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**COURSES OF STUDY, SCHEME OF EXAMINATION & SYLLABUS**

**FOR**

**M.C.A. (MASTER OF COMPUTER APPLICATION)**

**I Year (I&II Semester)**

**(Effective from the session: 2010-2011)**



**Uttarakhand Technical University, Dehradun**

## M.C.A. (MASTER OF COMPUTER APPLICATION)

### 1.0 COURSE OUTLINE AND SCHEME OF EXAMINATION

#### YEAR-1, SEMESTER-I

#### COURSES OF STUDY

S.N O.	SUBJECT CODE	SUBJECT	CONTACT HRS.	CREDIT
1	MCA-101	Mathematical Foundation of Computer Science	3-1-0	4
2	MCA-102	Principles of Financial Accounting	3-1-0	4
3	MCA-103	Fundamental of Computer and Digital Electronics	3-1-0	4
4	MCA-104	Programming Fundamentals and 'C' Programming	3-1-0	4
5	MCA-105	Logic and Its Applications	2-0-0	2
6	MCA-106	Technical Writing & Communication Skills	2-0-0	2
<b>PRACTICALS</b>				
7	MCA-111	Programming Lab	0-0-2	2
8	MCA-112	Communication Skill Lab.	0-0-2	2
9	MCA-113	Digital Electronics Lab	0-0-2	2
10	MCA 114	Seminar	0-0-4	4
		Total		30

### SCHEME OF EXAMINATION

S. No.	SUBJECT CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	Subject Total
			L	T	P	CT	TA	Total		
1	MCA-101	Mathematical Foundation of Computer Science	3	1	0	30	20	50	100	150
2	MCA-102	Principles of Financial Accounting	3	1	0	30	20	50	100	150
3	MCA-103	Fundamental of Computer and Digital Electronics	3	1	0	30	20	50	100	150
4	MCA-104	Programming Fundamentals and 'C' Programming	3	1	0	30	20	50	100	150
5	MCA-105	Logic and Its Applications	2	0	0	15	10	25	50	75
6	MCA-106	Technical Writing & Communication Skills	2	0	0	15	10	25	50	75
<b>TOTAL (Theory)</b>										<b>750</b>
<b>PRACTICALS</b>										
7	MCA-111	Programming Lab	0	0	2		25	25	25	50
8	MCA-112	Communication Skill Lab.	0	0	2		25	25	25	50
9.	MCA-113	Digital Electronics Lab	0	0	2		25	25	25	50
10	MCA 114	Seminar	0	0	4		50	50	50	100
<b>Total (Practical)</b>										<b>250</b>
<b>Total (Theory + Practical)</b>			<b>16</b>	<b>4</b>	<b>10</b>					<b>1000</b>

TA – Teacher Assessment      CT – Cumulative Test      ESE – End Semester Examination  
Note: Duration of ESE shall be 3 (Three) hours.

**YEAR – I, SEMESTER – II**

**COURSES OF STUDY**

<b>S. N O.</b>	<b>SUBJECT CODE</b>	<b>SUBJECT</b>	<b>CONTACT HRS.</b>	<b>CREDIT</b>
1	MCA-201	Organizational Structure and Personnel Management	2-0-0	2
2	MCA-202	Data Structures	3-1-0	4
3	MCA-203	Computer Organization	3-1-0	4
4	MCA-204	Computer Based Numerical & Statistical Techniques	2-0-0	2
5	MCA-205	Operating System	3-1-0	4
6	MCA-206	Object Oriented Programming	3-1-0	4
<b>PRACTICALS</b>				
7	MCA-211	Data Structure Lab	0-0-2	2
8	MCA-212	CBNST Lab	0-0-2	2
9	MCA-213	Object Oriented Programming Lab	0-0-2	2
10	MCA 215	Colloquium	0-0-4	4
Total				30

### SCHEME OF EXAMINATION

S. No.	COURSE CODE	SUBJECT	PERIODS			EVALUATION SCHEME				
						SESSIONAL EXAM			ESE	Subject Total
			L	T	P	CT	TA	Total		
1	MCA-201	Organizational Structure and Personnel Management	2	0	0	15	10	25	50	75
2	MCA-202	Data Structures	3	1	0	30	20	50	100	150
3	MCA-203	Computer Organization	3	1	0	30	20	50	100	150
4	MCA-204	Computer Based Numerical & Statistical Techniques	2	0	0	15	10	25	50	75
5	MCA-205	Operating System	3	1	0	30	20	50	100	150
6	MCA-206	Object Oriented Programming	3	1	0	30	20	50	50	100
<b>TOTAL (Theory)</b>										750
<b>PRACTICALS</b>										
7	MCA-211	Data Structure Lab	0	0	2		25	25	25	50
8	MCA-212	CBNST Lab	0	0	2		25	25	25	50
9	MCA-213	Object Oriented Programming Lab	0	0	2		25	25	25	50
11	MCA-214	Colloquium	0	0	4		50	50	50	100
<b>Total (Practical)</b>										250
<b>Total (Theory + Practical)</b>			<b>16</b>	<b>4</b>	<b>10</b>					<b>1000</b>

TA – Teacher Assessment      CT – Cumulative Test      ESE – End Semester Examination  
Note: Duration of ESE shall be 3 (Three) hours

YEAR –I, SEMESTER –I

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3 1 0

## MCA 101 - MATHEMATICAL FOUNDATION OF COMPUTER SCIENCE

**Objectives:** The objective of this course is to present the foundations of many basic computer related concepts and provide a coherent development to the students for the courses like Fundamentals of Computer Organization, RDBMS, Data Structures, Analysis of Algorithms, Theory of Computation ,Cryptography, Artificial Intelligence and others. This course will enhance the student's ability to think logically and mathematically.

**Prerequisites:** Knowledge of basic concepts on Sets, different operations on sets, binary operations, functions.

### UNIT-I

RELATION: Type and compositions of relations, Pictorial representation of relations, Equivalence relations, Partial ordering relation. Function: Types, Composition of function, Recursively defined function  
Mathematical Induction: Piano's axioms, Mathematical Induction, Discrete Numeric Functions and Generating functions, Simple Recurrence relation with constant coefficients, linear recurrence relation without constant coefficients, Asymptotic Behavior of functions, Algebraic Structures: Properties, Semi group, monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups.

### UNIT II

Propositional Logic: Preposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers, Posets, Hasse Diagram,

### UNIT -III

Lattices: Introduction, Ordered set, Hasse diagram of partially ordered set, Consistent enumeration, Isomorhic ordered set, Well ordered set, Lattices, Properties of lattices, Bounded lattices, Distributive lattices, and Complemented lattices.

### UNIT-IV

Introduction to defining language, Kleene Closure, Arithmetic expressions, Chomsky Hierarchy, Regular expressions, Generalized Transition graph.  
finite Boolean algebra, functions of Boolean algebra.

### UNIT -V

Conversion of regular expression to Finite Automata, NFA, DFA, Conversion of NFA to DFA, Optimizing DFA, FA with our Moore machine, Mealy machine, Conversions.

### Text Books:

1. Bernard **Kolman**, Robert Busby, Sharon C. Ross, "*Discrete Mathematical Structures*", Sixth Edition, 2008, Pearson Education Inc., New Delhi. / Prentice Hall of India (PHI) Pvt. Ltd., New Delhi.

### Reference Books:

1. Kenneth H. **Rosen**, "*Discrete Mathematics and Its Applications*", Sixth Edition, 2008, Tata McGraw-Hill (TMH) Publications Pvt. Ltd., New Delhi.
2. D. S. **Malik** & M. K. Sen, "*Discrete Mathematical Structures*", First Edition, 2005, CENGAGE Learning India Pvt. Ltd., New Delhi.
3. Judith L. **Gersting**, "*Mathematical Structures for Computer Science: A Modern treatment to Discrete Mathematics*", Fifth / Sixth Edition (Asian Student Editions), 2008, W. H. Freeman & Company, New Delhi.
4. Richard **Johnsonbaugh**, "*Discrete Mathematics*", Seventh Edition, 2008, Pearson Education Inc., New Delhi.
5. C.L.Liu "Elements of Discrete Mathematics", McGraw Hill

**MCA 102 - PRINCIPLES OF FINANCIAL ACCOUNTING**

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**3 1 0**

**Objective:** The objective of this course is to provide awareness of the underlying financial structure and procedures of the organization so that the interaction of financial system with information systems can be understood by the information system designer.

**Prerequisite:** None

**Unit-1**

**Accounting:** Principles, concepts and conventions, double entry system of accounting, Ledger posting and Trial balance.

**Final accounts:** Trading, profit and loss accounts and balance sheet of sole proprietary concern with normal closing entries. Introduction to manufacturing account, final account of partnership firms, limited company.

**Unit-II**

**Financial Management:** Meaning, role and scope of financial management.

**Basic financial concepts:** Time value of Money, present value, future value of a series of cash flows, annuity. Practical applications of compounding and present value techniques.

**Long-term sources of finance:** Introduction to shares, debentures, preference shares.

**Unit-III**

**Capital Budgeting:** Meaning, importance, difficulties. Introduction to evaluation techniques – Traditional techniques (ARR Payback method). Discounting cash flow techniques (Present value, NPV, IRR)

**Ratio Analysis:** Meaning, advantages, limitations of ratio analysis, Types of ratios and their usefulness.

**Unit-IV**

**Costing:** Nature, importance and types of cost

**Marginal costing:** Nature, scope and importance of marginal costing, Break-even analysis, its uses and limitations, construction of break-even charts. Practical applications of marginal costing.

**Inventory control system:** The need, cost of inventory, methods of inventory costing.

**Unit-V**

**Introduction to Computerized Accounting System:** Coding logic and codes required, master files, transaction files, introduction to documents used for data collection. Processing of different files and outputs obtained.

**Text Book**

1. Khan & Jain, "Management Accounting", Tata McGraw Hill Publication

**Reference Books:**

1. Jawahar Lal, "Financial Accounting", Wheeler Publishing.
2. S.N. Maheswari & S. K. Maheswari, "Introduction to Financial Accountancy", Vikas Publication.

## MCA 103 – Fundamental of Computer and Digital Electronics

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**Objectives:** The objectives of this course is

- To learn the basic methods for the design of digital circuits and provide the fundamental concepts used in the computer systems, microprocessor etc.
- To provide an exposure to deal with various electronic circuits. At the end of the course the students will gain knowledge to design electronic circuits and for consumer and industrial products as well.

**Prerequisite: None**

### Unit-I

Introduction to Computer:-Definition, Characteristics. Generation of Computers, Capabilities and Limitations. Introduction to Operating System. Concept of Bios, Booting Files. Basic Components of a Computer System- Control Unit, ALU, Input/output functions and characteristics. Memory Introduction, Classifications- Volatile Memory and Non- Volatile , Flash Memory, ROM, RAM, EPROM, PROM, EEPROM other types of memory.

### Unit-II

Input, Output and storage Units:-Computer Keyboard, Pointing Devices: Mouse, Trackball, Touch Panel, and Joystick, Light Pen, Scanners, Various types of Monitors, Touch-sensitive screens, Optical Recognition System, Pen based systems, Digitizers, MICR, OCR, OMR, Bar-code Reader, digital camera. Hard Copy Devices:- Impact and Non- Impact Printers- Daisy Wheel, Dot Matrix, Line Printer, Chain Printer, Comb Printers, Non Impact Printers- DeskJet, Laser Printer, Thermal Transfer Printer, Barcode Printers, Electro static printers and plotters.

### Unit-III

High Level Language and Low Level Language, Software and its different types- System Software, Application software. Hardware , Firmware, , Compiler, Interpreter and Assembler. File Allocation Table (FAT, FAT 32 & NTFS). Introduction to algorithm and Flow chart: - Representation of an algorithm, flowchart symbols and levels of flow chart, rules, advantage and limitations of flowchart and pseudo code.

### Unit-IV

Binary, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binary numbers. Binary Arithmetic- Binary codes: Weighted –BCD-2421-Gray code-Excess 3 code-ASCII –Error detecting code – conversion from one code to another-Boolean postulates and laws –De-Morgan’s Theorem- Principle of Duality- Boolean expression – Boolean function- Minimization of Boolean expressions – Sum of Products (SOP) –Product of Sums (POS)- Minterm- Maxterm- Canonical forms – Conversion between canonical forms – Karnaugh map Minimization – Don’t care conditions.

### Unit-V

LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR- Implementations of Logic Functions using gates, NAND –NOR implementations –Multi level gate implementations- Multi output gate implementations.

COMBINATIONAL CIRCUITS:Design procedure – Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor- Carry look ahead adder- BCD adder- Magnitude Comparator- Multiplexer/ Demultiplexer- encoder / decoder – parity checker – code converters.

### TEXT BOOKS

1. M. Morris Mano, Digital Design, 3.ed., Prentice Hall of India Pvt. Ltd., New Delhi, 2003/Pearson Education (Singapore) Pvt. Ltd., New Delhi, 2003
2. John .M Yarbrough, Digital Logic Applications and Design, Thomson- Vikas publishing house, New Delhi, 2002.



**A-104 - FUNDAMENTAL OF PROGRAMMING IN 'C' LANGUAGE**      **L T P**  
**3 1 0**

**Objectives:** This hands-on course provides a comprehensive introduction to programming, and builds a solid foundation of programming skills that can be used to master additional programming languages like C, C++. In this course, student write, compile, and debug programs in C.

**Prerequisite: None**

**UNIT-I**

Structure and properties of algorithm, Flow chart, Algorithms for g.c.d., Factorial, Fibonacci series, Prime number generation and other simple problems, searching & sorting techniques

**UNIT II**

C language fundamentals: Character set, Key words, Identifiers, data types, Constants and variables, Statements, Expressions, Operators, Precedence and Associativity of operators, Side effects, Type conversion, Managing input and output

Control structures: Decision making, branching and looping.

**UNIT -III**

Arrays: one dimensional, multidimensional array and their applications, Declaration and manipulation of arrays

Strings: String variable, String handling functions, Array of strings

Functions: Designing structured programs, Functions in C, User defined and standard functions, Formal vs. actual arguments, Function category, Function prototype, Parameter passing, Recursive functions.

Storage classes: Auto, Extern, register and static variables

**UNIT IV**

Pointers: Pointer variable and its importance, pointer arithmetic and scale factor, Compatibility, Dereferencing, L-value and R-value, Pointers and arrays, Pointer and character strings, Pointers and functions, Array of pointers, pointers to pointers

**UNIT- V**

Dynamic memory allocation

Structure and union: declaration and initialization of structures, Structure as function parameters, Structure pointers, Unions.

File Management: Defining and opening a file, Closing a file, Input/output Operations in files, Random Access to files, Error handling

The Pre-processor directives, command line arguments, Macros.

**Text books:**

1. Behrouz A. **Forouzan** and Richard F. Gilberg. Computer Science: A Structured Approach Using C, Third Edition, 2007, CENGAGE Learning India Pvt. Ltd., New Delhi.
2. E. **Balguruswamy**, "Programming in ANSI C", 4th edition, 2007, McGraw-Hill Publication, New Delhi.
3. **E. Horowitz and S.Sahani** Fundamentals of Computer Algorithms, (Galgotia, New Delhi)

**Reference books;**

1. Let us C-Yashwant Kanetkar.
2. K.R. Venugopal, S.R. Prasad, " Mastering C, McGraw-Hill Education India
3. P. Dey, M. Ghosh, "Programming in C", Oxford University Press
4. K.N. King,"C Programming-A modern approach", W.W. Norton
5. S. Prata," C Primer plus", 5<sup>th</sup> Edition, Pearson Education India

## MCA 105- LOGIC AND ITS APPLICATIONS

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**Objectives:** The objective of the course will be to introduce the main notions of mathematical logic: logical notations (syntax) and how to assign meaning to them (semantics). We will then study formal frameworks (in the sense of being rigorous as well as in the sense of manipulating "form") for constructing logical arguments (proof theory), studying in particular some deductive systems for propositional and first-order logic. Naturally, we will be concerned with the correctness and completeness of these deductive systems, as well as with the algorithmic.

**Prerequisites:** Formal mathematics, and should have the ability to think rigorously and program intelligently

### UNIT- I

**Introduction:** logic, truth tables, equivalence, language to logic, applications to circuit design, exponential growth, Semantic Tableaux, problem solving with semantic Tableaux.

### UNIT- II

**Propositional logic:** Syntax of propositional logic, rules of natural deduction, the sequent calculus, resolution in propositional logic: Normal forms, Resolving arguments, Resolution, Combinatorial search problems.

### UNIT- III

**Predicate Logic:** Introduction, objects, predicates and quantifiers, functions, first order languages, quantifiers, scope, and binding, Interpretations, higher order logic, semantic tableaux in predicate logic.

### UNIT- IV

**Resolution in Predicate Logic:** Normal Forms, Herbrand Universes, Resolution, Unification, Problem solving using resolution

### Text Book:

1. The Essence of Logic. John Kelly. Prentice-Hall International

### Reference Books:

1. Virginia Klenk, Understanding Symbolic Logic, 5/e, Pearson Education
2. C. L. Chang and R. C. T. Lee, Symbolic Logic and Mechanical Theorem Proving, Academic Press.

**MCA106 – TECHNICAL WRITING AND COMMUNICATION SKILLS**

**L T P**  
**2 0 0**

**Objectives:** Technical Communication is most essential for students and professionals. Thus there is a drastic need for effective communication. Due to the various phenomenal changes in the business environment, recruiters are now looking for students with good computer knowledge as well as good communication skills. Thus, the objective of this course is to equip the students with the basics of communication skills and technical writing, so that they can put it into use in their day-to-day activities.

**Prerequisites: None**

**UNIT I**

**Introduction to Communication**

What is Communication, Levels of Communication, Importance of Technical Communication, Barriers to Communication, Non-Verbal Communication, Technology-Enabled Communication, Impact of Technology, Selection of Appropriate Communication Technology

**UNIT II**

**Oral Forms of Communication**

Effective listening, Active vs Passive Listening, Effective Presentation Strategies, Effective Use of Visual Aids, Understanding the Nuances of Delivery, Interviews, Types of Interviews, Group Discussion, Meetings, Conferences

**UNIT III**

**Introduction to Essential English Grammar**

Punctuation and Capitalization, Nouns and Verbs, Pronouns, Adjectives, Prepositions, Conjunctions, Tenses, Active and Passive Voice, Use of Articles, Common Errors in Usage, Words Commonly Misspelt

**UNIT IV**

**Effective Writing**

Words and Phrases, Guidelines for Effectiveness, Sentence Construction, Paragraph Development, Precis Writing, Reading Comprehension

**Written Forms of Communication**

Letter Writing, Memorandums, E-mails, Report Writing, Technical Proposals, Research Paper, Dissertation, Thesis, Instruction Manuals, Technical Description

**Text Books:**

- a. Technical Communication – Principles and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press, Sixteenth Impression 2007.
2. Business Communication by Meenakshi Raman & Prakash Singh, Oxford University Press, Seventh Impression 2008.
3. High School English Grammar and Composition by Wren & Martin

**Reference Books:**

1. Effective Business Communication by Herta A Murphy, Herbert W. Hilderbrandt & Jane P Thomas, Seventh Edition, Tata McGraw Hill Publication
2. Effective Business Communication by Asha Kaul, Prentice-Hall India Pvt. Ltd., March 2008
3. Technical Writing by B. N. Basu, Prentice-Hall India Pvt. Ltd., 2007

**MCA 111 - PROGRAMMING LAB**

**L T P**  
**0 0 2**

1. Write program to find largest of three integers.
2. Write program to check whether the given string is palindrome or not.
3. Write program to find whether the given integer is a prime number & an Armstrong number.
4. Write program for Pascal triangle.
5. Write program to find sum and average of n integer using linear array.
6. Write program to perform addition, multiplication, transpose on matrices.
7. Write program to find fibonacci series of iterative method using user-defined function.
8. Write program to find factorial of n by recursion using user-defined functions.
9. Write program to perform following operations by using user defined functions:
10. Concatenation
11. Reverse
12. String Matching
13. Write program to find sum of n terms of series:  $n - n^2/2! + n^3/3! - n^4/4! + \dots$
14. Write program to interchange two values using
15. Call by value.
16. Call by reference.
17. Write program to sort the list of integers using dynamic memory allocation.
18. Write program to display the mark sheet of a student using structure.
19. Write program to perform following operations on data files: Read from data file & Write to data file.
20. Write C program to copy the content of one file to another file using command line argument.

**MCA 112 - COMMUNICATION SKILL LAB**

**L T P**  
**0 0 2**

Lab sessions will be devoted to practice activities based on all three modules of theory.

**a. phonemic transcription**

Students will be trained to find out the correct pronunciation of words with the help of a dictionary, to enable them to monitor and correct their own pronunciation.

- (i) transcription of words and short sentences in normal English orthography (writing) into their IPA equivalents ;
- (ii) transcription of words presented orally ;
- (iii) conversion of words presented through IPA symbols into normal orthography
- (iv) syllable division and stress marking (in words presented in IPA form)

**b. Listening**

- (i) listening with a focus on pronunciation (ear-training) : segmental sounds, stress, weak forms, intonation Students should be exposed, if possible, to the following varieties of English during listening practice : Standard Indian, British and American.

**c. Speaking**

- (i) pronunciation practice (for accent neutralization), particularly of problem sounds, in isolated words as well as sentences
- (ii) practising word stress, rhythm in sentences, weak forms, intonation
- (iii) reading aloud of dialogues, poems, excerpts from plays, speeches etc. for practice in pronunciation

**d. Grammar and usage**

The focus will be on the elimination of common errors. Some writing activities (e.g. writing of short paragraphs on assigned topics) can be used to identify these errors.

\* identifying the central idea as well as supporting ideas

\* preparing notes in diagrammatic form after reading a text, showing the main idea and supporting ideas and the relationships between them.

**Project Work**

Students will be required to produce and submit by the end of Semester 1 a 350-500 word project report on a topic of their choice. The project should involve data collection, analysis and reporting.

**MCA 113- DIGITAL ELECTRONICS LAB**

**L T P**  
**0 0 2**

**List of Experiments**

1. Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates; Realization of OR, AND, NOT and XOR functions using universal gates.
2. Half Adder / Full Adder: Realization using basic and XOR gates.
3. Half Subtractor / Full Subtractor: Realization using NAND gates.
4. Parallel Adder / Subtractor: Perform adder and subtractor operation using IC7483 chip.
5. 4-Bit Binary-to-Gray & Gray-to-Binary Code Converter: Realization using XOR gates.
6. 4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips.
7. Multiplexer: Truth-table verification and realization of Half adder and Full adder using IC74153 chip.
8. Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using IC74139 chip.
9. LED Display: Use of BCD to 7 Segment decoder / driver chip to drive LED display.
10. Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF using IC7476 chip.
11. Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter using IC7490 & IC7493 chip.
12. Synchronous Counter: Realization of 4-bit up/down counter and Mod-N counter using IC74192 & IC74193 chip.
13. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO & Shift left operations using IC7495 chip.
14. Ring counter and Twisted Ring Counter: Realization using IC7495 chip.
15. RAM: Study of RAM (2K x 8 RAM) operation.
16. DAC Operation: Study of 8-bit DAC (IC 08/0800 chip), obtain staircase waveform using IC7493 chip.

YEAR –I, SEMESTER –II

MCA – 201 - ORGANIZATIONAL STRUCTURE AND PERSONNEL MANAGEMENT **L T P**  
**2 0 0**

**Objective:** The objectives of this course are two-fold. First, the course is intended to provide a comprehensive background in the strategic, economic, financial and organizational aspects of Industry. Secondly, the course will seek to provide a practical framework for managerial decision-making in the context of IT sector.

**Prerequisite:** none

**Unit –I**

**Organization Structure:** Classical theories of Management: Scientific management theory, Fayol's 14 principles of Management, Weber's bureaucratic theory. Definition of organization and organization Structure.

**Some concepts regarding Organization Structure:** Line and Staff authority, Centralization and Decentralization, Span of control, Formal and Informal Organization.

**Forms of organization structure and features:** Function based, Product based, Geography based, Project based ( Matrix)

**Organization Design:** Mechanistic and Organic Structure, Virtual and Network organization Structure

**Unit-II**

**Motivation:** Definition of Motivation, Importance of Motivation, Motivation and behavior, Theories of Motivation – Maslows need Hierarchy, Two- Factor Theory, McClelland's Need Theory, Theory X and Theory Y.

**Training and Development:** Nature of training and Development, Inputs in training and Development, importance of training and Development, training process, training of International assignment

**Unit- III**

**Nature and Scope of Human resource Management:** Scope of HRM, HRM- functions and objectives, HRM model.

**Personnel Function:** Personnel polices and principles, duties and responsibilities of personnel manager, differences between HRM and PM Emerging trends of personnel management in India

**Unit-IV**

**Human Resource Planning:** Meaning, definition and importance of HRP.

**Job analysis:** Meaning and definition, process of job analysis.

**Recruitment:** Meaning and definition, importance, sources of recruitment. Indian scenario

**Selection:** Meaning and definition, selection process, types of interview

**Reference Books:**

1. L. M. Prasad, "Organizational Behavior", S. Chand.
2. V. S. P. Rao, P. S. Narayana, "Organizational Theory and Behavior", Konark Publishers Pvt. Ltd.
3. Tripathi, Reddy, "Principles of Management", TMH
4. Koontz, Weihrich, "Essentials of Management", TMH
5. Fred Luthans, "Organizational Behaviour", McGraw Hill
6. K. Aswathappa, "Human Resource and Personnel Management", TMH
7. L. M. Prasad, "Human Recourse Management", S. Chand

**MCA 202 - DATA STRUCTURE**

**L T P**  
**3 1 0**

**Objectives:**

- To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.
- To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.
- To get a good understanding of applications of Data Structures.
- To develop a base for advanced computer science study.

**Prerequisites:** Any programming language like C, C++

**Unit -I**

**Introduction:** Basic Terminology, Elementary Data Organization, 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.

**Unit - II**

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

**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, 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, path length algorithm. 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.

**Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm.

**Unit - V**

**Introduction to Graphs:** Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal

**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**

1. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia
2. R. Kruse etal, "Data Structures and Program Design in C" Pearson Education
3. A M Tenenbaum etal, "Data Structures using C & C++", PHI
4. Lipschutz, "Data Structure", TMH
5. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia
6. Pal G. Sorenson, "An Introduction to Data Structures with Application", TMH.

**MCA-203 - COMPUTER ORGANIZATION**

**L T P**  
**3 1 0**

**Objectives:** The objective of this course is to study the design options in computer architecture and organization. This course also includes functional units of the PC, basic working of CPU, memory organization and I/O device etc.

**Prerequisites:** Fundamental of Computers Systems and Digital Electronics

**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.

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

**Unit-IV**

**Memory Organization:** Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of 2D and 2<sup>1/2</sup>D, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.

**Unit-V**

**Assembly Language Programming**

**Text Book:**

1. Computer System Architecture, PHI/Pearson Education, 3<sup>rd</sup> Edition, M. Morris Mano
2. Digital Computer Fundamentals, Tata McGraw Hill, 6<sup>th</sup> Edition, Thomas C. Bartee

**Reference Book:**

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)



**MCA-204 - COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES**    **L T P**  
**2 0 0**

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

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

**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 regressions

**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

**MCA 205 - OPERATING SYSTEM**

**L T P**  
**3 1 0**

**Objectives:**

- To provide an understanding of the functions of operating systems.
- To provide an insight into internals and functional modules of operating systems.
- To study the concepts underlying the design and implementation of operating systems.
- Prepare a base for advanced subjects in Computer Science and Applications.

**Prerequisites:**

- Basic knowledge of Computer hardware and software
- Knowledge of programming language like C/C++

**Unit-I**

Introduction: Operating System and Function, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time System, System Protection. Operating System Structure: System Components, System Structure, Operating System Services.

**Unit-II**

Concurrent Processes: Process Concept, Principle of Concurrency, Producer / Consumer Problem, Critical Section, Problem, Semaphores, Classical Problems in Concurrency, Inter Processes Communication, Process Generation, Process Scheduling.

**Unit-III**

CPU Scheduling: Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling. Deadlock: System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from Deadlock.

**Unit-IV**

Memory Management: Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming With Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

**Unit-V**

I/O Management & Disk Scheduling: I/O Devices and the Organization of I/O Disk I/O, Operating System Design Issues. File System: File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues.

**Text Books:**

1. Stalling, William, "Operating System", Maxwell Macmillan
2. Silveschatza, Peterson J, "Operating System Concepts", Willey.
3. Tannenbaum, "Operating System Design and Implementation", PHI.

**References Books:**

1. Milenekovie , "Operating System Concept", McGraw Hill.
2. Petersons, "Operating Systems", Addison Wesley.
3. Dietal, "An Introduction to Operating System", Addison Wesley.
4. Gary Nutt, "Operating System, A Modern Perspective", Addison Wesley.
5. Crow ley, "Operating System", TMH.

**MCA-206 - OBJECT ORIENTED PROGRAMMING**

**L T P**  
**3 1 0**

**OBJECTIVES:**

Java play a predominant role in software development it is felt that the following objectives can be achieved after studying this subject.

- i) Understand the concepts of Object oriented Programming.
- ii) Write simple applications using Java.
- iii) Compare and contrast features Java.

**Prerequisites:** Fundamental programming knowledge in C.

**Unit I**

Object Modeling: Objects and classes, links and association, generalization and inheritance, aggregation, abstract class, multiple inheritance, meta data, candidate keys, constraints..

**Unit II**

Dynamic Modeling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model

Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model.OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparisons of methodologies, SA/SD, JSD.

**Unit III**

Java Programming: Introduction, Operator, Data types, Variables, Methods & Classes, Multithread Programming, I/O, Java Applet.

**Unit IV**

Java Library: String Handling, Input/Output exploring Java.io, Networking, Exception Handling, Event Handling, Introduction to AWT, Working with window, Graphics, AWT Controls, Layout Manager and Menus, Images.

**Unit V**

Software Development using Java:

Java Swing, Migrating from C++ to java, Application of java, JDBC.

**Text Books:**

1. Herbert Schildt, "The Complete Reference: Java", TMH, 7<sup>th</sup> Edition.
2. E. Balagurusamy, "Programming in JAVA", TMH, 4<sup>th</sup> Edition.
3. James Rumbaugh etal, "Object Oriented Modeling and Design", PHI

**References:**

1. Bjarne Stroustrup, "C++ Programming Language", Addison Wesley, 3<sup>rd</sup> Edition.
2. E. Balagurusamy, "Object Oriented Programming ,TMH, 2008.
3. Sharma, Pant, Vaisla, "Object Oriented Systems and C++", Firewall Media, 2008

**MCA 211 - Data Structure lab**

**L T P**  
**0 0 2**

**List of Experiment:**

1. Matrix Operations-Add, Multiply, Rank, Det.etc.
2. Stack & Queue operations using Arrays.
3. Self-referential structures & single linked list operations.
4. Implementing Stack and queues using linked lists.
5. Implementing Polish Notations using Stacks.
6. Circular and double linked list operations.
7. Implementing priority queue & dequeue using lists.
8. Evaluating polynomial operations using Linked lists.
9. Implementing set related operations & Hashing.
10. linear & binary search, bubble sort technique.
11. Insertion sort, selection sort & merge sort techniques.
12. Quick sort, counting sort and Shell sort techniques.
13. Radix (bucket) and address calculation sort methods.
14. Binary tree traversals (preorder, inorder, postorder).
15. Heap sort & AVL tree implementations.
16. Graph representation with matrix & adjacency lists.

**MCA-212 - Computer Based Numerical & Statistical Techniques Lab**

**L T P**  
**0 0 2**

**Write Programs in 'C' Language:**

1. To deduce error involved in polynomial equation.
2. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
3. To implement Newton's Forward and Backward Interpolation formula.
4. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
5. To implement Newton's Divided Difference and Langranges Interpolation formula.
6. To implement Numerical Differentiations.
7. To implement Numerical Integration using Trapezoidal, Simpson 1/3 and Simpson 3/8 rule.
8. To implement Least Square Method for curve fitting.
9. To draw frequency chart like histogram, frequency curve and pie-chart etc.
10. To estimate regression equation from sampled data and evaluate values of standard deviation, t-statistics, regression coefficient, value of R<sup>2</sup> for atleast two independent variables.

**MCA – 213 - Object Oriented Programming Using Java Lab**

**L T P**  
**0 0 2**

1. To become familiar with classes that represent entities that can interact with the user.
2. To successfully write simple programs that involve if statements.
3. To gain practice in the use of Boolean operators like && and ||.
4. To construct a class that represents a simple ATM (automatic teller machine).
5. Write a new program called Options.java that will request that the user enter an integer and then will display the message .positive,. .negative,. or zero. if the value that was entered was greater than zero, less than zero, or equal to zero, respectively.
6. Write a simple program called RandomGeneration.java that will request N, the number of values desired, and then generate a list of N random double values. Use a ViewFrame for input and output.
7. Write program for Java Applets.
8. Use Java Servlets for proxy server.