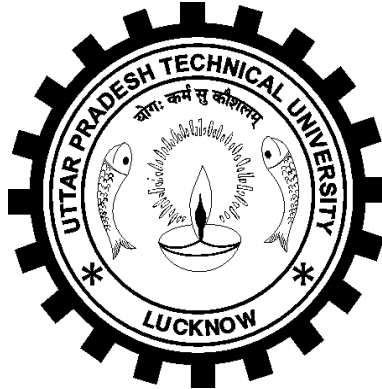# UTTAR PRADESH TECHNICAL UNIVERSITY, LUCKNOW

Syllabus

for

[Effective from session 2013-14]

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 2013-14)

YEAR-I SEMESTER-I

Sl. No	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	SUBJET TOTAL
			L	T	P	CT	TA	Total		
1	NAS-104	Professional Communication	3	1	0	30	20	50	100	150
2	NMCA-112	Accounting and Financial Management	3	1	0	30	20	50	100	150
3	NMCA-113	Computer Concepts and Programming	3	1	0	30	20	50	100	150
4	NMCA-114	Discrete Mathematics	3	1	0	30	20	50	100	150
5	NMCA-115	Digital Logic Design	3	1	0	30	20	50	100	150
PRACTICALS										
6	NMCA-151	Programming Lab	0	0	3	30	20	50	50	100
7	NAS-154	Professional Communication Lab	0	0	3	30	20	50	50	100
8	GP-101	General Proficiency	0	0	0	-	-	50	-	50
		TOTAL	15	5	6					1000

YEAR-I SEMESTER-II

Sl. No	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	SUBJET TOTAL
			L	T	P	CT	TA	Total		
1	NAS105/ NAS 205	Environment and Ecology	3	1	0	30	20	50	100	150
2	NMCA-212	Computer based Numerical and Statistical Techniques	3	1	0	30	20	50	100	150
3	NMCA-213	Data Structure Using 'C'	3	1	0	30	20	50	100	150
4	NMCA-214	Introduction to Automata Theory and Languages	3	1	0	30	20	50	100	150
5	NMCA-215	Computer Organization	3	1	0	30	20	50	100	150
PRACTICALS										
6	NMCA-251	Data Structures Lab	0	0	3	30	20	50	50	100
7	NMCA-252	Computer Based Numerical and Statistical Techniques Lab	0	0	3	30	20	50	50	100
8	GP-201	General Proficiency	0	0	0	-	-	50	-	50
		TOTAL	15	5	6					1000

NAS-104/NAS-204 : PROFESSIONAL COMMUNICATION

L T P
3 1 2

Unit-1 Fundamentals of Communication
Technical Communication: features: Distinction between General and Technical communication; Language as a tool of communication; Levels of communication: Interpersonal, Organizational, Mass communications; The flow of Communication: Downward, Upward, Lateral of 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; **Correct Usage**: all Parts of Speech; Modals; Concord; Articles; Infinitives; Requisites of Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial, Linear, Chronological etc; The Art of Condensation-various steps.

Unit-III Business Communication
Principles, Sales & Credit letters;
Claim and Adjustment Letters; Job application and Resumes**.**
Reports: Types; Significance; Structure, Style & Writing of Reports.
Technical Proposal; Parts; Types; Writing of Proposal; Significance.
Negotiation & Business Presentation skills.

Unit-IV Presentation Strategies and Listening Skills.
Defining Purpose; Audience & Local; Organizing Contents; Preparing Outline; Audio-visual Aids; Nuances of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Listening Skills: Active Listening, Passive Listening. methods for improving Listening Skills.

Unit-V Value-Based Text Readings
Following essays form the suggested text book with emphasis on Mechanics of writing.
(i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
(ii) The Language of Literature and Science by A. Huxley
(iii) Man and Nature by J.Bronowski
(iv) The Social Function of Literature by Ian Watt
(v) Science and Survival by Barry Commoner
(vi) The Mother of the Sciences by A.J.Bahm
(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, 2001, New Delhi..
2. Technical Communication: A Practical Approach: Madhu Rani and Seema Verma- Acme Learning, New Delhi-2011
3. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press,2007, New Delhi.

Reference Books
1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt.Ltd,2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C.Sharma & Krishna Mohan, Tata McGraw Hill & Co.Ltd.,2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R.Goyal Pub. &Distributors, 2009,Delhi.
4. Developing Communication Skills by Krishna Mohan, Mecra Bannerji- Macmillan India Ltd. 1990, Delhi.
5. Manual of Practical Communication by L.U.B.Pandey: A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2013, Delhi.
6. English Grammar and Usage by R.P.Sinha, Oxford University Press, 2005, New Delhi.
7. Spoken English- A manual of Speech and Phonetics by R.K.Bansal & J.B.Harrison, Orient Blackswan, 2013, New Delhi.
8. Business English by Ken Taylor, Orient Blackswan, 2011, New Delhi.

NMCA 112
ACCOUNTING AND FINANCIAL MANAGEMENT

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.

Suggested Readings

1) Narayanswami -   Financial Accounting: A Managerial Perspective (PHI, 2nd Edition).
2) Mukherjee   - Financial Accounting for   Management   (TMH,   1st Edition).
3) Ramchandran & Kakani - Financial Accounting for Management (TMH, 2nd Edition).
4) Ghosh T P   - Accounting and Finance   for Managers (Taxman,   1st Edition).
5) Maheshwari S.N & Maheshwari S K – An Introduction to Accountancy (Vikas, 9th Edition)
6) Ashish K. Bhattacharya-   Essentials of   Financial Accounting (PHI,   New Delhi)
7) Ghosh T.P- Financial   Accounting   for Managers (Taxman,   3rd   Edition)
(i) Maheshwari S.N & Maheshwari S K – A text book of Accounting for Management (Vikas, 1st Edition)
(ii) Gupta Ambrish - Financial Accounting for Management (Pearson Education, 2nd Edition)
(iii) Chowdhary Anil - Fundamentals of Accounting and Financial Analysis (Pearson Education, 1st Edition).

NMCA-113
COMPUTER CONCEPTS AND PROGRAMMING

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++.

Text Books:
1. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
2. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
3. C programming by Kernighan and Ritchie, PHI
4. Computer Fundamentals and Programming in C. Reema Thareja, Oxford Publication
5. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
6. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication
7. Programming in C A Practical approach by Ajay Mittal, Pearson Publication
8. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

Reference:
1. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
2. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition [India Edition], 2007.
3. Object- Oriented Programming In C++ by Rajesh K Shukla

NMCA-114
DISCRETE MATHEMATICS

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.

Text Books:

(iv)   Discrete Mathematics and Its Applications, Kenneth H. Rosen, McGraw-Hill, 2006.
(v)   Discrete Mathematical Structures, B. Kolman, R. C. Busby, and S. C. Ross, Prentice Hall, 2004.
(vi)   Discrete and Combinatorial Mathematics, R.P. Grimaldi, Addison Wesley, 2004.
(vii)   Discrete Mathematical Structures, Y N Singh, Wiley-India, First Edition, 2010.

NMCA-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.

Suggested Readings:
1. M. Morris Mano and M. D. Ciletti, "DigitalDesign", 4th Edition, Pearson Education
2. Hill & Peterson, "Switching Circuit & Logic Design", Wiley.

NMCA-151
Programming Lab

Write a program in C/ C++ :
1. that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. that calculates the Simple Interest and Compound Interest. (The Principal, Amount, Rate of Interest and Time are entered through the keyboard).
3. to calculate the area and circumference of a circle.
4. that accepts the temperature in Centigrade and converts into Fahrenheit using the formula C/5=(F-32)/9.
5. that swaps values of two variables using a third variable.
6. that checks whether the two numbers entered by the user are equal or not.
7. to find the greatest of three numbers.
8. that finds whether a given number is even or odd.
9. that tells whether a given year is a leap year or not.
10. to demonstrate the use of switch case statement.
11. to understand the concept of pointers.
12. to print the sum of all numbers up to a given number.
13. to find the factorial of a given number.
14. to print sum of even and odd numbers from 1 to N numbers.
15. to print the Fibonacci series.
16. to check whether the entered number is prime or not.
17. to find the sum of digits of the entered number.
18. to find the reverse of a number.
19. to print Armstrong numbers from 1 to 100.
20. to convert binary number into decimal number and vice versa.
21. that simply takes elements of the array from the user and finds the sum of these elements.
22. that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and prints them.
23. to find the minimum and maximum element of the array.
24. to search an element in a array using Linear Search.
25. to sort the elements of the array in ascending order using Bubble Sort technique.
26. to add and multiply two matrices of order nxn.
27. that finds the sum of diagonal elements of a mxn matrix.
28. to implement strlen (), strcat (),strcpy () using the concept of Functions.
29. to demonstrate the structure and union.
30. to implement different file handling functions.
31. to demonstrate the object oriented concepts.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NAS-154/NAS-254 : PROFESSIONAL COMMUNICATION LABORATORY PRACTICALS

L T P
0 0 2

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

1. Bansal R.K. & Harrison: Phonetics in English, Orient Longman, New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B.Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

NAS 105/ NAS 205
ENVIRONMENT AND ECOLOGY

UNIT-I: Nature of Environment
Introduction to Environmental Science - Definition and scope and need for public awareness Ecosystems - Concept, structure and functions, restoration of damaged ecosystems

Biodiversity – Definition, description at national and global level, threats and conservation Natural Resources - Renewable and non-renewable and their equitable use for sustainability, Material cycles – carbon, nitrogen and sulphur cycle.

Conventional and Non-conventional Energy Sources – fossil fuel-based, hydroelectric, wind, -nuclear and solar energy, biomass, biodiesel, hydrogen as an alternative fuel

UNIT-II: Impact of Human Activity on Environment
Human Population and Environment – Population growth, population explosion and migration; Impact of farming, housing, mining, transportation and industrial growth

Social Issues Related to Environment– Sustainable development, urban problems (related to water and energy conservation and waste management), resettlement and rehabilitation Environmental ethics

UNIT-III: Environmental Changes and Human Health
Environmental Pollution–Definition, causes and effects, control measures for water, air, soil, marine, land, noise, thermal pollution,

Climate change– Greenhouse effect and global warming**,** acid rain**,** ozone layer formation and depletion

Impact on human health – water and air borne diseases, diseases induced by residual impurities in drinking water (fluoride and arsenic); Toxic wastes and carcinogens; Nuclear hazards

UNIT- IV: Environmental Protection through Assessment and Education
Indicators and Impact Assessment **–** Bio-indicators, Natural disasters and disaster management, Impact assessment through inventorying and monitoring

Environmental Protection– Role of individuals, organizations and government in pollution control

Laws, Conventions and Treaties–National legislation, issues in the enforcement of environmental legislation, initiatives by non- governmental organizations, global efforts in environmental protection

Environmental education–women and value education

Recommended Textbook:
> Environmental Studies, J Krishnawamy , R J Ranjit Daniels, Wiley India.

Recommended Reference Books:
1. Environmental Science, Bernard J. Nebel, Richard T. Right, 9780132854467, Prentice Hall Professional 1993.
2. Environment and Ecology, R K Khandal, 978-81-265-4277-2, Wiley India.
3. Environmental Science, 8th Ed ISV, Botkin and Keller, 9788126534142, Wiley India.
4. Environmental Studies, R Rajagopalan, 978-0195673937, Oxford University Press
5. Textbook of Environmental Science and Technology, M.Anjireddy, BS Publications
6. Environmental Studies, Soli. J Arceivala, Shyam, R Asolekar, 9781259006050, McGrawHill India, 2012.
7. Environmental Studies, D.L. Manjunath, 9788131709122 Pearson Education India, 2007
8. Textbook of Environment Ecology , Singh, Acme Learning
9. Perspective in Environmental Studies, Kaushik, New Age International
10. Environmental Studies, B. Joseph, 2nd Ed, 978-0070648134, Tata McGraw Hill

NMCA-212
COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

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:
1. Rajaraman V., "Computer Oriented Numerical Methods", PHI
2. Gerald & Wheatley, "Applied Numerical Analyses", AW
3. Jain, Iyengar and Jain, "Numerical Methods for Scientific and Engineering Computations", New Age Int.
4. Grewal B. S., "Numerical methods in Engineering and Science", Khanna Publishers, Delhi
5. T. Veerarajan, T Ramachandran, "Theory and Problems in Numerical Methods", TMH
6. Pradip Niyogi, "Numerical Analysis and Algorithms", TMH
7. Francis Scheld, "Numerical Analysis", TMH
9. Gupta S. P., "Statistical Methods", Sultan and Sons

NMCA-213
DATA STRUCTURES USING 'C'

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.

References
Text Books
1. Y. Langsam, M. Augenstin and A. Tannenbaum, Data Structures using C and C++, Pearson Education Asia, 2nd Edition, 2002.
2. Ellis Horowitz, S. Sahni, D. Mehta Fundamentals of Data Structures in C++, Galgotia Book Source, New Delhi.

Reference Books
1. S. Lipschutz, Data Structures Mc-Graw Hill International Editions, 1986.
2. Jean-Paul Tremblay, Paul. G. Soresan, An introduction to data structures with Applications, Tata Mc-Graw Hill International Editions, 2nd edition 1984.
3. A. Michael Berman, Data structures via C++, Oxford University Press, 2002.
4. M. Weiss, Data Structures and Algorithm Analysis in C++, Pearson Education, 2002, 2nd edition.

NMCA - 214

INTRODUCTION TO AUTOMATA THEORY AND LANGUAGES

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.

Text Books:
1. Introduction to Automata theory, Languages and Computation, J.E.Hopcraft, R.Motwani, and Ullman. 2nd edition, Pearson Education Asia
2. Introduction to languages and the theory of computation, J Martin, 3rd Edition, Tata McGraw Hill
3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI
4. Mathematical Foundation of Computer Science, Y.N.Singh, New Age International

NMCA-215
COMPUTER ORGANIZATION

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.

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)
4.   Computer Organization, John P.Hayes (McGraw Hill)

NMCA-251
DATA STRUCTURES LAB

Write a Program in C or C++ for:
1. **Sorting:** Bubble sort, Selection sort and Quick sort.
2. **Searching** : Linear Search and Binary Search.
3. Array implementation of Stack and Circular Queue.
4. Dynamic implementation of Stack, Linked List and Circularly Linked List.
5. to realize the creation of Binary Search Tree.
6. for post order tree traversal.
7. to realize graph data structure.
8. to obtain minimum cost spanning tree of a given weighted graph.
9. to find shortest path using Warshal's algorithm and Dijikstra algorithm.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

NMCA-252
COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES LAB

Write a program in C:
1. to demonstrate the errors produced during numerical computations with floating point numbers.
2. to find roots of algebraic / trancedental equations using Bisection, Newton Raphson, regul-falsi methods.
3. to determine interpolating polynomial using Langrange method, Newton's divided difference method of interpolation
4. to implement method of least square curve fitting.
5. to determine numerical differentiation.
6. to implement numerical integration using Trapezoidal rule and Simpson's 3/8 rules.
7. to implement Runge-Kutta second order and fourth order method for solving differential equations
8. to implement Predictor-Corrector method for solving differential equations
9. to display various types of frequency chart

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.