

# Master of Computer Applications

## Course Structure and Scheme of Valuation w.e.f. 2013-14

### I Semester

Code	Name of the subject	Periods/week			Max. Marks		Total Int.	Credits
		Theory	Lab	Ext.	Lab	Ext.		
MCA 1.1	Computer Fundamentals & Programming Methodology	3	-	70	30	100	3	
MCA 1.2	Data Structures & File Structures	3	-	70	30	100	3	
MCA 1.3	Discrete Mathematical Structures	3	-	70	30	100	3	
MCA 1.4	Computer Organization	3	-	70	30	100	3	
MCA 1.5	Management Accountancy	3	-	70	30	100	3	
MCA 1.6	Data Structures & Programming Lab		3	50	50	100	2	
MCA 1.8	Computer Organization Lab		3	50	50	100	2	
<b>Total</b>		<b>15</b>	<b>6</b>	<b>450`</b>	<b>250</b>	<b>700</b>	<b>19</b>	

### II Semester

Code	Name of the subject	Periods/week			Max. Marks		Total Int.	Credits
		Theory	Lab	Ext.	Lab	Ext.		
MCA 2.1	Probability, Statistics & Queuing Theory	3	-	70	30	100	3	
MCA 2.2	Data Base Management Systems	3	-	70	30	100	3	
MCA 2.3	Object Oriented Programming With C++ & JAVA	3	-	70	30	100	3	
MCA 2.4	Formal Languages & Automata Theory	3	-	70	30	100	3	
MCA 2.5	Information Systems & Organizational Behaviour	3	-	70	30	100	3	
MCA 2.6	Object Oriented Programming Lab		3	50	50	100	2	
MCA 2.7	Data Base Management Systems Lab		3	50	50	100	2	
<b>Total</b>		<b>15</b>	<b>6</b>	<b>450`</b>	<b>250</b>	<b>700</b>	<b>19</b>	

### III Semester

Code	Name of the subject	Periods/week			Max. Marks		Total Int.	Credits
		Theory	Lab	Ext.	Lab	Ext.		
MCA 3.1	Operating Systems	3	-	70	30	100	3	
MCA 3.2	Computer Networks	3	-	70	30	100	3	
MCA 3.3	Web Technologies	3	-	70	30	100	3	
MCA 3.4	Operations Research	3	-	70	30	100	3	
MCA 3.5	Artificial Intelligence	3	-	70	30	100	3	
MCA 3.6	Web Technologies Lab		3	50	50	100	2	
MCA 3.7	Operating Systems Lab		3	50	50	100	2	
<b>Total</b>		<b>15</b>	<b>6</b>	<b>450`</b>	<b>250</b>	<b>700</b>	<b>19</b>	

#### IV Semester

Code	Name of the subject	Periods/week			Max. Marks		Total Int.	Credits
		Theory	Lab	Ext.	Lab	Ext.		
MCA 4.1	Design & Analysis of Algorithms	3	-	70	30	100	3	
MCA 4.2	Object Oriented Software Engineering	3	-	70	30	100	3	
MCA 4.3	Fundamentals of Microprocessors and Systems Programming	3	-	70	30	100	3	
MCA 4.4	Elective I	3	-	70	30	100	3	
MCA 4.5	Elective II	3	-	70	30	100	3	
MCA 4.6	Object Oriented Software Engineering Lab		3	50	50	100	2	
MCA 4.7	. (Dot) net Software Lab		3	50	50	100	2	
<b>Total</b>		<b>15</b>	<b>6</b>	<b>450`</b>	<b>250</b>	<b>700</b>	<b>19</b>	

Elective I : Computer Graphics/Compiler Design/Mathematical Modeling & Simulation/Parallel Programming/ Embedded Systems

Elective II : Distributed Databases/Image Processing/Computer Vision/ Mobile Computing/ Network Security & Cryptography

#### V Semester

Code	Name of the subject	Periods/week			Max. Marks		Total Int.	Credits
		Theory	Lab	Ext.	Lab	Ext.		
MCA 5.1	Wireless and Ad-hoc Networks	3	-	70	30	100	3	
MCA 5.2	Data Warehousing & Data Mining	3	-	70	30	100	3	
MCA 5.3	Information Systems Control & Auditing	3	-	70	30	100	3	
MCA 5.4	Elective III	3	-	70	30	100	3	
MCA 5.5	Elective IV	3	-	70	30	100	3	
MCA 5.6	Mini Project Using DBMS & OOSE Concepts		3	50	50	100	2	
MCA 5.7	Advanced Programming with MAT Lab		3	50	50	100	2	
<b>Total</b>		<b>15</b>	<b>6</b>	<b>450`</b>	<b>250</b>	<b>700</b>	<b>19</b>	

Elective III: Cloud Computing/ /Soft Computing/Grid Computing/Cluster Computing/Ubiquitous Computing/ Semantic Web/

Elective IV: Big Data analysis /Neural networks & Fuzzy Systems/Bio-Informatics/ E-Commerce

#### VI Semester

Code	Name of the subject	Periods/week			Max. Marks		Total	Credits
		Theory	Lab	Ext.	Lab	Ext.		
MCA 6.1	Seminar on Advanced Topics				100	100	3	
MCA 6.2	Project Work				100	200	12	
<b>Total</b>		<b>75</b>	<b>30</b>	<b>2350</b>	<b>1450</b>	<b>3800</b>	<b>110</b>	

Three Stages In Project adjudication:

Sage I: Presentation of Concept Note & Problem Approval by Guide

Sage II; Progress Approval by System Demonstration with results without Documentation Internal -100 Marks

Stage III: Final Presentation with Documentation: External Project Viva-Voce Examination - 100 Marks

# Detailed Syllabus for M.C.A First Semester

## MCA 1.1 COMPUTER FUNDAMENTALS & PROGRAMMING METHODOLOGY

**Instruction: 3 Periods/week**

**Time: 3 Hours**

**Credits: 3**

**Internal: 30 Marks**

**External: 70 Marks**

**Total: 100 Marks**

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1. **Computer Fundamentals:** Computer components, characteristics & classification of computers, hardware & software, peripheral devices, system software, application software, compiler, interpreter, utility program, programming languages.
2. **Algorithmic Development:** Techniques of problem solving, Flowcharting, decision table, Structured programming concepts, Modular Programming, Algorithms for searching, sorting and merging, Programming methodologies: top-down and bottom-up programming.
3. **Operating system:** Definition and significance of OS, Introduction to DOS, UNIX, Linux, GUI windows and their important commands.
4. **Elements of C:** C character set, identifiers and keywords, Data types: declaration and definition, storage classes in C, Type conversion, Types of error, 'C' macro, macro vs function. Operators: Arithmetic, relational, logical, bitwise, unary, assignment and conditional operators and their hierarchy & associativity.
5. **Control statements:** Sequencing, Selection: if and switch statement; alternation, Repetition: for, while, and do-while loop; break, continue, goto.
6. **Functions & pointers:** Definition, prototypes of functions, passing parameters, recursion, pointers, declaration & operations on pointers,
7. **Data Structures:** arrays, struct, union, string, array of pointers, Pointers to arrays.
8. Data input/output. Data files.

### Text Books:

1. Ashok N. Kamthane, Programming with ANSI and Turbo C, Pearson Education, New Delhi.
2. R. G. Dromey, How to Solve it by Computer, Prentice Hall Of India Ltd, New Delhi.

### References:

1. E. Balaguruswami, Programming in ANSI C, Tata Mcgraw Hill.
2. R. B. Patel, Fundamental of Computers and Programming in C, Khanna Book Publishing Company PVT. LTD. Delhi, India, 1st edition, 2008, ISBN: 13: 978-81-906988-7-0, pp. 1-962.
3. Yashwant Kanetker, Let us C, BPB Publications.
4. Gottfried, Programming with C, Tata McGraw Hill.
5. Brian W. Kernighan, Dennis M. Ritchie, The C Programming Language, 2nd Ed., Prentice Hall of India.
6. P.K.Sinha, Priti Sinha, Computer Fundamentals, 3rd Ed., BPB Publications.
7. Kriti Basandra, Gagan Basandra, Computers Today, Galgotia Publications.
8. S.S. Bhatia and Vikram Gupta, Computer Fundamentals, Kalayani Publication.

**Instruction: 3 Periods/week****Time: 3 Hours****Credits: 3****Internal: 30 Marks****External: 70 Marks****Total: 100 Marks**

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**PART - A****Introduction to Data Structures**

**The Stack:** Primitive operations – As an Abstract Data Type – Implementing the Stack operations using Arrays, and Structures

**Queues:** The Queue as Abstract Data Type – Sequential Representation ,Types of Queues – Operations – Implementation using Arrays, and Structures

**Linked List:** Operations – Implementation of Stacks, Queues and priority Queues. Circular Lists: Insertion, Deletion and Concatenation Operations \_ Stacks and Queues as Circular Lists \_ Doubly Linked Lists \_Applications.

**Trees:** Binary Trees Operations and Applications. Binary Tree Representation: Node Representation – Implicit array Representation – Choice of Representation – Binary Tree Traversal – Threaded Binary Trees and their Traversal – Trees and their Applications

**Tree Searching:** Insertion into a Binary Search Tree – Deleting from a Binary Search Tree – Efficiency of Binary Search Tree operation

**PART - B****File Processing Operations**

Physical and logical files, opening, reading & writing and closing files in C, seeking and special characters in files, physical devices and logical files, file-related header files in C

**Secondary Storage**

Disks – organization, tracks, sectors, blocks, capacity, non-data overhead, cost of a disk access,Magnetic Tape – types, performance, organization estimation of tape length and data transmission times

**Journey and buffer Management**

File manager, I/O buffer, I/O processing, buffer strategies and bottlenecks

**File Structure Concepts**

A stream file, field structures, reading a stream of fields, record structures and that uses a length indicator, Mixing numbers and characters – use of a hex dump, reading the variable length records from the files

**Managing records in C files**

Retrieving records by keys, sequential search, direct access, choosing a record structure and record length, header records, file access and file organization

**Organizing files for performance**

Data compression, reclaiming space – record deletion and storage compaction, deleting fixed-length records for reclaiming space dynamically, deleting variable-length records, space fragmentation, replacement strategies.

## **Indexing**

Index, A simple index with an entry sequenced file, basic operations on an indexed, entry sequenced file, indexes that are too large to hold in memory, indexing to provide access by multiple keys, retrieval using combination of secondary keys, improving the secondary index structure – inverted lists

## **Indexed sequential file access and prefix B<sup>+</sup> Trees**

Indexed sequential access, maintaining a sequence set, adding a simple index to the sequence set, the content of the index: separators instead of keys, the simple prefix B<sup>+</sup> tree, simple prefix B<sup>+</sup> tree maintenance, index set block size, internal set block size, internal structure of index set blocks: a variable order B-tree, loading a simple prefix B<sup>+</sup> tree

## **Hashing**

Collisions in hashing, a simple hashing algorithms, hashing functions and record distributions, memory requirements, collision resolution by progressive overflow, buckets, deletions

### **Textbooks:**

1. Data Structures Using C and C++ Yddish Langsam, Moshe J. Augenstein and Aaron M. Tanenbaum, Prentice Hall Of India (2<sup>nd</sup> Edition) (Chapters 1 to 8)
2. Data Structures, Algorithms and Applications with C++, Sahani Mc-Graw Hill.

**Text Book:** File Structures – An Object Oriented Approach with C<sup>++</sup> by Michael J. Folk, Bill Zoellick and Greg Riccardi,, Pearson

**Instruction: 3 Periods/week****Time: 3 Hours****Credits: 3****Internal: 30 Marks****External: 70 Marks****Total: 100 Marks**

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- 1. Sets, relations and functions:** Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations, principles of mathematical induction.
- 2.** Permutations and combinations; recurrence relation and generating functions.
- 3. Algebraic structures and morphisms:** Algebraic structures with one binary operation - semigroups, monoids and groups, congruence relation and quotient structures. Free and cyclic monoids and groups, permutation groups, substructures, normal subgroups.
- 4.** Algebraic structures with two binary operations, Lattices, Principle of Duality, Distributive and Complemented Lattices, Boolean Lattices and Boolean Algebras, Uniqueness of Finite Boolean Algebras, Boolean Functions and Boolean Expressions, Propositional Calculus.
- 5. Mathematical logic:** Syntax, semantics of Propositional and predicate calculus, valid, satisfiable and unsatisfiable formulas, encoding and examining the validity of some logical arguments.
- 6. Proof techniques:** forward proof, proof by contradiction, contrapositive proofs, proof of necessity and sufficiency.
- 7. Graph Theory:** Graphs and digraphs, trees, Eulerian cycle and Hamiltonian cycle, adjacency and incidence matrices, vertex colouring, planarity.

**Text Book**

J. P. Tremblay and R. P. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw-Hill, 2001.

**Reference Books:**

1. Kenneth H. Rosen, Discrete Mathematics and its Applications, Tata McGraw-Hill.
2. C. L. Liu, **Elements of Discrete Mathematics**, 2nd Edition, Tata McGraw-Hill, 2000.

**Instruction: 3 Periods/week****Time: 3 Hours****Credits: 3****Internal: 30 Marks****External: 70 Marks****Total: 100 Marks**

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1. Digital Logic Fundamentals
2. Instruction Set Architectures
3. Introduction to Computer Organization
4. Register Transfer Languages
5. CPU Design
6. Micro-sequence Control Unit Design
7. Computer Arithmetic
8. Memory organization
9. Input/Output Organization

**Text Book:**

Computer Systems Organization & Architecture, John D. Carpinelli, Addison Wesley  
Longman, Inc ./ Pearson Education , 1993

**Reference Book:**

Computer System Architecture, M. Morris Mano, Third Edition, Pearson Education, 2007

Computer Architecture and organization: Design Principles and Applications, B. Govindarajalu, TMH  
Publishing Company Ltd., 2004

Fundamentals of Computer organization and Design, Sivarama P. Dandamudi Springer  
International Edition, 200

**Instruction: 3 Periods/week****Time: 3 Hours****Credits: 3****Internal: 30 Marks****External: 70 Marks****Total: 100 Marks**

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1. **Principles Of Accounting** : Nature And Scope Of Accounting, Double Entry System Of Accounting, Introduction To Basic Books Of Accounts Of Sole Proprietary Concern, Closing Of Books Of Accounts And Preparation Of Trial Balance.
  2. **Final Accounts** : Trading, Profit And Loss Accounts And Balance Sheet Of Sole Proprietary Concern With Normal Closing Entries. (With numerical problems)
  3. **Ratio Analysis**: Meaning, Advantages, Limitations, Types of Ratio and Their Usefulness. (Theory only) Fund Flow Statement: Meaning Of The Term Fund, Flow Of Fund, Working Capital Cycle, Preparation and Inter-preparation Of Statement.
  4. **Costing**: Nature, Importance And Basic Principles. Budget and Budgetary Control: Nature And Scope, Importance Method Of Finalization And Master Budget, Functional Budgets.
  5. **Marginal Costing** : Nature, Scope, Importance, Construction Of Break Even Chart, Limitations And Uses Of Break Even Chart, Practical Applications Of Marginal Costing.(with numerical problems)
  6. **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 Books:**

1. Introduction to Accountancy. T.S.Grewal.
2. Management Accountancy, S .P.Jain.

**Reference Book:**

1. Introduction To Accounting, G.Agarwal.



**Instruction: 3 Periods/week****Time: 3 Hours****Credits: 2****Internal: 50 Marks****External: 50 Marks****Total: 100 Marks**

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**Objective:** The Objective of this lab is to make student to learn techniques for attacking and writing C programs for various types of problems. This emphasis should be on writing correct and efficient programs in C. The programs should include all the ones suggested below but should not be limited to them only. The examiner need not stick to these programs only in the examination.

**Cycle-I**

- 1 BASIC TECHNIQUES: Swapping of the contents of two variables- Finding the sum of digits of a given number- Reversing a given number.
- 2 DECISION MAKING: Finding the largest and the smallest of a given array- solving a quadratic equation- selecting an operation based on a menu.
- 3 LOOPING TECHNIQUES & ARRAYS: Finding the sum to n terms of a sine series- Matrix Multiplication- Transpose-Polynomial addition- Polynomial Multiplication- Sorting algorithms- Searching algorithms.
- 4 CHARACTERS AND STRING HANDLING: Finding the length of string-reversal of string- concatenation of two strings-checking whether it is a palindrome or not- converting upper case alphabets to lowercase and vice versa in a string.
- 5 POINTERS, STRUCTURES AND UNIONS: Finding the sum of all elements of an array using pointers- Swapping the contents of two variables using pointers- Finding the first and second rank holders and printing their names and roll numbers, in a class of 60 students using structures- Defining a complex number as structure and write a program to illustrate the operations on complex numbers-Some examples of Unions.
- 6 FILES & OTHER TOPICS: Copying and concatenation of files- Bit wise operations- Command line parameters- C preprocessor directives- Macros.

**Cycle-II**

- 7 Implementation of ADT Linked list.
- 8 Implementation of Stack using arrays.
- 9 Implementation of Queue using arrays.
- 10 Conversion of prefix expression into post-fix form using stacks.
- 11 Implementation of Binary tree and its Traversals  
a)Preorder b)Inorder c)Postorder.
- 12 Write a C Programming to implement the following Sorting techniques  
a)Bubblesort b)Quick sort c)Merge sort d)Heap Sort

**Instruction: 3 Periods/week****Time: 3 Hours****Credits: 2****Internal: 50 Marks****External: 50 Marks****Total: 100 Marks**

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**I – CYCLE : Digital Logic Design Experiments :**

1. TTL Characteristics and TTL IC Gates
2. Multiplexers & Decoders
3. Flip-Flops
4. Counters
5. Shift Registers
6. Binary Adders & Subtractors
7. A L U

**II – CYCLE: 8085 Assembly Language Programming :**

1. 8085 Assembly Language Programming according to theory course microprocessors-I using the following trainers :  
  
Keyboard Monitor of 8085 $\mu$ P Trainer.  
Serial Monitor of 8085 $\mu$ P Trainer with Terminal  
8085 Line Assembler of 8085 $\mu$ P Trainer with PC as Terminal  
8085 Cross Assembler using In-Circuit Emulator (ICE) with 8085 $\mu$ P Trainer and PC as Terminal  
Graded Problems are to be used according to the syllabus of COMPUTER ORGANIZATION
2. PENTIUM CLASS PC ARCHITECTURE FAMILIARIZATION HARDWARE & SOFTWARE PARTS DEMONSTRATION