounting principles and standards; Matching of Indian Accounting Standards with International Accounting Standards.

Unit II (12 Sessions)

Mechanics of Accounting: Double entry system of accounting, journalizing of transactions; preparation of final accounts, Trading Account, Manufacturing Accounts,Profit & Loss Account, Profit & Loss Appropriation account and Balance Sheet, Policies related with depreciation, inventory and intangible assets like copyright, trademark, patents and goodwill.

Unit III (12 Sessions)

Analysis of financial statement: Ratio Analysis- solvency ratios, profitability ratios, activity ratios, liquidity ratios, market capitalization ratios ; Common Size Statement ; Comparative Balance Sheet and Trend Analysis of manufacturing, service & banking organizations.

Unit IV (10 Sessions)

Funds Flow Statement: Meaning, Concept of Gross and Net Working Capital, Preparation of Schedule of Changes in Working Capital, Preparation of Funds Flow Statement and its analysis ; Cash Flow Statement: Various cash and non-cash transactions, flow of cash, preparation of Cash Flow Statement and its analysis.

MCA-113 : COMPUTER CONCEPTS AND PROGRAMMING

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UNIT 1:

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, windows, linux and android] purpose, function, services and types,

Number system : Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: approaches to Problem solving, concept of algorithm and flow charts, types of computer languages: Machine language, assembly language and high level language, concept of assembler, compiler, loader and linker.

UNIT 2:

Standard I/O in "C", **Fundamental Data Types and Storage Classes:** Character types, Integer, short, long, unsigned, single and double-precision floating point, storage classes, automatic, register, static and external, **Operators and Expressions:** Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity,

UNIT 3:

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch, **Program Loops and Iteration:** Uses of while, do and for loops, multiple loop variables, assignment operators, using break and continue, **Modular Programming:** Passing arguments by value, scope rules and global variables, separate compilation, and linkage, building your own modules. **Arrays:** Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size,

UNIT 4: Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types ,**Functions:** introduction, types of functions, functions with array, recursive functions, **Pointers:** introduction, declaration, applications File handling**,** standard C preprocessors**,** defining and calling macros, conditional compilation, passing values to the compiler.

UNIT 5: Concept of OOP: Abstraction, Encapsulation, Inheritance, and Polymorphism in C++.

DISCRETE MATHEMATICS

(MCA-114)

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Unit-I

Set Theory: Introduction, Size of sets and cardinals, Venn diagrams, Combination of sets, Multisets, Ordered pairs and Set identities.

Relations & Functions: Relations - Definition, Operations on relations, Composite relations, Properties of relations, Equality of relations, Partial order relation. Functions - Definition, Classification of functions, Operations on functions, Recursively defined functions.

Notion of Proof: Introduction, Mathematical Induction, Strong Induction and Induction with Nonzero base cases.

Unit-II

Algebraic Structures: Definition, Properties, Types: Semi Groups, Monoid, Groups, Abelian Groups. Subgroups and order, Cyclic Groups, Cosets, Normal Subgroups, Permutation and Symmetric groups, Homomorphisms and isomorphism of Groups, Definition and elementary properties of Rings and Fields: definition and standard results.

Unit-III

Lattices: Introduction, Partial order sets, Combination of partial order sets, Hasse diagram, Introduction of lattices, Properties of lattices – Bounded, Complemented, Modular and Complete lattice.

Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Boolean functions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra.

Unit-IV

Propositional & Predicate Logic: Propositions, Truth tables, Tautology, Contradiction, Algebra of propositions, Theory of Inference and Natural Deduction. Theory of predicates, First order predicate, Predicate formulas, quantifiers, Inference theory of predicate logic.

Unit-V

Trees & Graphs: Trees - Definition, Binary trees, Binary tree traversal, Binary search trees. Graphs - Definition and terminology, Representation of graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Multigraphs, Euler and Hamiltonian paths, Graph coloring.

Recurrence Relations: Introduction, Growth of functions, Recurrences from algorithms, Methods of solving recurrences.

Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle, Pólya's Counting Theory.

MCA-115 : Digital Logic Design

Unit-I

Digital system and binary numbers: : Signed binary numbers, binary codes, cyclic codes, error detecting and correcting codes, hamming codes.
Floating point representation
Gate-level minimization: The map method up to five variable, don't care conditions, POS simplification, NAND and NOR implementation, Quine Mc-Clusky method (Tabular method).

Unit-II

Combinational Logic: Combinational circuits, analysis procedure, design procedure, binary adder-subtractor, decimal adder, binary multiplier, magnitude comparator, decoders, encoders, multiplexers

Unit-III

Synchronous Sequential logic: Sequential circuits, storage elements: latches, flip flops, analysis of clocked sequential circuits, state reduction and assignments, design procedure.
Registers and counters: Shift registers, ripple counter, synchronous counter, other counters.

Unit-IV

Memory and programmable logic: RAM, ROM, PLA, PAL.
Design at the register transfer level: ASMs, design example, design with multiplexers.

Unit-V

Asynchronous sequential logic: Analysis procedure, circuit with latches, design procedure, reduction of state and flow table, race free state assignment, hazards.

MCA 211 : Environmental Science & Ethics

Unit-I :
Knowing our environment, socio-economic, political & environmental situations of India, Population, The land, Forest & wild life, energy sources, Toxic Chemicals & Toxicity, Hazardous waste, sustainability and Human Development.

Unit-II
Ecology, Principles of Energy and Matter in the environment, Food Chain, Carbon and Nitrogen cycles, Biodiversity, benefits and what threatens it, Causes of extinction of the species and their remediation.

Unit-III
Perspectives of global environmental issues, the green house effect, sources of carbon emissions, chlorofluorocarbons, their major uses and combined effect of green house gases, stratosphere, Ozone depletion and impacts.

Unit-IV
Environmental Pollution; causes, pollutants their effect and control of pollution – (i) Air (ii) Water (iii) Soil (iv) Noise (v) Thermal (vi) Marine, the legislation of air & water pollution, solid and/ hazardous waste disposal.

Unit-V
Social issues and environment, the western perspective, Environmental ethics, conservation of natural resources, Effectiveness of various religions in environmental conservation, technological progress and quality of life, harmony between materialism and spiritualism, imbibing human values in environmental studies, NGOs and their role in environmental preservations.

MCA - 214

Introduction to Automata Theory and Languages

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Unit-I

Basic concepts of Automata Theory: Alphabets, Strings and Languages, Deterministic Finite Automata (DFA) and Nondeterministic Finite Automata (NFA) – Definition, Representation using Transition Tables and State Diagrams, Language of DFA and NFA. NFA with ε-transitions, Language of NFA with ε-transitions, Equivalence of NFA and DFA.

Unit – II

Regular Expressions and Languages: Introduction, Definition of regular expression, Kleen's Theorem, Equivalence of regular expression and Finite Automata, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Decision properties of Regular Languages, Finite Automata with Output: Moore and Mealy Machine, Equivalence of Moore and Mealy Machines.

Unit – III

Non-Regular Grammars: Definition of Grammar, Classification of Grammars, Chomosky's Hierarchy. Context Free Grammars (CFG) and Context Free Languages (CFL) - Definition, Examples, Derivation trees, Ambiguous Grammars, Simplification of Grammars, Normal forms of CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs, Pumping lemma for CFLs. Push Down Automata (PDA): Definition and Description, Language of PDA and its applications.

Unit – IV

Turing Machines: Introduction, Basic Features of a Turing Machine, Language of a Turing Machine, Variants of Turing Machine: Multitapes, Nondeterministic Turing Machine, Universal Turing Machine. Turing Machine as Computer of Integer functions, Halting problem of Turing Machine, Church-Turing Thesis.

Unit – V

Undecidability: Introduction, Undecidable problems about Turing Machines, Rice's Theorem, Post's Correspondence problem (PCP) and Modified PCP. Tractable and Intractable Problems: P and NP, NP-Complete Problems, Introduction to recursive function theory.

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MCA-111 : PROFESSIONAL COMMUNICATION

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Unit -1 Basics of Technical Communication

Technical Communication: features; Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of Communication: Downward, Upward, Lateral or Horizontal (Peer group); Importance of technical communication; Barriers to Communication.

Unit - II Constituents of Technical Written Communication

Words and Phrases: Word formation. Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods -Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation- various steps.

Unit - III Forms of Technical Communication

Business Letters: Sales and Credit letters; Letter of Enquiry; Letter of Quotation, Order,

Claim and Adjustment Letters; Job application and Resumes.

Official Letters: D.O. Letters; Govt. Letters, Letters to Authorities etc.

Reports: Types; Significance; Structure, Style & Writing of Reports.

Technical Proposal; Parts; Types; Writing of Proposal; Significance.

Technical Paper, Project. Dissertation and Thesis Writing: Features, Methods & Writing.

Unit - IV Presentation Strategies

Defining Purpose; Audience & Locale; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Space; Setting Nuances of Voice Dynamics; Time- Dimension.

Unit - V Value- Based Text Readings

Following essays form the suggested text book with emphasis on Mechanics of writing,

(i) The Aims of Science and the Humanities by M.E. Prior

(ii) The Language of Literature and Science by A.Huxley

(iii) Man and Nature by J.Bronowski

(iv) The Mother of the Sciences by A.J.Bahm

(v) Science and Survival by Barry Commoner

(vi) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior

(vii) The Effect of Scientific Temper on Man by Bertrand Russell.

MCA-212: COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

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Unit-I

Floating point Arithmetic: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation, Errors in numerical computation

Iterative Methods: Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.

Unit-II

Simultaneous Linear Equations: Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Seidal iterative method, Rate of Convergence

Interpolation and approximation: Finite Differences, Difference tables

Polynomial Interpolation: Newton's forward and backward formula

Central Difference Formulae: Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula.

Interpolation with unequal intervals: Langrange's Interpolation, Newton Divided difference formula, Hermite's Interpolation

Approximation of function by Taylor's series and Chebyshev polynomial

Unit-III

Numerical Differentiation and Integration: Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule, Weddle's Rule Euler- Maclaurin Formula

Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method,

Runge-Kutta methods, Predictor-corrector method, Automatic error monitoring, stability of solution.

Unit-IV

Curve fitting, Cubic Spline and Approximation: Method of least squares, fitting of straight lines, polynomials, exponential curves etc

Frequency Chart: Different frequency chart like Histogram, Frequency curve, Pi-chart.

Regression analysis: Linear and Non-linear regression, Multiple regression

Unit-V

Time series and forcasting: Moving averages, smoothening of curves, forecasting models and methods. Statistical Quality Controls methods

Testing of Hypothesis: Test of significance, Chi-square test, t-test, ANOVA, F-Test

Application to medicine, agriculture etc.

References:

MCA-213 : DATA STRUCTURES USING 'C'

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Unit -I

Introduction: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off

Arrays: Array Definition, Representation and Analysis, Single and Multidimensional Arrays, address calculation, application of arrays, Character String in C, Character string operation, Array as Parameters, Ordered List, Sparse Matrices, and Vectors.

Stacks: Array Representation and Implementation of stack, Operations on Stacks: Push & Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack.

Recursion: Recursive definition and processes, recursion in C, example of recursion, Tower of Hanoi Problem, simulating recursion. Backtracking, recursive algorithms, principles of recursion, tail recursion, removal of recursion.

Unit - II

Queues: Array and linked representation and implementation of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Circular queue, Deque, and Priority Queue.

Linked list: Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

Unit - III

Trees: Basic terminology, Binary Trees, Binary tree representation, algebraic Expressions, Complete Binary Tree. Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary trees, Huffman algorithm.

Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.

Unit - IV

***Sorting**: Insertion Sort, Bubble Sorting, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.*

Binary Search Trees: Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit - V

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

File Structures: Physical Storage Media File Organization, Organization of records into Blocks, Sequential Files, Indexing and Hashing, Primary indices, Secondary indices, B+ Tree index Files, B Tree index Files, Indexing and Hashing Comparisons.

MCA-215 : COMPUTER ORGANIZATION

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Unit-I

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Microoperation, Arithmetic Logic Shift Unit, Design of Fast address, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.

Unit-II

Control Design:

Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, Performing of arithmetic or logical operations, Fetching a word from memory, storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control(Microinstruction, Microprogram sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Prefetching Microinstruction).

Unit-III

Processor Design:

Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer.

Unit -IV

Input-Output Organization:

I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor, Serial Communication.

Unit-V

Memory Organization:

Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and $2^{1/2}$D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.

U.P. TECHNICAL UNIVERSITY LUCKNOW

Syllabus

MASTER OF COMPUTER APPLICATIONS LAB

1st Year (I and II Semester)

U P TECHNICAL UNIVERSITY, LUCKNOW

MCA (Master of Computer Applications)

YEAR-I SEMESTER-I

Sl. No	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	SUBJET TOTAL
			L	T	P	CT	TA	Total		
PRACTICALS										
6	MCA-151	Programming Lab	0	0	3	30	20	50	50	100
7	MCA-152	Language Lab	0	0	3	30	20	50	50	100

YEAR-I SEMESTER-II

Sl. No	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	SUBJET TOTAL
			L	T	P	CT	TA	Total		
PRACTICALS										
6	MCA-251	Data Structures Lab	0	0	3	30	20	50	50	100
7	MCA-252	Computer Based Numerical and Statistical Techniques Lab	0	0	3	30	20	50	50	100

MCA-151 : PROGRAMMING LAB

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Suggested Assignments to be conducted on a 3-hour lab slot. It will be conducted in tandem with the theory course so the topics for problems given in the lab are already initiated in the theory class. The topics taught in the theory course should be appropriately be sequenced for synchronization with the laboratory. A sample sequence of topics and lab classes for writing the program on the topic are given below:

1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals statements
4. Branching statement
5. Iteration
6. Functions
7. Recursion
8. Arrays
9. Structures & Union
10. Dynamic Memory Allocation
11. Introduction to pointers
12. Stacks
13. Queue
14. Linked lists
19. Binary Trees
15. Searching (Sequential Searching , Binary Searching)
16. Sorting (Bubble sorting , Insertion Sorting , Selection Sorting)
17. File Handling Operations (Like fopen , fclose , fread , fwrite etc) implementation of programs using these file operations

MCA-152 : LANGUAGE LAB

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Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

Practical in Communication to enhance the Oral Communication and Presentation Skills.

LIST OF PRACTICALS

1. Introduction to Phonetic Transcription : International Phonetic Alphabet (I.P.A)
2. Practices on Accent, Stress, Intonation and Rhythm
3. Communication Skills in Professional and Personal front with variety of situations provided.
4. Role play.
5. Writing and Oral presentation techniques with emphasis on Kinesics, Proxemics and Paralinguistic's.
6. Reading and Listening Comprehension.
7. Picture/ Thematic expression.
8. Seminar/ Conference Presentation.
9. Brain storming: To develop the debating skills .
10. Group discussion
11. Narration/ Story Formation.
12. Short play performance and Communication (Eclogue)

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MCA-251 : DATA STRUCTURES LAB

Write Program in C or C++ for following:

1. Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort, Heap Sort
2. Searching programs: Linear Search, Binary Search.
3. Array implementation of Stack, Queue, Circular Queue, Linked List.
4. Implementation of Stack, Conversion of infix to Postfix & Prefix notation ,Evaluation of Postfix Expression
5. Implementation of Recursion
6. Queue, Circular Queue, Linked List using dynamic memory allocation.
7. Implementation of Binary tree.
8. Program for Tree Traversals (preorder, inorder, postorder).
9. Program for graph traversal (BFS, DFS)
10. Program for finding shortest path using Floyd Warshell Algorithm.
11. Program for minimum cost spanning tree, shortest path.

MCA-252 : COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES LAB

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Write programs in C

1. To implement floating point arithmetic operations i.e., addition, subtraction, multiplication and division.

2. To implement methods of root finding of Algebraic and trance dental equations using Bisection, Newton Raphson, false position and list the amount of errors in each iteration.

3. Implementation of Gaussian Elimination and Gauss Seidal iterative method to solve system of algebraic equations.

4. Implementation of Interpolation methods for eg. Langranges, Newton's Forward and Newton's Backward Methods etc.

5. To implement method of least square curve fitting.

6. Implement numerical differentiation methods.

7. Implement numerical integration using Simpson's 1/3 and 3/8 rules, trapezoidal rule.

8. Implementation of Runge Kutta Forth order method for solving differential equation.

NOTE- Instructor may add some more experiments at his level.