



**SCHEME AND SYLLABI  
MASTER OF COMPUTER APPLICATIONS  
NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA  
(2007-10)**

**SEMESTER – I**

SUBJECT CODE	COURSE TITLE	LECTURE hrs	LAB hrs	CREDITS
MCA-101	Computer Programming	4	0	4
MCA-103	Computer Organization and Architecture	4	0	4
MCA-105	Discrete Mathematics	4	0	4
MCA-107	Microprocessors	4	0	4
MCA-109	File Structures	4	0	4
MCA-111	Computer Programming Lab	0	3	1.5
MCA-113	Microprocessors Lab	0	3	1.5
			Total Credits	23

**Weightage for Theory Courses:**

During Semester Evaluation Weightage - 40%

End Semester Examination Weightage - 60%

**Weightage for Lab Courses:**

During Semester Evaluation Weightage - 60%

End Semester Examination Weightage - 40%

**MCA - 1 SEMESTER**

**MCA-101 COMPUTER PROGRAMMING**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

Programming and problem solving: Basics of Computer organisation, High level and low level languages, Steps involved in computer programming, Developing algorithms and flow charts,

C data types, C operators, Expressions, Order and Precedence of evaluation, Statements in C.

Control Statements, Functions, Arrays, Pre-processor Directives.

Pointers, Pointers and Arrays, String Handling, Functions and pointers, Dynamic Memory Allocation.

User defined data types – Structures and Unions, Bit Fields, Array of Structures, Structures with arrays.

Command line arguments, Input-output operations, File Handling.

**Suggested References**

1. The C Programming Language, Second Edition, Brian W. Kernighan and Dennis M. Ritchie, PHI, New Delhi.
2. C++ The Complete Reference, Herbert Schildt, Tata McGrawHill, 2005.
3. Programming with C, Gottfried & J.K. Chhabra, Schaum's Series, McGraw Hill.
4. E. Balagurusamy, Programming in ANSI C, 2004, McGrawHill, New Delhi

**MCA - 1 SEMESTER**

**MCA 103      COMPUTER ORGANIZATION AND ARCHITECTURE**

**L T P Total**  
**4 0 0 4**

**Credits-4**  
**Duration of Exam- Three hours**

Introduction to number system, Boolean Algebra, Fundamentals of Digital Circuits– Combinational and Sequential, Multiplexers, Flip flops, Registers and Counters.

Arithmetic and Logic Unit, Instruction Sets, Types of operands and operations, Addressing modes, Register Organization, Simple ALU design, Instruction cycle and pipelining.

Memory Classification: Memory Organization, Associative, Cache and Virtual memory.

Peripheral Devices, Data Transfer Techniques- Programmed I/O, Interrupt Driven and DMA, I/O Processors, Asynchronous Data transfer.

Introduction to Advanced computer architecture, RISC v/s CISC, Multiprocessing and multiprocessors, Parallel Processors.

**Suggested References**

1. Computer System Architecture (Third Edition) Morris Mano – Prentice Hall
2. Computer architecture and Organization (third edition) John P.Hayes – TMH

**MCA - 1 SEMESTER**

**MCA-105 DISCRETE MATHEMATICS**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

**Sets and Propositions**

Introduction, Combination of sets, Finite and Infinite sets, Uncountably Infinite Sets, Mathematical Induction, Principle of Inclusion and Exclusion, Multisets, Properties of Binary Relations, Equivalence Relations and Partitions, Partial Ordering Relations, Functions and Pigeonhole Principle, Propositions.

**Algebraic System**

Definitions and elementary properties of algebraic structures, Semigroups, monoids and submonoids, Groups and subgroups, Homomorphisms and Isomorphisms of Monoids and Groups, Definition and Examples of Rings and Subrings, Types of Rings, Commutative Ring, Ring with Unity, Ring with or without Zero divisions, Integral Domain, Division Ring, Relation of Isomorphism in the set of rings, Field, its characteristics and subfield.

**Graphs and Planar Graphs**

Introduction, Basic Terminology, Multigraphs and Weighted Graphs, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planar Graphs, Trees, Rooted Trees, Path Lengths in Rooted Trees, Binary Search Trees, Spanning Trees and Cut-sets, Minimum Spanning Trees.

**Permutations, Combinations and Recurrence Relations**

The Rules of Sum and Product, Permutations, Combinations, Generation of Permutations and Combinations, Recurrence Relations, Linear Recurrence Relations with Constant Coefficients, Homogeneous Solutions, Particular Solutions, Total Solutions, Solution by the Method of Generating Functions.

**Suggested References**

1. C.L. Liu; Elements of Discrete Mathematics
2. Kenneth Kalmanson: An Introduction to Discrete Mathematics and its Applications, Addison Wesley Publishing Co., 1986.
3. J.P. Tremblay: Discrete Mathematical Structures with Applications to Computer Science, McGraw Hill, N.Y., 1977.

**MCA - 1 SEMESTER**

**MCA 107 MICROPROCESSOR**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

**8085 Microprocessors**

Microprocessors and Microcomputers, 8085 Microprocessor Architecture, Timing and Control unit, Machine cycles, Interrupts.

Programming 8085 Microprocessor: Addressing modes, instruction set, assembly language programming, programs for multibyte addition/subtraction, multiplication, division, block transfer. Stacks and subroutines, Interrupts, Counters and time delays. Details of interfacing devices 8255 and 8253, Interfacing with A/D and D/A converters,

**8086 Microprocessors**

Salient features of x86 architecture, Addressing modes and basic operations.

**Suggested References**

1. R. Gaonkar, "The 8085 Microprocessor" PHI
2. Liu and Gibson, Microcomputer Systems: 8086/8088 family: Architecture, Programming and Design, PHI.
3. D. V. Hall, "Microprocessors and Interfacing", 1997 TMH

MCA 109 FILE STRUCTURES

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

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, disk vs tape, CDROM – CDROM as a file structure, Physical Organization, strengths and weakness of CD-ROMS, Storage hierarchy.

Byte Journey and Buffer Management: File Manager, IO Buffer, IO 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, Mixed numbers and characters – use of a hex dump, reading the variable length records from the file.

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 and replacement strategies.

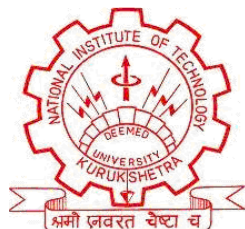
Indexing: Index, a Simple index with an entry sequenced file, basic operations on an index, entry sequenced file, indexes that are too large to hold in memory, indexing to provide access by multiple keys, retrieval using combination of secondary keys, improving the secondary index structure – inverted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

Index Sequential files : Access and prefix B+ trees – Simple index to the sequence set, the content of the index : separators instead of keys, the simple prefix B+ tree, simple prefix B+ tree maintenance, index set block size, internal set block size, the internal structural of index set blocks : a variable order B-tree, loading a simple prefix B+ tree.

Hashing: Collisions in hashing, a simple hashing algorithm, function and record distributions, memory requirements, collision resolution by progressive overflow, buckets, deletion, Extendable hashing: Working of extendable hashing, implantation, deletion, extendable hashing performance

**Suggested References**

1. File Structures – An Object Oriented Approach with C, Muchael J Folk, Bill Zoellick and Greg Riccardi , Addison Wesley
2. M.E. Loomis: Data Management and File Structures, 2nd Ed. PHI. 1997.



**MCA - II SEMESTER**

**SCHEME AND SYLLABI  
MASTER OF COMPUTER APPLICATIONS  
NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA  
(2007-08)**

**SEMESTER – II**

SUBJECT CODE	COURSE TITLE	LECTURE hrs	LAB hrs	CREDITS
MCA 102	Data Structures and Algorithms	4	0	4
MCA 104	Object Oriented Programming	4	0	4
MCA 106	Programming Languages	4	0	4
MCA 108	Operating Systems	4	0	4
MCA 110	Numerical Analysis and Optimization Techniques	4	0	4
MCA 112	Data Structures and Algorithms Lab	0	3	1.5
MCA 114	Object Oriented Programming Lab	0	3	1.5
MCA 116	Computational Techniques Lab	0	3	1.5
			Total Credits	24.5

**MCA - II SEMESTER**

**MCA-102 DATA STRUCTURES AND ALGORITHMS**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

Review of data types: Scalar types – Primitive types, Enumerated types, Subranges  
Structures types – Character strings, arrays, records, sets, files. Data abstraction.  
Complexity of algorithms: Time and space complexity of algorithms using “big oh”  
notation.

Recursion: Recursive algorithms, Analysis of recursive algorithms.

Linear data structures: Stacks, queues, lists. Stack and queue implementation using  
array, linked list. Linked list implementation using pointers.

Non linear Structures: Graphs, trees, sets. Graph and tree implementation using array  
linked list. Set implementation using bit string, linked list.

Searching: Sequential Search – Searching arrays and linked lists. Binary Search –  
Searching arrays and binary search trees. Hashing – Introduction to simple hash  
functions, resolution of collisions.

Sorting :  $n^2$  Sorts – Bubble sort, insertion Sort, selection sort.  $n \log n$  sorts – quick sort,  
heap sort, merge sort. External sort – merge files.

**Suggested References**

1. Sahni S., Data Structures, Algorithms, and Applications in C++, Mc Graw Hill, Singapore, 1998.
2. Cormen T.H., Leiserson C.E, and Rivest R.L., Introduction to Algorithms, Prentice Hall India, New Delhi, 1990.



MCA - II SEMESTER

**MCA-104 OBJECT ORIENTED PROGRAMMING**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

Introduction: Introduction to OOP, Basic Concepts of OOP, Applications of OOP. Introduction to C++, function Prototypes, Inline functions, Reference Parameters, Dynamic memory allocation, default arguments, Scope resolution operator, Linkage specifications

Classes, Constructors, Friend Class: Introduction, Comparing class with Structure, Class Scope, Accessing Members of a class, Constructor, Destructor, Const objects, Const member functions, Friend class, Friend function, This pointer, Data abstraction and Information hiding, container classes and Iterators.

Overloading & Inheritance: Operator Overloading, Fundamentals, Restrictions, Overloading stream, Insertion and stream extraction operators, Overloading unary & binary operators, Converting between types, Overloading ++ and --. Inheritance, Introduction, Protected members, Casting base \_class pointers to derived \_class pointers, Overloading Base class members in a Derived class, Public, Protocols and Private inheritance, Direct base classes and Indirect Base Classes, Using Constructors and Destructors in Derived classes, Implicit Derived class object to base class object conversion.

Virtual functions, Streams, Files: Introduction, Type fields and switch statements, Virtual functions, Abstract base classes and concrete classes, Polymorphism, Dynamic binding, Virtual destructors. C++ Stream I/O: Streams, Stream Input, Stream Output, Unformatted I/O, Stream manipulators, Stream format states, Stream error, States.

Files: File Operations –File pointers, error handling during file Operations

Templates & Exception Handling: Templates, Function templates, Class templates, Overloading template functions, Class template and non type parameters –Templates with Multiple parameters. Exception Handling: When exception handling, Basic of C++ exception, Catching an exception, re throwing an exception, exception specifications. Namespace: Introduction to Namespace

**Suggested References**

1. Deitel H.M. & Deitel P.J., “How to Program C++”, PHI, 2003
2. AL Stevenes, “C++ Programming”, Wiley Dreamtech, 2003.
3. Herbert Scheldt, “C++, The Complete Reference”, 2003.
4. E. Balagurusamy, “Object Oriented Programming with C++”, 2<sup>nd</sup> Edition., 2001.

**MCA - II SEMESTER**

**MCA-106 PROGRAMMING LANGUAGES**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

High level languages, Programming Paradigms, Language implementation. Syntactic structure – Language representation, Abstract syntax tree, Lexical syntax, Context Free grammars (CFG), Normal forms of CFG.

Structured programming, its need and design issues, block structures, types, variables, binding, types of binding, type checking, strong typing, type conversion, named constant, principle data types, character string, user defined data types, pointer and reference.

Fundamentals of subprogram, referencing, environment – local and non local parameter passing, subprogram name as parameter, overloaded subprogram, generic subprograms, co routine, CALL-RETURN structure, recursion, implementing non-local referencing environment, scope-static and dynamic, implementation of scopes.

Introduction, subprogram level concurrency, and synchronization, through semaphores, monitors and message passing, Introduction to Exception handling.

Fundamentals of functional programming, features and implementation, Types – values and operations, product of types, Lists and operations on Lists, Functions from a domain to a range, Function application and lexical scope. Binding of values and functions.

Fundamentals of logical programming, basic elements of Prolog, deficiencies and application of Prolog.

**Suggested References**

1. T.W. Pratt, Programming Languages: Design & Implementation, PHI, 3<sup>rd</sup> Ed.
2. Ravi Sethi, “Programming Languages – Concepts and Constructs”, Addison Wesley, 1989.

MCA - II SEMESTER

**MCA-108 OPERATING SYSTEMS**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

Types of Operating Systems (OS), historical evolution of operating systems, Real time systems, Distributed systems. OS concepts – Processes, Files, System calls, Shell, Interrupt mechanisms.

File Systems: Functions of the system, File access and allocation methods, Directory Systems: Structured Organization, directory and file protection mechanisms, implementation issues; hierarchy of file and device management.

CPU Scheduling: Levels of Scheduling, Comparative study of scheduling algorithms, multiple processor scheduling.

Memory management, memory allocation, paging, virtual memory, page replacement algorithms, Paging, Segmentation combination of Paging and Segmentation, Virtual memory concepts, Demand Paging, Page replacement Algorithms

Device and Input-Output management.

Deadlocks, prevention and avoidance, concurrent processes, Semaphores.

Device and Input-Output management.

Study of UNIX operating system.

**Suggested References**

1. Peterson, J.L. & Silberschatz, A.: Operating System Concepts, Addison, Wesley-Reading.
2. Silberschatz Galvin – “Operating system concepts” – John Wiley & Sons – 2004

**MCA - II SEMESTER**

**MCA 110 NUMERICAL ANALYSIS AND OPTIMIZATION  
TECHNIQUES**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

Errors in numerical calculations, sources of errors, significant digits, numerical solution of polynomial and transcendental equations, bisection method, regula-falsi method, Newton-Raphson method, fixed point method of iteration, rates of convergence of these methods, solution of system of algebraic equations, exact methods, Crout's triangularization method, iterative methods, gauss - seidel and relaxation method, polynomial interpolation, Lagrange interpolation polynomial, divided differences, Newton's divided difference interpolation polynomial, finite differences, operators  $\Delta, \nabla, e, \delta$ , Gregory, Newton forward and backward difference interpolation polynomials, central differences, stirlings interpolation formulae.

Numerical differentiation, differentiation formulae in the case of equally spaced points, numerical integration, trapezoidal and Simpson's rules, compounded rules, errors of interpolation and integration formulae numerical solution of ordinary differential equations, single step methods, Taylor series method, Euler's method, modified Euler's method, Picard's iteration method, Runge - Kutta methods (2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> order formulae- derivations not required), multistep methods, Milne's predictor and corrector formulae

Optimization methods, mathematical formulation of linear programming problem, simplex method, artificial variables, Charnes M method, two phase technique, duality in linear programming, dual simplex method, Transportation assignment and routing problems

**Suggested References**

1. Sastry S. S., Numerical Analysis, Prentice-Hall India.
2. S. S. Rao, Optimization Techniques, New Age Int., New Delhi
3. Froberg, Introduction to Numerical Analysis, Second Edition, Addition Wesley
4. Grawin W.W., Introduction to Linear Programming, McGraw Hill



**MCA - III SEMESTER**

**SCHEME AND SYLLABI  
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(2008-09)**

**SEMESTER – III**

SUBJECT CODE	COURSE TITLE	LECTURE hrs	LAB hrs	CREDITS
MCA 201	Database Management Systems	4	0	4
MCA 203	Software Engineering	4	0	4
MCA 205	Computer Networks	4	0	4
MCA 207	Visual Programming	4	0	4
MCA 209	Web Engineering	4	0	4
MCA 211	Database System (Pr.)	0	2	1
MCA 213	Visual Programming (Pr.)	0	2	1
MCA 215	Web Engineering(Pr.)	0	2	1
MCA 217	SEMINAR	1	0	1
			Total Credits	24

MCA - III SEMESTER

**MCA-201 DATABASE MANAGEMENT SYSTEMS**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

**Basic Concepts**

What is database system, why database, Data independence, 3 levels of architecture; external level, conceptual level, internal level, mapping DBA, DBMS, organization of databases, components of DBMS, Data Models, Relational Models, Networks data model, Hierarchical Model, semantic data model.

**Relational Model**

Introduction – Relational Model, base tables & views, relations, domains, candidate keys, primary key, alternate keys, foreign key, Integrity rules, relational Operators – relational algebra, relational calculus, Data Base Design – Introduction, Basic Definitions, Non-loss decomposition and functional dependencies, 1NF, 2NF, 3NF, BCNF, MVD & 4NF, JD & 5NF, Normalization procedure, other normal forms.

SQL: Data definition, Constraints, & Schema Changes in SQL, insert, Delete and update statements, View in SQL, Specifying constraints and Indexes in SQL, Queries in SQL.

A relational database management system: Oracle-A historical perspective, Basic structure, Data base Structure and its manipulation in Oracle, Storage Organization in Oracle Programming Oracle Applications.

**Concurrency**

Transaction concept, transaction state, concurrent executions, serializability lock based protocols, timestamp based protocols, validation based protocols, deadlock handling.

**Distributed Data Bases**

Introduction, fundamental principles, objectives, Problems of distributed processing-query processing, catalog management, updates propagation, recovery control, and concurrency control.

**Suggested References**

1. C.J. Date: An Introduction to Database systems 7th Ed. Addison Wesley, Indian Edition, 2000.
2. A.K. Majumdar and Bhattacharyya: Database Management Systems, THM, 1996.
3. A Silberschatz, H.F. Korth & S. Sudarshan: Data Base System Concepts, TMH, 1997.
4. S. B. Navathe, R. Elmasri: Fundamentals of database

MCA - III SEMESTER

MCA-203 SOFTWARE ENGINEERING

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

**Introduction**

Introduction to Software crisis & Software processes; Software life cycle models – Build & Fix, waterfall prototype evolutionary, spiral model.

**Requirement Analysis & Specifications**

Problem Analysis – DFD, Data dictionaries, ER diagrams, object diagrams; approaches to problems analysis; SRS; specifying behavioral & non-behavioral requirements.

**Software Design**

What is design? Modularity, strategy of design, function oriented design, object oriented design.

**Software Metrics**

Introduction, size metrics, data structure metrics, information flow metrics, entropy-based measures, metric analysis.

**Software Reliability**

Importance, Software reliability & Hardware reliability, failures & faults, reliability concepts, reliability models – macro, basic, logarithmic Poisson, calendar time component, micro models; estimating number of residual errors; reliability allocation.

**Software Testing**

Introduction, Functional testing, structural testing, activities during testing, debugging, testing tools.

**Software Maintenance**

Introduction, types of maintenance, maintenance process, maintenance models, reverse engineering, re-engineering.

**Suggested References**

1. K.K.Aggarwal, Yogesh Singh: Software Engineering, New Age International Ltd, 2001.
2. R.S. Pressman, Software Engineering – A Practitioner’s Approach, 5th Ed, TMH, 2000.
3. Ian Sommerville, Software Engineering, 4th Ed., Addison Wesley.

**MCA - III SEMESTER**

**MCA-205 COMPUTER NETWORKS**

**L T P Total**  
**4 0 0 4**

**Credits-4**  
**Duration of Exam- Three hours**

**Introduction**

Network Functions, Network Topology, Network Services, Switching Approaches, Transmission media and systems, multiplexing and signaling techniques, Error detection and correction, ISDN and BISDN

**Layered Architectures**

Examples, OSI Reference Model, Overview of TCP/IP architecture, Socket system calls, SNMP, Electronic Mail.

**Peer-to-Peer Protocols**

Protocols, Service Models and End-to-End requirements, ARQ, Sliding Window, RTP, HDLC, PPP protocols, Statistical Multiplexing.

**MAC and LAN Protocols**

Multiple access communication, Random Access-ALOHA, Slotted-ALOHA, CSMA, CSMA-CD, Channelization – FDMA, TDMA, CDMA, Channelization in Cellular networks LAN Standards - 802.3, 802.4, 802.5, 802.6, FDDI, 802.11, LAN Bridges.

**Packet Switching Networks**

Packet network topology, Datagrams and Virtual Circuits – Structure of Switch / Router, Connectionless and Virtual Circuit packet Switching, X.25, Routing Algorithms, ATM Networks, Traffic management and QoS – FIFO, Priority Queues, Fair Queuing, Congestion Control techniques.

**TCP/IP**

Architecture, Internet protocols – IP packet, Addressing, Subnet addressing, IP routing, CIDR, ARP, RARP, ICMP, Reassembly, IPv6, UDP, Transmission Control Protocol – TCP, Reliable stream service, operation, protocol, DHCP, Mobile IP, Internet Routing protocols, Multicast Routing.

**Suggested References**

1. Leon Garcia and Indra Widjaja: Communication Networks – Fundamental Concepts and Key Architectures, TMH, 2000.
2. A.S. Tanenbaum: Computer Networks, 3/e, PHI, 1997.
3. Forouzan, Coombs and Fegan: Introduction to Data Communications and Networks, TMH, 1999.
4. William Stallings: Data and Computer Communications 5/e, PHI.



**MCA - III SEMESTER**

**MCA-207 VISUAL PROGRAMMING**

**L T P Total**  
**4 0 0 4**

**Credits-4**  
**Duration of Exam- Three hours**

**Visual Basic**

Concepts of Object based Event Oriented Languages, Visual Architecture: Method, Statement, Properties and Events; Basic concept of Visual Program Design and comparison with Non-Visuals.

The VB Integrated Development Environment, VB language and its elements: Variables, constants, arrays, collections, subroutines, functions, arguments, and control structures.

Designing a VB application: Working with VB forms and managing forms at run time, coding event procedures, implementing drag and drop operations, menu designing.

Coding a VB application: Implementing user interface controls, common controls and their properties, dynamic controls, custom controls, control arrays, using variables, subroutines, function and control structures, accessing data through code and data controls, using DLLs in VB applications, building ActiveX clients, ActiveX servers, ActiveX controls, ActiveX documents, and web-enabled applications, Multiple Document Interface. Database programming (DAO, ADO)

**Visual C++**

Windows basic concepts, window API, DEF files, creating windows, message, Mouse and keyboard. Introduction to resources, designing and creating menus, pop-up menus, user defined resources. Bitmaps and dialogues; windows animation; font basics; window controls; font display; static controls, edit controls, list boxes.

Overview and structure of windows programming, coding conventions.  
Programming using visual C++

**Suggested References**

1. Visual Basic – 6 by Howard Hawee PHI
2. Teach yourself Visual Basic by Warner TMH
3. Mastering VB – 6 by Evangelos Petroustos TMH
4. Programming in VB – 6 by J C Bradley TMH
5. VB – 6 The Complete Reference by Jerks TMH
6. Windows Programming by Charles Petzol
7. Windows Programming by Jim Conger.
8. Visual C++ by Yashwant Kanetkar.

**MCA - III SEMESTER**

**MCA 209 WEB ENGINEERING**

**L T P Total**  
**4 0 0 4**

**Credits-4**  
**Duration of Exam- Three hours**

HTML Basic Concepts, Good Web Design, Process of Web Publishing, Phases of Web Site development, Structure of HTML documents, HTML Elements – Core attributes, Language attributes, Core Events, Block Level Events, Text Level Events, Linking Basics, Linking in HTML, Images and Anchors, Anchor Attributes, Image Maps, Semantic Linking Meta Information, Image Preliminaries, Image Download Issues, Images as Buttons, Introduction to Layout: Backgrounds, Colors and Text, Fonts, Layout with Tables. Advanced Layout: Frames and Layers, HTML and other media types. Audio Support in Browsers, Video Support, Other binary Formats. Style Sheets, Positioning with Style sheets. Basic Interactivity and HTML: FORMS, Form Control, New and emerging Form Elements.

C#.NET — Variables, Operators and Expressions, Writing Methods and Applying Scope, Decision statements, Iteration statements, Managing errors and Exceptions values and references, Value types with enumerations and Structures, Arrays and Collections parameter arrays, Inheritance, Garbage collection and Resource management.

Introducing ASP.NET — Understanding validation controls — Accessing Data with web forms — Building ASP.NET applications Building XML web service, handling XML.

**Suggested References**

1. Jeff Prosise, Programming Microsoft .NET, Microsoft Press
2. Thomas A Powell, HTML The Complete Reference, Tata McGraw Hill Publications.
3. Doug Tidwell, James Snell, Pavel Kulchenko; Programming Web Services with SOAP, O' Reilly
4. Jesse Liberty, Programming C#, 3rd Edition, O'Reilly & Associates
5. Jesse Liberty. Dan Hurwitz, Programming ASP.NET, O'Reilly & Associates



**MCA - IV SEMESTER**

**SCHEME AND SYLLABI  
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NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA  
(2008-09)**

**SEMESTER – IV**

SUBJECT CODE	COURSE TITLE	LECTURE hrs	LAB hrs	CREDITS
MCA 202	Server Side Computing with Java	4	0	4
MCA 204	Linux and Shell Programming	4	0	4
MCA 206	System Programming	4	0	4
MCA 208	Elective-I	4	0	4
MCA 210	Elective-II	4	0	4
MCA 212	Server Side Computing Lab (Pr.)	0	2	1
MCA 214	Unix Programming (Pr.)	0	2	1
MCA 216	Mini Project	0	2	1
MCA 218	SEMINAR	1	0	1
			Total Credits	24

List of Electives

- MCA 220 Data Warehousing and Data Mining
- MCA 222 System Security and Cryptography
- MCA 224 E-Governance
- MCA 226 E-Commerce

MCA - IV SEMESTER

**MCA-202 SERVER SIDE COMPUTING WITH JAVA**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

An overview of Java: - Java features how java differs from C & C++, data types, constants & variables, operators & expressions, control structure in java, classes, objects & methods, arrays, strings & vectors introduction to Java Design patterns.

Interfaces & Packages: - Defining, extending, implementing interfaces, accessing interface variables, Packages: - Introduction using system package, accessing a package, using a package, adding a class to a package & hiding classes, Introduction to multithread programming.

Architecture of Web Server: tomcat, Introduction to servlet, Life cycle of a servlet, Action and filter servlet, Java Server Pages, RMI, Java persistence, Java Server Faces.

Applet Programming: - Applet fundamentals, life cycle of applet, creating an executable applet, applet tags, running the applet & passing parameters to applet.

**Suggested References**

1. Ivor Horton 1.Beginning Java 2 – JDK 5 Edition, Wiley-India
2. Mark Grand Patterns in Java Vol. 1-3, Wiley-India
3. Steve Holzner Java 2 (JDK 5 Edition) Black Book Wiley-India
4. B. Eckel Thinking in JAVA, Pearson Education.
5. Deitel & Deitel How to Program JAVA. Pearson Education.

MCA - IV SEMESTER

**MCA-204 LINUX AND SHELL PROGRAMMING**

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

1. Linux Startup

User accounts, accessing linux – starting and shutting processes, Logging in and Logging out, Command line, simple commands

2. Shell Programming

Unix file system: Linux/Unix files, inodes and structure and file system related commands, Shell as command processor, shell variables, creating command substitution, scripts, functions, conditionals, loops, customizing environment

3. Regular Expressions and Filters

Introducing regular expressions patterns, syntax, character classes, quantifiers, introduction to egrep, sed, programming with awk and perl.

4. The C Environment

The C compiler, vi editor, compiler options, managing projects, memory management, use of makefiles, dependency calculations, memory management – dynamic and static memory, building and using static and dynamic libraries, using ldd, soname, dynamic loader, debugging with gdb

5. Processes in Linux

Processes, starting and stopping processes, initialization processes, rc and init files, job control – at, batch, cron, time, network files, security, privileges, authentication, password administration, archiving, Signals and signal handlers, Linux I/O system

**Suggested References**

1. John Goerzen: Linux Programming Bible, IDG Books, and New Delhi, 2000.
2. Sumitabha Das: Your Unix – The Ultimate Guide, TMH, 2000.
3. Mathew: Professional Linux Programming, vol.1 & 2, Wrox-Shroff, 2001.
4. Welsh & Kaufmann: Running Linux, O'Reiley & Associates, 2000.

MCA - IV SEMESTER

MCA-206 SYSTEM PROGRAMMING

**L T P Total**  
**4 0 0 4**

**Credits-4**  
**Duration of Exam- Three hours**

INTRODUCTION

Language Processing - Its activities, Fundamentals of Language Processing Development Tools, System Software and Machine Architecture, Hypothetical Computer.

ASSEMBLER AND MACRO PROCESSORS

Basic Assembler functions, Machine-dependent and Machine-independent Assembler features, Assembler Design options, Implementation Examples, Basic Macro Processor functions - Machine- independent Macro Processor features, Design options and Examples.

LOADERS AND LINKERS

Basic Loader Functions, Machine-dependent and Machine-independent Loader features, Design options, Linkage Editors, Dynamic Linking and Bootstrap Loaders. Implementation Examples, MS-DOS linker, SUN-OS linkers and Cray MPP linker.

COMPILERS AND SOFTWARE TOOLS

Compiler Structure, Phases of Compiler, Comparison of Compilers and Interpreters, Software Tools, Tools for Programming Development, Editors, Debug monitors Programming Environments, User Interfaces.

**Suggested References**

- 1.Leland L. Beck," System Software — An Introduction to Systems Programming", 3<sup>rd</sup> Edition, 1999, Addison Wesley.
2. D.M.Dhamdhare, "Systems Programming and Operating Systems", 2 Edition, 1997. TMH.
3. Donovan J.J. "Systems Programming", 1972, McGraw Hill.

MCA - IV SEMESTER

MCA 220 DATA WAREHOUSING AND DATA MINING

**L T P Total**  
**4 0 0 4**

**Credits-4**

**Duration of Exam- Three hours**

**INTRODUCTION**

Data Mining-motivation, importance-DM Functionalities, Basic Data Mining Tasks, DM Vs KDD, DM Metrics, DM Applications, Social implications.

**DATA WAREHOUSING**

Difference between Operational Database and Data warehouse-Multidimensional Data Model: From tables to data Cubes, Schemas, Measures-DW Architecture: Steps for design and construction of DW, 3-tier DW Architecture-DW Implementation: Efficient computation of DATA Cubes, Efficient Processing of OLAP queries, Metadata repository.

**DATA PREPROCESSING, DATA MINING PRIMITIVES, LANGUAGES**

Data cleaning, Data Integration and Transformation, Data Reduction. Discretization and concept Hierarchy Generation. Task-relevant data, Background Knowledge, Presentation and Visualization of Discovered Patterns. Data Mining Query Language-other languages for data mining

**DATA MINING ALGORITHMS**

Association Rule Mining: MBA Analysis, The Apriori Algorithm, Improving the efficiency of Apriori. Mining Multidimensional Association rules from RDBMS and DXV. Classification and Predication: Decision Tree, Bayesian Classification back propagation, Cluster Analysis: Partitioning Methods, Hierarchical Method, Grid-based methods, Outlier Analysis.

**WEB, TEMPORAL AND SPATIAL DATA MINING**

Web content Mining, Web Structure Mining, Web usage mining. Spatial Mining: Spatial DM primitives, Generalization and Specialization, Spatial rules, spatial classification and clustering algorithms. Temporal Mining: Modeling Temporal Events, Times series, Pattern Detection, Sequences.

**Suggested References**

- 1.Jiawei I-lan, & Micheline Kamber,"data mining: Concepts and Techniques". Harcourt India Private Limited, First Indian Reprint,2001
- 2.Margaret H.Dunham,"Data Mining: Introductory and Advanced Topics". Pearson Education,First Indian Reprint,2003
- 3.Arun K. Pujari," Data Mining Techniques", University Press (India) Limited, First Edition,2001

MCA - IV SEMESTER

MCA 222 SYSTEM SECURITIES AND CRYPTOGRAPHY

L T P Total  
4 0 0 4

Credits-4  
Duration of Exam- Three hours

**Basic Encryption and Decryption**

Attackers and Types of threats, challenges for information security, Encryption Techniques, Classical Cryptographic Algorithms: Monoalphabetic Substitutions such as the Casers Cipher, Cryptanalysis of Monoalphabetic ciphers, Polyalphabetic Ciphers such as Vigenere ; Vernam Cipher, Stream and Block Cipher

**Number Theory**

Prime Numbers, Greatest Common Divisor, Euclidean algorithm, Modular Arithmetic, Properties of Modular Arithmetic, Computing the inverse, Fermat's Theorem, algorithm for computing inverses, Random number generation

**Secret key Systems**

The Data Encryption Standard(DES), Analyzing and Strengthening of DES, Introduction to Advance Encryption Standard (AES)

**Key Management Protocols**

Solving Key Distribution Problem, Diffie-Hellman Algorithm, Key Exchange with Public Key Cryptography

**Public Key Encryption Systems**

Public key Encryption, Rivets- Shamir- Adlman (RSA) Cryptosystem, elliptic curve cryptography, Rabin, ElGamal, Goldwassers- Micali , Blum-Goldwasser cryptosystem, The Digital Signature Standard (DSA), Security handshake pitfalls, Strong password protocols.

**Hash Algorithms**

Hash concept, description of Hash algorithms, Message Digest Algorithms such as MD4 and MD5, Secure Hash Algorithms such as SH1 and SHA2



### **Public Key Infrastructure (PKI)**

Concept of digital Certificate, Certificate Authorities and its roles, X.509 Structure of Digital Certificate, Types of public key infrastructures

### **Introduction to Network Security**

Network security Issues such as Impersonation, Message Confidentiality, Message Integrity, Code Integrity, Denial of Service, Securing Switches and Routers, Firewalls, DMZs, Virtual Private Networks, Network Monitoring and Diagnostic Devices, Virtual LANs, IPSec Secure Communication Mechanism, PKI based Authentication and Kerberos

### **Introduction to Web Security**

Secure socket Layer protocol, Secure Electronic Transaction Protocol, Safe Guarding Web Servers, Secure Electronic Mail, Enhanced Email, Pretty Good Privacy, Public Key Cryptography Standards, Secure, SMIME

### **Suggested References**

1. A.J. Menezes .P. VAN OORSCHOT AND S. VANSTONE, "Handbook of Applied Cryptography", CRC Press
2. Principles of Cryptography, William Stallings, Pearson Education
3. Cryptography & Network Security, Atul Kahate, TMH

MCA - IV SEMESTER

MCA 224 E-GOVERNANCE

**L T P Total**  
**4 0 0 4**

**Credits-4**  
**Duration of Exam- Three hours**

E-government, need of e-governance, e-assistance, e-democracy, e-administration, citizen services, e-procurement, Mobile government

Law and policies, IT Act. Right for Information Act, Introduction to various Tax Payable, Purchase and Tender procedures and E-filing of Information, Concepts of E-portals

E-governance implementations: Software and Hardware required for E-governance Implementation , E-governance in a Small Office, E-governance for public utilities, E-governance in a medium enterprise, E-governance and finance, E- Tender and Web E-governance efforts of State Government in India

Detailed study of domestic and one international sample of E-governance system, E-governance model of Haryana, Implementation of one E-governance model in .NET/ Enterprise Java

**Suggested References**

1. 'Professional Office Procedure' By Susan H Cooperman, Prentice Hall
2. 'Public Information Technology and E-governance : Managing the virtual state' (paperback) By G.David Garson

**MCA - IV SEMESTER**

**MCA 226 E-COMMERCE**

**L T P Total**  
**4 0 0 4**

**Credits-4**  
**Duration of Exam- Three hours**

Web commerce concepts - electronic commerce environment - electronic marketplace technologies - web based tools for e-commerce - e-commerce softwares - hosting services and packages - modes of e-commerce - EDI - commerce with WWW/ internet

Security issues - threats to e-commerce - approaches to safe e-commerce - secure transactions and protocols - intruder approaches - security strategies and tools - encryption - security teams - protecting e-commerce assets - protecting client machines - servers and channels - transaction integrity

Electronic payment systems - types of e-payment - internet monetary payment and security requirements - payment and purchase order process - electronic cash - electronic wallets - smart cards - credit and charge cards - risks - design of e-payment systems

Strategies for marketing - creating web presence - identifying and reaching customers - web branding - sales on the web - strategies for purchasing and support activities - EDI - supply chain management - softwares for purchasing - strategies for web auctions - virtual communities and web portals - international - legal - ethical and tax issues - planning and managing e-commerce projects.

Implementation of sample E-Commerce model in .NET/ Enterprise Java

**Suggested References**

1. Kalakota R. & Whinston A.B., "Frontiers of Electronic Commerce", Addison-Wesley, New Delhi
2. Schneider G. P. & Perry J. T., Electronic Commerce, Course Technology, Cambridge
3. Westland J. C. & Clark T.H. K., "Global Electronic Commerce", University Press, 2001.
4. Minoli D. & Minoli E., "Web Commerce Technology Handbook", Tata McGraw Hill, New Delhi
5. Treese G.W. & Stewart L. C., "Designing Systems for Internet Commerce", Addison Wesley, New Delhi



**MCA – V SEMESTER**  
**SCHEME AND SYLLABI**  
**MASTER OF COMPUTER APPLICATIONS**  
**NATIONAL INSTITUTE OF TECHNOLOGY, KURUKSHETRA**

**Proposed (2007-2010)**

SUBJECT CODE	COURSE TITLE	LECTURE hrs	LAB hrs	CREDITS
MCA-301	System Analysis and Design	4	0	4
MCA-303	Computer Graphics and Multimedia	4	0	4
	Elective- I*	4	0	4
	Elective – II#	4	0	4
MCA-305	Computer Graphics Lab	0	2	1
MCA-307	Major Project	0	4+2*	4
MCA-309	Seminar	0	1	1
Total Credits				22

List of Electives:

\*Any one out of the following:

MCA 311      Compiler Design  
MCA 313      Wireless and Mobile Computing

#Any one out of the following:

MCA 315      Bioinformatics  
MCA 317      Enterprise Resource management

**MCA - V SEMESTER**

**MCA-301 SYSTEM ANALYSIS AND DESIGN**

**L T P Total**  
**4 0 0 4**

**Credit 04**  
**Duration of Exam- 03 hours**

**Project Management:** Fundamentals, Responsibilities of Project Manager, Project Planning and Scheduling, Types of Project Organizations.

**System Analysis:** Approaches to System Development, Modeling System Requirements, Traditional and Object Oriented approach to Requirements, Role of System Analyst.

**System Design:** Design Phase Activities, Traditional and Object Oriented approach to Design, Designing of Databases, UI, System Interfaces, Controls and Security.

Current Trends in System Development.

**Suggested References**

1. John W.Satzinger, Robert B. Jackson and Shephon D.Burd: *System Analysis & Design*, 2<sup>nd</sup> Ed., Course Technology Ptr, 2006.
2. James P.Clements and Jack Gido: *Effective Project Management*, Thomson Learning, 2007.

MCA - V SEMESTER

MCA 303 COMPUTER GRAPHICS AND MULTIMEDIA

L T P Total  
4 0 0 4

Credits 04

Duration of Exam- Three hours

**Line Drawing:** Geometry and line generation, Vector Generation, Bresenham's algorithms for line and Circle, Anti Aliasing, Character generation.

**Graphic Primitives:** Introduction, Display devices, Primitive Operations, Normalized Device Coordinates, Display file - Interpreter, Structure, Algorithms, Display Control, Text, Line style primitive.

**Polygons:** Representation, Interfacing Algorithms, Filling.

**2D Transformations:** Scaling, Rotation, Translation, Homogenous coordinates, Coordinate Transformations, Rotation about arbitrary point, Other types of transformations.

**Windowing and Clipping:** Viewing transformations, Line and Polygon clipping algorithms, Generalized clipping, multiple windowing.

**3-D Graphics:** Transformations, Rotation about an arbitrary axes, projections, Hidden surface and line: Back face removal and algorithms, Z- buffers, scan line algorithm, Painters Algorithm, Comparison Techniques, Warnock's Algorithm, Franklin Algorithm, Illumination, shading algorithms.

**Multimedia:** Multimedia and Hypermedia, Overview of Multimedia software tools.

**Suggested References**

1. Steven Harrington: *Computer Graphics : A Programmer Approach*, TMH, 2<sup>nd</sup> Ed, 1990.
2. David F Rogers: *Procedural Elements for computer Graphics*, TMH, 2<sup>nd</sup> Ed, 2003.
3. Foley, Vandam, Feiner, Huges: *Computer Graphics: Principles and Practice*, PEA, 2<sup>nd</sup> Ed, 2004.
4. Newman, Sproull: *Principles of Interactive Computer Graphics*, MCG, 2<sup>nd</sup> Ed, 1973.
5. Donad Hearn, Pauline Baker: *Computer Graphics: 'C' Version*, PEA, 2<sup>nd</sup> Ed, 2004.

MCA - V SEMESTER

MCA -311 COMPILER DESIGN

L T P Total  
4 0 0 4

Credits-4

Duration of Exam- Three hours

**Compiler Structure:** Analysis-synthesis model of compilation, Various phases of a compiler, Lexical, Syntax & Syntactic analysis.

**Run time system:** Storage Organization, Activation Tree, Activation Record, Parameter Passing, Symbol Table, Dynamic Storage Allocation.

**Intermediate Code Generation:** Intermediate Representations, Translation of Declarations, Assignments, Control Flow, Boolean Expressions and Procedure Calls. Implementation Issues.

**Code Generation and Instruction selection:** Object programs, Problems in Code Generation, a machine model, a Simple Code Generator, Register Allocation and Assignment, Code Generation from DAGs, Peephole Optimization

**Suggested References**

- 1 A.H. Aho and J.D. Ullman: *Principles of Compiler Design*, Addison Wesley,1974.
2. J. Donovan: *System Programming*, TMH, 1972.
3. D.M. Dhamdhere: *Compiler Construction- Principles and Practice*, McMillan India., 2001.
4. David Gries: *Compiler Construction for Digital Computer*, John Wiley & Sons, 1971.
5. Wilhelm and Maurer: *Compiler Design*, Addison-Wesley, 1995.

MCA - V SEMESTER

MCA-313 WIRELESS AND MOBILE COMPUTING

L T P Total  
4 0 0 4

Credits-4

Duration of Exam- Three hours

**Introduction:** Challenges in Mobile Computing, Coping with uncertainties, Resource poorness, Cellular architecture, Mobility Management.

**(Wireless) Medium Access Control:** Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA.

**Publishing & Accessing Data in Air:** Pull and push based data delivery models, Data dissemination by broadcast, Broadcast disks, Directory service in air, Energy efficient indexing scheme for push based data delivery.

**File System Support for Mobility:** Distributed file sharing for mobility support, Coda and other storage manager for mobility support.

**Ad hoc Network Routing Protocols:** Ad hoc network routing protocols, Destination sequenced distance vector algorithm, Cluster based gateway switch routing, Global state routing, Fish-eye state routing, dynamic source routing, Ad hoc on-demand routing, Location aided routing, Zonal routing algorithm.

**Mobile Transaction and Commerce:** Models for mobile transaction, Kangaroo and Joey transactions, Team transaction, Recovery model for mobile transactions, Electronic payment and Protocols for mobile commerce.

**Suggested References:**

1. Jochen Schiller: *Mobile Communications*, Addison-Wesley, 2<sup>nd</sup> Ed, 2004.
2. Stojmenovic and Cacute: *Handbook of Wireless Networks and Mobile Computing*, Wiley, 2002.
3. Reza Behravanfar: *Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML*, Cambridge University Press, 2004.



MCA –V SEMESTER

MCA-315 BIOINFORMATICS

L T P Total  
4 0 0 4

Credits-4

Duration of Exam- Three hours

**Introduction to Bioinformatics:** Fundamentals of Bioinformatics systems modeling.

**Computing Evolution:** Phylogenetic Analysis Sequence-based taxonomy, Mathematical tools of proteins and nucleic acids, sequence-Function Relationships, Sequence Homology and Conserved Regions, Conserved DNA sequences.

**Bioinformatics tools:** Networks - WWW, CERN EMBnet; EMBL Database, SEQNET, GenBank, NLM., Sequence Databases and Sequence Analysis: genomic, cDNA EMBL database GenBank protein sequence, pattern recognition tools, Genome databases, Molecular graphics software and other packages.

**Suggested References**

1. Teresa K. Attwood, David J. Parry-Smith: *Introduction to Bioinformatics*, Longman Higher Education, 1999.
2. S. Eddy, A. Krogh, G. Mitchison, Richard Durbin: *Biological sequence analysis: probabilistic models of proteins and nucleic acids*, Cambridge University Press, 1999.
3. Andreas Baxevanis, B.F. Francis Ouellette: *Bioinformatics: a practical guide to the analysis of genes and proteins*, John Wiley & Sons, Inc., 1998.
4. James D. Tisdall: *Beginning Perl for Bioinformatics*, O'Reilly & Associates, 2001.
5. Michael S. Waterman: *Mathematical methods for DNA sequences*, CRC Press, 1989.

MCA –V SEMESTER

MCA- 317 Enterprise Resource Planning

L T P Total  
4 0 0 4

Credits-4

Duration of Exam- Three hours

**Enterprise Resources Planning:** Introduction, Growth of ERP.

**ERP and related technologies:** Business Process Re- Engineering, Management Information System, Decision Support System, Executive Support System, OLAP, Supply Chain Management, Customer Relationship Management.

**ERP Modules and Vendors:** Finance, Production Planning, Control and Management, Sales and Distribution, Human Resources Management, Inventory Control System, Quality Management, ERP market.

**ERP Implementation Life Cycle:** Evaluation and selection of ERP package, Project planning and implementation, Team training and Testing, End User Training and Going Live, Post Evaluation and Maintenance.

**ERP Case Studies:** Post Implementation review of ERP package in manufacturing, Service and others Organizations.

**Suggested References:**

1. Alexis Leon: *Enterprise Resource Planning*, 2003.
2. V.K.Garg & N.K.Venkita Krishnan: *ERP Ware: ERP Implementation Framework*, 2003.



**MCA – VI SEMESTER**  
**SCHEME AND SYLLABI**  
**MASTER OF COMPUTER APPLICATIONS**  
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**Proposed (2007-10)**

SUBJECT CODE	COURSE TITLE	Time Duration	CREDITS
MCA-302A	Industrial Project*.	Full semester	24
Total credits			24

\* Project work shall be pursued for a minimum of 16 weeks.

# Research Lab