U.P. TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

[Effective from the Session : 2008-09]

MASTER OF COMPUTER APPLICATIONS
1st Year (I and II Semester)
## U P TECHNICAL UNIVERSITY, LUCKNOW

### STUDY AND EVALUATION SCHEME

**MCA (Master of Computer Applications)**  
(Effective from session 2008-09)

**YEAR-I SEMESTER-I**

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>COURSE CODE</th>
<th>SUBJECT</th>
<th>PERIODS</th>
<th>EVALUATION SCHEME</th>
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**YEAR-I SEMESTER-II**

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<td>Data Structures using C</td>
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Unit -I 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.

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.

Text Book
1. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, New Delhi.
**Reference Books**

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, 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)

**SUGGESTED READINGS**
UNIT 1:
Introduction to any Operating System [Unix, Linux, Windows], Programming Environment, Write and Execute the first program, Introduction to the Digital Computer; Concept of an algorithm; termination and correctness. Algorithms to programs: specification, top-down development and stepwise refinement. Introduction to Programming, Use of high level programming language for the systematic development of programs. Introduction to the design and implementation of correct, efficient and maintainable programs, Structured Programming, Trace an algorithm to depict the logic, Number Systems and conversion methods

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.

UNIT 4:
Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size, Structures: Purpose and usage of structures, declaring structures, assigning of structures, Pointers to Objects: Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments, Dynamic memory allocation, defining and using stacks and linked lists.

UNIT 5:

Lecture-wise Break-UP

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture 1</th>
<th>Lecture 2</th>
<th>Lecture 3</th>
<th>Lab Meeting</th>
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<tbody>
<tr>
<td>Week-2</td>
<td>An Example, Termination, Correctness</td>
<td>Different Types of Programming Languages</td>
<td>Number Systems</td>
<td>Get familiar with C compiler Implement and Test Small Routine in C</td>
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<tr>
<td>Week-3</td>
<td>Number Systems</td>
<td>Standard I/O in C</td>
<td>Data Types and Variables</td>
<td>Implement and Test Small Routine in C</td>
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<td>Week-4</td>
<td>Data Types and Variable</td>
<td>Data Types and Variable</td>
<td>Operators &amp; Expression</td>
<td>Evaluation of Expression</td>
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<tr>
<td>Week-5</td>
<td>Operators &amp; Expression</td>
<td>Operators &amp; Expression</td>
<td>Operators &amp; Expression</td>
<td>Evaluation of Expression</td>
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<td>Week-6</td>
<td>IF, SWITCH Statements</td>
<td>IF, SWITCH Statements</td>
<td>Nested If Statement</td>
<td>Iteration</td>
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<td>Week-7</td>
<td>Repetition structure in C</td>
<td>Repetition structure in C</td>
<td>Modular Programming</td>
<td>Iteration, Function</td>
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<td>Week-8</td>
<td>Modular Programming</td>
<td>Modular Programming</td>
<td>Arrays</td>
<td>Recursion, Function</td>
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<td>Week-9</td>
<td>Arrays</td>
<td>Structures</td>
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<td>Arrays, Structures</td>
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<td>Week-10</td>
<td>Pointers</td>
<td>Pointers</td>
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<td>Linked Lists</td>
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<td>Week-11</td>
<td>Searching</td>
<td>Selection</td>
<td>Sorting</td>
<td>Searching, Selection</td>
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<tr>
<td>Week-12</td>
<td>Sorting</td>
<td>Strings</td>
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<td>Week-13</td>
<td>Files</td>
<td>Files</td>
<td>Std C Preprocessor</td>
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<td>Week-14</td>
<td>Std C Library</td>
<td>Std C Library</td>
<td>Std C Library</td>
<td>Use of Std. C Library</td>
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**Text Books:**
MCA-114 : DISCRETE MATHEMATICS

Unit-I:

Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets
Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions.
Notion of Proof: Proof by counter-example, the contra-positive, proof by contradiction, inductive proofs.

Unit-II:

Algebraic Structures: Definition, Properties, types: Semi Groups, Monoid, Groups, Abelian group, properties of groups, Subgroup, cyclic groups, Cosets, factor group, Permutation groups, Normal subgroup, Homomorphism and isomorphism of Groups, example and standard results, Rings and Fields: definition and standard results.

Unit-III:

Boolean Algebra: Basic definitions, Sum of Products and Product of Sums, Form in Boolean Algebra, Logic gates and Karnaugh maps.
Graphs: Simple graph, multi graph, graph terminology, representation of graphs, Bipartite, Regular, Planar and connected graphs, connected components in a graph, Euler graphs, Hamiltonian path and circuits, Graph coloring, chromatic number, isomorphism and Homomorphism of graphs.
Tree: Definition, Rooted tree, properties of trees, binary search tree, tree traversal.

Unit-IV:

Propositional Logic: Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence, predicates, Universal and existential quantifiers.

Unit-V:

Combinatorics: Basic Counting Technique, Pigeon-hole Principle, Recurrence Relation, Generating function, Polya's Counting Theorem

Text books and Supplementary reading:
3. Graph Theory With Applications to Engineering and Computer Science, By Prentice Hall, Englewood Cliffs, N. J, 1974
UNIT I (8 Sessions)

UNIT II (10 Sessions)
Attitude: Concept, Process and Importance, Attitude Measurement. Attitudes and Workforce Diversity.
Personality: Concept, Nature, Types and Theories of Personality Shaping, Personality Attitude and Job Satisfaction.
Learning: Concept and Theories of Learning.

UNIT III (10 Sessions)
Motivation: Concepts and Their Application, Principles, Theories, Employee Recognition, Involvement, Motivating a Diverse Workforce.
Leadership: Concept, Function, Style and Theories of Leadership-Trait, Behavioural and Situational Theories.
Analysis of Interpersonal Relationship, Group Dynamics: Definition, Stages of Group Development, Group Cohesiveness, Formal and Informal Groups, Group Processes and Decision Making, Dysfunctional Groups.

UNIT IV (12 Sessions)
Organisational Power and Politics: Concept, Sources of Power, Distinction Between Power, Authority and Influence, Approaches to Power, Political Implications of Power: Dysfunctional Uses of Power.
Knowledge Management & Emotional Intelligence in Contemporary Business Organisation
Conflict: Concept, Sources, Types, Functionality and Dysfunctionality of Conflict, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organisational, Resolution of Conflict, Meaning and Types of Grievance and Process of Grievance Handling.
Stress: Understanding Stress and Its Consequences, Causes of Stress, Managing Stress.

Suggested Reading:
2. Luthans Fred - Organizational Behaviour (Tata Mc Graw Hill)
Suggested Assignments to be conducted on a 3-hour 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 the topic are given below:

1. Familiarization of a computer and the environment and execution of sample programs
2. Expression evaluation
3. Conditionals and branching
4. Iteration
5. Functions
6. Recursion
7. Arrays
8. Structures
9. Linked lists
10. Data structures

It is suggested that some problems related to continuous domain problems in engineering and their numerical solutions are given as laboratory assignments. It may be noted that some of basic numerical methods are taught in the Mathematics course.
Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A.)

LIST OF PRACTICALS
1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational Skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics/Kinesics.
4. Presentation Skills for Technical Paper/Project Reports/ Professional Reports based on proper Stress and Intonation Mechanics.
5. Official/Public Speaking based on suitable Rhythmic Patterns.
6. Theme- Presentation/ Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehension Skills based on Reading and Listening Practicals on a model Audio-Visual Usage.

Reference Books
MCA-211 : ENVIRONMENTAL SCIENCE AND ETHICS

L T P
3 1 0
MCA-212: COMPUTER BASED NUMERICAL AND
STATISTICAL TECHNIQUES

L T P
3 1 0

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

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

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 forecasting: Moving averages, smoothing 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:
7. Francis Scheld, “Numerical Analysis”, TMH
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.


**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


**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**


**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.

**References**

**Text Books**

**Reference Books**
UNIT I (8 Sessions)


Business Ethics and Social Responsibility: Concept, Shift to Ethics, Tools of Ethics.

UNIT II (10 Sessions)
Introduction to Functions of Management


UNIT III (10 Sessions)

Directing: Concept, Direction and Supervision
Motivation: Concept, Motivation and Performance, Theories Of Motivation, Approaches for Improving Motivation, Pay and Job Performance, Quality of Work Life, Morale Building.

UNIT IV (12 Sessions)
Leadership: The Core of Leadership: Influence, Functions of Leaders, Leadership Style, Leadership Development.
Communication: Communication Process, Importance of Communication, Communication Channels, Barriers to Communication.


Suggested Reading:
**Unit-I**

**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.

**Text Book**
1. Computer System Architecture, M. Mano(PHI)

**Reference Books**
1. Computer Organization, Vravice, Zaky & Hamacher (TMH Publication)
2. Structured Computer Organization, Tannenbaum(PHI)
3. Computer Organization, Stallings(PHI)
Write Program in C or C++ for following:

- Sorting programs: Bubble sort, Merge sort, Insertion sort, Selection sort, and Quick sort.
- Searching programs: Linear Search, Binary Search.
- Array implementation of Stack, Queue, Circular Queue, Linked List.
- Implementation of Stack, Queue, Circular Queue, Linked List using dynamic memory allocation.
- Implementation of Binary tree.
- Program for Tree Traversals (preorder, inorder, postorder).
- Program for graph traversal (BFS, DFS).
- Program for minimum cost spanning tree, shortest path.
Write programs in C

- To implement floating point arithmetic operations i.e., addition, subtraction, multiplication and division.
- To deduce errors involved in polynomial interpolation. Algebraic and transcendental equations using Bisection, Newton Raphson, Iterative, method of false position, rate of conversions of roots in tabular form for each of these methods.
- To implement formulae by Bessels, Newton, Stirling, Langranges etc.
- To implement method of least square curve fitting.
- Implement numerical differentiation.
- Implement numerical integration using Simpson's 1/3 and 3/8 rules, trapezoidal rule.
- To show frequency chart, regression analysis, Linear square fit, and polynomial fit.

**NOTE**- Institutions are required to add four more experiments as per available expertise with them.