Revised
SCHEME OF EXAMINATION

FOR

MASTER OF COMPUTER APPLICATIONS

[MCA]

REGULAR PROGRAMME

Offered by

Indira Gandhi Delhi Technical University for Women
(Established by Govt. of Delhi vide Act 09 of 2012)
(Formerly Indira Gandhi Institute of Technology)
Kashmere Gate Delhi-110006

MASTER OF COMPUTER APPLICATIONS

FIRST SEMESTER

Paper Code	Paper Title	L	P	Credit
THEORY				
MCA-101	Fundamentals of IT	4	0	4
MCA-103	Problem solving using C Programming	4	0	4
MCA-105	Discrete Mathematics	4	0	4
MCA-107	Computer Organization	4	0	4
MCA-109	Soft Skills	4	0	4
PRACTICALS				
MCA-151	Fundamentals of IT Lab.	0	2	1
MCA-153	Problem solving using C Programming Lab	0	4	2
MCA-155	Computer Organization Lab.	0	2	1
MCA-157	Linux Programming Lab	0	2	1
	TOTAL	**20**	**10**	**25**

SECOND SEMESTER

Paper Code	Paper Title	L	P	Credit
THEORY				
MCA-102	Data and File Structures	4	0	4
MCA-104	Object Oriented Programming in C++	4	0	4
MCA-106	Operating Systems	4	0	4
MCA-108	Web Technology	4	0	4
MCA-110	System Analysis and Design	4	0	4
PRACTICALS				
MCA-152	Data and File Structures Lab	0	2	1
MCA-154	Object Oriented Programming in C++ Lab	0	2	1
MCA-156	Web Technology Lab	0	2	1
MCA-158	System Analysis and Design lab	0	2	1
MCA-162	Technical Report Writing*	0	2	1
	TOTAL	**20**	**10**	**25**

* Non-University Examination System (NUES)

THIRD SEMESTER

Paper Code	Paper Title	L	P	Credit
THEORY				
MCA-201	Software Engineering	4	0	4
MCA-203	Database Management Systems	4	0	4
MCA-205	Java Programming	4	0	4
MCA-207	Data Communications and Networking	4	0	4
MCA-209	Design and Analysis of Algorithms	4	0	4
PRACTICALS				
MCA-251	Software Engineering Lab	0	2	1
MCA-253	Database Management Systems Lab	0	2	1
MCA-255	Java Programming Lab	0	2	1
MCA-257	Design and Analysis of Algorithms Lab	0	2	1
MCA-261	Human Values and Professional Ethics*	0	2	1
	TOTAL	**20**	**10**	**25**

* Non-University Examination System (NUES)

FOURTH SEMESTER

Paper Code	Paper Title	L	P	Credit
THEORY				
MCA-202	Computer Graphics and Multimedia Technologies	4	0	4
MCA-204	Business Intelligence	4	0	4
MCA-206	Theory of Computation	4	0	4
MCA-208	Cloud Computing	4	0	4
MTIT-614	Business Analytics and BIG Data	4	0	4
PRACTICALS				
MCA-252	Computer Graphics and Multimedia Technologies Lab	0	4	2
MCA-254	Business Intelligence Lab	0	2	1
MCA-256	Business Analytics and BIG Data	0	2	1
MCA-258	Cloud Computing Lab	0	2	1
	TOTAL	**20**	**10**	**25**

FIFTH SEMESTER

Paper Code	Paper Title	L	P	Credit
THEORY				
MCA-301	Advanced Database Management Systems	4	0	4
MCA-303	Software Testing & Quality Management	4	0	4
MCA-305	Network Security	4	0	4
Elective - I *(Choose any One)*				
MCA-307	Numerical and Scientific Computing	4	0	4
MCA-309	Mobile Computing			
MCA-311	Artificial Intelligence			
MCA-313	Microprocessors			
MCA-315	Compiler Design			
MTIT-713	E-Commerce and M-Commerce			
MCA-317	Software Project Management			
Elective - II *(Choose any One)*				
MCA-319	Distributed Systems and Parallel Processing	4	0	4
MCA-321	Organizational Behavior			
MCA-323	Advanced Computer Architecture			
MCA-325	Digital Signal Processing			
MCA-327	Soft Computing			
MTCS-601	Mobile Architecture and Programming			
MCA-329	Emerging Trends			
PRACTICALS				
MCA-351	Advanced Database Management Systems Lab	0	2	1
MCA-353	Software Testing & Quality Management Lab	0	2	1
MCA-355	Network Security Lab	0	2	1
MCA-357	Lab based on Elective – I & II	0	2	1
MCA-361	Term Paper*	-	2	1
	TOTAL	**20**	**10**	**25**

* Non-University Examination System (NUES)

SIXTH SEMESTER

Paper Code	Paper Title	L	P	Credit
MCA-302	Dissertation	-	-	26
MCA-362	Seminar and Progress Report*	-	-	4
	TOTAL	**-**	**-**	**30**

* Non-University Examination System (NUES)

1. The total number of credits of the MCA Programme. = 155.
2. Each student shall be required to appear for examination in all courses. However, for the award of the degree a student shall be required to earn a minimum of 150.

Paper Code: MCA 101	L	P	C
Paper Title: Fundamentals of Information Technology	4	0	4

INSTRUCTIONS TO PAPER SETTERS:
1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT 1

Information Concepts and Processing : Definition of Information Technology, Quality, need of information system, levels of information, data processing, definition of knowledge, Range of application : Scientific, business, educational, e-commerce, web publishing, Management Information System, Decision Support System, inventory control, and industrial control.
Number System: Bit, byte, binary, decimal, hexadecimal, and octal systems, conversion from one system to the other, Binary Arithmetic: Addition, subtraction and multiplication. Representation of Information: Integer and floating point representation, Complement schemes, Character codes (ASCII, EBCDIC, BCD, Excess-3, Grey).

(10Hrs)

UNIT 2

Introduction to Computer software: Introduction to system software, categories of system and application, Distinction between systems software and Application software, Introduction to Software Development activities (Requirement, Design (algorithm and flowchart), Coding, Testing, Installation & Maintenance).
Introduction to Computer Hardware: CPU, Memory, different types of memories (Cache memory, virtual memory and Auxillary memory) , Various I/O devices.
Programming languages and Translators: Low and high level languages, assembly language, 4GL and 5GL Introduction to assemblers, compilers, interpreters, linkers and loaders.

(10Hrs)

UNIT 3

Operating systems (Only introductory level): Evolution, introduction to OS , functions and facilities, Different types of operating systems (Batch, multi-programming, time sharing, multiprocessing, PC operating system, real time operating system, single tasking and multitasking OS , single user and multi-user OS), Introduction to process management: process, threads, scheduling, characteristics of MS-DOS and Unix operating systems , DOS and UNIX commands, Introduction to Database Management System and its types

(10Hrs)

UNIT 4

Communication and Computer Network: - Basic elements of a Communication System, , Data transmission media, Digital and Analog, Network Types (LAN, WAN and MAN), inter networking devices and Communication Protocols, Intranet and Extranet, Hypertext Markup Language, WWW, HTTP, HTTPs, FTP, Telnet, Web Browsers, Search Engines, Email, Digital Signatures, Firewall.

(10Hrs)

Text Books:
1. Alex Leon and Mathews Leon, "Fundamentals of Information Technology", Leon Techworld, 2007.
2. Robert G. Murdick,Joel E. Ross, "Introduction to management information systems", Prentice Hall PTR.
3. A. S. Tananbaum, "Computer Networks", 3rd Ed, PHI.
4. P. K. Sinha and Priti Sinha , "Computer Fundamentals", BPB Publications, 2007.
5. Malvino and Leach, "Digital Principles and Application", TMH,
6. D.H. Sanders," Computers Today", Mc Graw Hill.

References:
1. Alex Leon and Mathews Leon, "Introduction to Computers", Vikas Publishing House, 2007.
2. Norton Peter, "Introduction to computers", TMH, 4th Ed., 2006.
3. Morris Mano, " Digital Design", PHI, 2nd Ed, 2002.
4. Simon Haykins, "Communication System", John Wiley & Sons, 2006.
5. B. Basaraj, "Digital Fundamentals", Vikas Publications,.
6. V. Rajaraman, "Introduction to Information Technology", PHI, 2006.
7. V. Rajaraman, "Fundamentals of Computers", PHI, 5th Ed., 2006.
8. David Anfinson and Ken Quamme, "IT Essentials PC Hardware and Software Component on Guide", Pearson, 3rd Ed., 2008.

Paper Code: MCA 103	**L**	**P**	**C**
Paper Title: Problem Solving using C	**4**	**0**	**4**

UNIT 1

Introduction to Programming and its Environment: Need for programming, Levels (High and Low) of programming, Development process (Preprocessor, Compiler, Linker and Loader), Linux – operating system familiarity, commonly used commands like mkdir, cd, ls, etc. , compiler – gcc, editor – vim, use of debugger – gdb (to be taught throughout the course for debugging C programs)

C Language Introduction: Program Structure through simple C programs, Constants and Variables, Data Types – Basic and Advanced, Operators and Expressions, Managing input and output operations using *printf* and *scanf*, Command line input, Conditional constructs, Looping constructs.

Problem solving exercises based on – conditional and looping constructs.

(10Hrs)

UNIT 2

Pointers, Arrays and Strings: Concept of memory, Definition, Usage – *address of* and *value at* operation, Pointer arithmetic. Pointer to pointer, Arrays (Single and Multi-dimensional) and Strings – with emphasis on role of pointers in them, Pointer to Array, Array of pointers.

Problem solving exercises based on – pointers, arrays and strings.

Procedural programming: Functions (Function Prototyping, passing parameters through call by value and call by reference, returning values, recursion), Program organization using functions, Emphasis on reusability through C examples.

Problem solving exercises based on – functions.

(10Hrs)

UNIT 3

File handling: Concept of streams, File pointer, Reading and Writing to file, Closing a file, Random access in a file, Error handling during file I/O operations.

Problem solving exercises based on – files.

Problem Solving: Algorithm, Flowchart and Pseudocode. Program design.

(10Hrs)

UNIT 4

Advanced concepts: Pointers to functions and Callback functions. Storage classes (auto, extern, static, register), The C Preprocessor (#define, #undef, #include, #if conditional inclusion and other preprocessor directives), Defining New Data Types – Structures, Unions, Enumerated Types,

Dynamic Memory Management: malloc, calloc, realloc, size of, free. Introduction to Data Structure - Linked Lists and dynamic 2- dimensional arrays.

Problem solving exercises based on – advanced concepts and data structures

(10Hrs)

Text Books:
1. E. Balaguruswamy, "Programming in ANSI C", 6th Edition, TMH.
2. Yashwant Kanetkar, "Let us C", BPB Publications, 2002.
3. B. Kernighan and D. Ritchie, "The ANSI C Programming Language", PHI. 2000.
4. R. G. Dromey, "How to solve using computers", Pearson, 2008.

Refereneces:
1. Yashwant Kanetkar, "Pointers in C", BPB Publications, 2002.
2. Paul Deitel and Harvey Dietel, "How to Program", PHI, 6th Ed., 2010.
3. Behrouz A. Forouzan and Richard F. Gilberg, "Computer Science A Structured Programming Approach Using C", PHI, 3rd Ed., 2007.
4. Jeri R. Hanly and Elliot B. Koffman, "Problem Solving and Programming in C", Pearson, 5th Ed. 2007.
5. Rama N. Reddy and Carol A. Ziegler, "C Programming for Scientist and Engineers with Applications", Jones and Bartlet, 2010.

Paper Code: MCA 105   **L   P   C**
Paper Title: Discrete Mathematics   **4   0   4**

UNIT 1

Set Theory: Notations, Types of sets, Multisets, Ordered pairs, Cartesian product, Combination of sets, Set Algebra, Proofs of some general identities on sets.
Relations: Representation, Relation types and properties, Operations on relations, Equivalence relations, Equivalence Partitions, Equality of relations, Order of relations, Partial ordering, Recursive definition of relation,
Closure: Reflexive, Symmetric and Transitive closures, Warshall's algorithm to compute transitive closure of a relation, Composite Relations, Functions, Classification of functions, Operation on functions.
Boolean Algebra: Introduction, Boolean functions, Representations and simplification of Boolean functions, Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions, Logic implications, Karnaugh maps, Application of Boolean functions to synthesis of circuits
Partially Ordered Sets and Lattices: Posets, lattices, Combination of partial order sets, Properties of lattices, Lattices as Algebraic systems, Sub lattices, Homomorphism, Hasse's diagram, Bounded, Complemented, Modular and Complete lattice.   (10Hrs)

UNIT 2

Combinatorics: Principle of mathematical induction, Selected problems on mathematical induction, Fundamental principles of counting, Pigeonhole principle, Principle of inclusion and exclusion.
Discrete Numeric Functions and Recurrence Relations: Introduction, Asymptotic behavior, Linear recurrence relations with constant coefficients (homogeneous and non homogeneous case, Solution of linear recurrence relations using generating functions.
Logic: Propositional logic, Tautology, Predicate Algebra, Quantifiers, Operators, Methods of proofs: direct, formal, informal, contradiction, induction, contraposition, exhaustive.

                                                                                         (10Hrs)
UNIT 3

Discrete Probability: Sample space, Discrete Sample space, Types of Events: mutually exhaustive, mutually exclusive, Axioms of probability, Conditional probability, Total probability, Bayes' theorem, Univariate and bivaiate probability distributions , Discrete random variables, Probability mass function and cumulative distribution function, Mode and median and variance of a univariate and bivariate discrete probability distribution, Mathematical Expectation

(Univariate and bivariate Random Variable), Expectation of a function of a random variable, Effect of change of origin and scale on mean and variance. Expectation and variance of sums of random variables. Conditional expectation and prediction. The Central Limit Theorem, **Algebraic Structures:** Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Semi groups and monoids, Cyclic semigraphs and submonoids, Congruence relations on semigroups, Normal Subgroups, Dihedral groups, Permutation and Symmetric groups, Group Homomorphisms, Properties of Rings and Fields, Integers Modulo n, polynomial arithmetic, quadratic residues, reciprocity, discrete logarithms, elliptic curve arithmetic. (10Hrs)

UNIT 4

Graph theory: Path, cycles, handshaking theorem, bipartite graphs, sub-graphs, graph isomorphism, operations on graphs, Eulerian graphs and Hamiltonian graphs, planar graphs, Euler formula, traveling salesman problem, shortest path algorithms. Graphs, Euler tours, planar graphs, Hamiltonian graphs, Euler's formula, applications of Kuratowski's theorem, graph coloring, chromatic polynomials, trees, weighted trees, shortest path algorithms, spanning trees, the max-flow min-cut theorem.
Applications of Discrete Mathematics in Computer Science: Information Theory, Semantic Web, Formal Software Verification, Theorem Proving, Game Theory, Cryptography
(10Hrs)

Textbooks:
1. J. P. Tremblay and R. Manohar, "Discrete Mathematical Structure with Application to Computer Science", TMH, New Delhi, 2000.
2 . Koshy, Discrete Structures, Elsevier Pub. 2008
3. Kenneth H. Rosen, "Discrete Mathematics & Applications", TMH, 6th Ed., 2007.

References:
1. B. Kolman, R.C. Busby, and S.C. Ross, Discrete Mathematical Structures, 5/e, Prentice Hall, 2004.
2. Kenneth Bogart Clifford and Stein Robert Drysdale, "Discrete Mathematics for computer science" Springer, 2006.
3. E.R. Scheinerman, Mathematics: A Discrete Introduction, Brooks/Cole, 2000.
4. R.P. Grimaldi, Discrete and Combinatorial Mathematics, 5/e, Addison Wesley, 2004.
5. Swapan Kumar Sarkar, "Discrete Mathematics", S. Chand, 4th Ed., 2006.

Paper Code: MCA 107   **L**   **P**   **C**
Paper Title: Computer Organization   **4**   **0**   **4**

UNIT 1

Introduction and overview: Multiplexes, Demultiplexers, Decoders, Adders,
Flip-flops: S-R, JK, D, T, Master Slave and Edge triggered, Registers, shift registers, Bi-direction shift registers.
Register Transfer and Microoperation: Register transfer language, register transfer, bus and memory transfer, arithmetic microoperations, logic microoperations, shift microoperations.

(10Hrs)

UNIT 2

Basic Computer Organization and Design: Instruction codes, computer registers, computer instructions, timing & control, instruction cycle, memory reference instructions, input-output and interrupts, design of basic computer, design of accumulator logic.
Microprogrammed Control Unit: Control memory, address sequencing.
Central Processing Unit: Introduction, general register organization, stack organization, instruction formats, addressing modes.

(10Hrs)

UNIT 3

Pipeline and Vector processing: Parallel Processing, pipelining, arithmetic pipeline, RISC Pipeline, Vector Processing, Array Processors.
Input-Output Organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of data transfer, priority interrupt, direct memory access, input-output processor.

(10Hrs)

UNIT 4

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.
Multiprocessors: Characteristics of multiprocessor, Interconnection Structure, Interprocessor Communication & Synchronization.

(10Hrs)

Text Books:
1. Mano M, "Computer System and Architecture", Pearson, 3rd Ed., 2009
2. Stallings W, "Computer Organization & Architecture", PHI, 8th Ed., 2010.

References:
1. Malvino, "Digital Computer Electronics: An Introduction to Microcomputers",
McGraw Hill, 1993. Syllabus of Master of Computer Applications (MCA), approved by MCA Coordination Committee on 7th May 2010 &
Sub-Committee Academic Council held on 31st May 2010. W.e.f. academic session 2010-11
2. Hayes, J. P. "Computer Architecture and Organization", McGraw Hill, 1998.
3. Andrew S. Tanenbaum, "Structured Computer Organization", PHI, 5th Ed., 2006.
4. P. V. S Rao, "Computer System Architecture", PHI, 5th Ed., 2009.
5. Anthony J. Dos Reis, "Assembly Language and Computer Architecture using C++ and Java", Cengage Learning, 2004.

Paper Code: MCA 109	L	P	C
Paper Title: Soft Skills	4	0	4

UNIT 1

Types of Communication, Oral Communication: clarity, speed, tone and pitch, Oral and Aural skills, Sounds, Introduction to syllable stress, Noun stress, Voiced and voiceless sounds, Diphthongs, Rate of speech, Vowel and consonant, Phonetics. Informal vs Formal communication, Communication Barriers.
Language skills: Vocabulary, Phrase, Clause, Sentence fluency building, Word match, Reading aloud, Recognition of attributes, listening – reading comprehension, Listening Sills, Parts of speech, Media/channels for communication, Written Communication, Grammar.   (10Hrs)

UNIT 2

Self analysis through SWOT, Johari window, Personality Development, Intra personal communication vs. Inter personal Communication and Relationships, Leadership Skills, Team Building, Public speaking, Individual Communication, Self advertising, Over stating and under stating, Time Management.
Communication Boosters: Body language, Voice, Posture and gesture, Eye contact, Dress codes, Verbal crutches, Pronunciation, Contextualization: creating and understanding contexts, Aura words.   (10Hrs)

UNIT 3

Interview: Types of Interview, Preparing for the Interviews, Attending the Interview, Interview Process, Employers Expectations, General Etiquette.
Group Discussions: Guidelines, Expressions, Evaluation. Video conferencing, Telephone skills, Teleconferencing, Participation in meetings: chairing sessions. Presentation Skills, Types of presentation, Capturing Data, Guidelines to make an effective presentation, Body Language, Voice Modulation, Integrating voice & picture, Audience Awareness, Presentation Plan, Visual Aids, Forms of Layout, Styles of Presentation, Management presentations.
                                     (10Hrs)

UNIT 4

Letter writing: Types of Letters, Business letters, E-mail, Fax, Pro-forma culture, Drafting the Applications, Format, Style, Effectiveness, study of sample letters, Elements of structure,

Preparing a CV / Resume, Statement of Purpose, Web chat, Greeting, Memos, Reports, Minutes, Business correspondence. (10Hrs)

Textbooks:
1. Essentials of Business Communication, Rajendra Pal, JS Korlahhi.
2. Basic Communication Skills for Technology, Andre J. Rutherford: Pearson Education Asia.
3. KR Lakshiminarayana: English for Technical Communication.

References:
1. Business Communication, RK Madhukar, Vikas Publishing House Pvt. Ltd.
2. Edmund H Weiss: Writing Remedies: Practical Exercises for Technical Writing. Universities Press.
3. English in Mind, Herbert Puchta and Jeff Stranks, Cambridge.
4. Raymond V.Lesikav, John D. Pettit Jr.: Business Communication; Theory and Application.

Paper Code: MCA 102   L   P   C
Paper Title: Data and File Structures   4   0   4

UNIT 1

Introduction: Abstract Data Type, Elementary Data Organization, Measuring efficiency of an Algorithm, Time and Space Complexity, Asymptotic notations. Arrays: Single and Multidimensional Arrays,
Representation of Arrays: Row Major Order, and Column Major Order, Application of arrays, Sparse Matrices.
Linked lists: Array and Dynamic Implementation of Single Linked Lists, Doubly Linked List, Circularly Linked List, Operations on a Linked List. Insertion, Deletion, Traversal, Polynomial Representation and Addition, Generalized Linked List.
Stacks: Stack operations: Push & Pop, Array and Linked list implementation of Stack, Applications: Prefix and Postfix Expressions, Evaluation of postfix expression, Recursion, Tower of Hanoi Problem.

(10Hrs)

UNIT 2

Queues: Operations: Create, Add, Delete, full and empty queues, Array and linked implementation of queues, Dequeue, Circular queues and Priority Queue. Hashing: Hash Function, Hash Table, Collision **Resolution Strategies Trees:** Basic terminology, Binary Trees, Array and linked list implementation, Types of Binary Tree, Extended Binary Trees, Algebraic Expressions , Tree Traversal algorithms: Inorder, Preorder and Postorder, Threaded Binary trees, Search, Addition and deletion of an element in a binary tree, Huffman algorithm, AVL Trees, Heaps, B Trees, B+ Trees, B* Trees, Trees and their applications, Evaluating an expression tree.

(10Hrs)

UNIT 3

Searching: Sequential search, Binary Search, Interpolation Search, Comparison and Analysis. Sorting: Insertion Sort, Selection, Bubble Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Radix Sort, Bucket Sort, Shell Sort, Graphs: Representation (Matrix and Linked), Traversals, Connected components, Shortest path and Transitive closure, Topological sort, Activity network, Critical path, Path enumeration. Dijkstra's Algorithm, Floyd Warshall's Algorithm, Coloring of Graphs, Minimum Spanning Tree Algorithms (Kruskal's Algorithm, Prim's Algorithm)

(10Hrs)

UNIT 4

Files: Creation and Processing of files, File handling using command line arguments, File opening, closing, modes, formatted inputs, output to file, reading/writing of files, accessing records randomly, updating files. Operations on files, Library functions, File organization, Indexing (primary, secondary, clustered, unclustered, dense, sparse), File streams, Hierarchy of file stream classes, Error handling during file operations. (10Hrs)

Textbooks:
1. Aaron Tenenbaum, "Data Structures Using C"
2. Ramkrishnan Gehrke, " Database Management Systems", McGraw Hill, Third Edition
3. Ellis Horowitz and Sartaj Sahni, "Fundamentals of data structures"
4. Rajni Jindal, "Data Structures using C"

References:
1. Abhay K. Abhyankar, "Data Structures Files and Algorithms"
2. Alfred V.Aho, John E. Hopcroft, Jeffrey D. Ullman, "Data Structures and Algorithms, Pearson Education
3. Abraham Silberschatz, Henry F. Korth, "Database System Concepts "

Paper Code: MCA 104   **L**   **P**   **C**
Paper Title: Object Oriented Programming in C++   **4**   **0**   **4**

INSTRUCTIONS TO PAPER SETTERS:
1. uestion No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks

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UNIT 1

Introduction to Object Oriented Programming: Need for Object Oriented Programming, Comparison of Programming paradigms, Characteristics of Object-Oriented Programming Languages, Structure of a C++ program, Use of *cin* and *cout*, Compilation process.
C++ Programming Language (Procedural): Tokens, Data Types (Basic, Advanced and Derived), Variables, Reference vs Pointers, Operators (scope resolution, dynamic memory related, type cast), Expressions, Functions (inline function, *const* arguments, default arguments).

(10Hrs)

UNIT 2

Classes and Objects: Objects, Classes, Encapsulation, Data Abstraction, Role of *private* and *public* access specifier, Memory organization of class, Member functions – inline and non-inline, static member variables, Friend functions, Class vs Structure, Constructors – default, parameterized, copy and dynamic, Destructors, Assignment operator – deep and shallow copying.
Polymorphism: Function overloading, Constructor overloading, Compile time polymorphism, Overloading Rules, Operator Overloading (Unary and Binary) as member function/friend function, Example operators to be overloaded: Arithmetic, Output/Input, Prefix/ Postfix Increment and Decrement, Comparison, Assignment, subscript and function call Operator.

(10Hrs)

UNIT 3

Inheritance: Inheritance, Types of Inheritance, Use of *protected* access specifier, Virtual base class, Ambiguity resolution using scope resolution operator and Virtual base class, Overriding inheritance methods, Constructors and Destructor in derived classes. Runtime polymorphism, Pointer to objects, Virtual Functions (concept of virtual table), pure virtual functions, Abstract Class.
Managing Input / Output: Concept of streams, console I/O – formatted and unformatted, Manipulators, File I/O – Predefined classes, file opening & closing, file manipulation, read & write operations, sequential and random file access.

(10Hrs)

UNIT 4

Exception Handling: Basic mechanism, Throwing, Catching and Re-throwing.
Namespace: Basic concept, role of scope resolution operator and *using* keyword.
Generic Programming: User defined Templates - Class templates with and without multiple parameters and Function templates with and without parameters, Template overloading. Standard Template Library (STL): Introduction, Components – Container, Iterator and Algorithm, Example programs using STL.

(10Hrs)

Text Books:
1. E. Balaguruswamy, "Object Oriented Programming with C++", 4th Edition, TMH.
2. Bjarne Stroustrup , "The C++ Programming Language", Addison Welsley, 3rd Ed.

Reference:
1. D . Parasons, "Object Oriented Programming with C++", BPB Publication.
2. Steven C. Lawlor, "The Art of Programming Computer Science with C++", Vikas Publication.
3. Schildt Herbert, "C++: The Complete Reference", Tata McGraw Hill, 4th Ed., 1999.
4. Behrouz A. Forouan, Richrad F. Gilberg, Computer Science - A Structural Approach Using C++", Cengage Learning, 2004.
5. Nell Dale, "C++ Plus Data Structure", Jones and Bartlett, 4th Ed., 2010.
6. Nell Dale, Chips Weens, "Programming and Problem Solving with C++", Jones and Bartlett , 5th Ed., 2010.

Paper Code: MCA 106

Paper Title: Operating Systems

	L	P	C
	4	0	4

UNIT 1

Introduction: Definition, Role, Types of Operating System, Batch Systems, multi programming, time–sharing parallel, distributed and real-time systems, Operating system structure, Operating system components and services, System calls, System programs, Virtual machines.

Processes: Process Concept, Process Scheduling, Operation on Processes, Cooperating Processes, Threads.

CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms, Multiple Processor Scheduling, Real-Time Scheduling, Algorithm Evaluation.   (10Hrs)

UNIT 2

Interprocess Communication and Synchronization: Background, The Critical-Section Problem, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Critical Regions, Monitors, Message Passing.

Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock, Combined Approach to Deadlock Handling.

Memory Management: Background, Logical vs. Physical Address space, swapping, Contiguous allocation, Paging, Segmentation, Segmentation with Paging in MULTICS and Intel 386.

Virtual Memory: Demand Paging and its performance, Page-replacement Algorithms, Allocation of Frames, Thrashing, page size and other Considerations, Demand Segmentation.   (10Hrs)

UNIT 3

Device Management: Techniques for Device Management, Dedicated Devices, Shared Devices, Virtual Devices, Independent Device Operation, Buffering, Multiple Paths, Block Multiplexing, Device Allocation Consideration

Secondary-Storage Structure: Disk Structure, Disk Scheduling, Disk Management, Swap Space Management, Disk Reliability.   (10Hrs)

UNIT 4

File-System Interface: File Concept, Access Methods, Directory Structure.
File-System Implementation: Introduction, File-System Structure, Basic File System, Allocation Methods, Free-Space Management, Directory Implementation.
Security : The Security problem, Goals of protection, Access matrix, Authentication, Program threats, System threats, Intrusion detection , Cryptography.
Case Study: Linux Operating System-design principles, kernel modules, process and memory management, interprocess communication, network structure, security, and Windows XP-design principles, system components, networking and program interface.

(10Hrs)

Text Books:
1. Silbersachatz and Galvin, "Operating System Concepts", John Wiley, 8th Ed., 2009.
2. Milan Kovic., "Operating Systems", Tata McGraw Hill, 2001
3. Deitel, Deitel and Choffnes, "Operating Systems", Pearson, 3rd Edition

References:
1. Tannenbaum, "Operating Systems", PHI, 5th Ed., 2000.
2. Madnick E. and Donovan J., "Operating Systems", Tata McGraw Hill, 2001.
3. Flynn McHoes, "Operating System", Cengage Learning, 2006.
4. Pbitra Pal Choudhury, "Operating System Principles and Design", PHI, 2009.
5. Sibsankar Halder and Alex A. Aravind, "Operating System", Pearson, 2009.
6. William Stallings, "Operating Systems Internals & Design Principles", Pearson Education, 6th Ed., 2009.
7. Richard Peterson, "Linux: The Complete Reference", Osborne McGraw-Hill.

Paper Code: MCA 108   **L**   **P**   **C**
Paper Title: Web Technologies   **4**   **0**   **4**

INSTRUCTIONS TO PAPER SETTERS:
  1. **Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 20 marks.**
  2. **Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 10 marks**

UNIT 1

Introduction to the internet, the world wide web: the idea of hypertext and hyper media, how the web works, how the browser works- mime types, plugins and helper applications.
Introduction to html: basic tags of html, tables, frames, forms
Separating style from structure with style sheets: inline style specification and internal style specifications within html, external linked style specification using css.

(10Hrs)

UNIT 2

Introduction to xml: XML vs. HTML, uses of xml, simple xml, xml key components, dtd and schemas, well formed, using xml with application.
Client side programming: introduction to JavaScript, JavaScript programming, variables, functions, conditions, loops, JavaScript object model, event handling, forms handling, cookies, hidden fields, images, applications

(10Hrs)

UNIT 3

DHTML: combining html, css and javascript, dhtml document object model (dom)
SQL Queries: Introduction to SQL**,** Simple queries with use of where, having, group by, View, create, drop.
Server side programming: Introduction to php, basics of php, php file handling, php file upload, php sessions, php cookies, php error handling, php mysql introduction, php mysql insert into, php mysql select, php mysql -the where clause, php mysql update, php mysql delete

(10Hrs)

UNIT 4

Web services: components and working of web services, web services architecture, introduction to service oriented architecture, soap, wsdl, uddi, ajax, overview of grid computing, overview of cloud computing.

(10Hrs)

Text Books:
  1. Deitel, "Internet and World Wide Web, How to Program", PHI
  2. Achyut S Godbole and Atul Kahate, "Web Technologies", Tata McGraw Hill.
  3. Ivan Bay Ross, "HTML, DHTML, Java Script, Perl CGI", PBP
  4. S. Padma Priya, "Web Technology", SCITECH.

References:
1. Jeffrey C. Jackson, "Web Technologies – A Computer Science Perspective", Pearson, 2005
2. Anders Moller, Michael Schwartzeach, "An Introduction to XML and Web Technologies", Pearson, 2009
3. James L Mohler and Jon Duff, "Designing Interactive web sites", Delmar Thomson Learning

Paper Code: MCA 110　　　　　　　　　　　　　　　　　　　　**L**　　**P**　　**C**
Paper Title: Systems Analysis & Design　　　　　　　　　　**4**　　**0**　　**4**

Unit-1

Introduction : System Definition and concepts, System Environments and Boundaries , Basic principles of successful systems, , Role and Need of Systems Analyst. Qualifications and responsibilities, System Analysis as a Profession.
System Development Cycle: Introduction to Systems Development Life Cycle (SDLC).
Various phases of SDLC: Study, Analysis, Design, Development, Implementation, Maintenance, Systems documentation consideration, Enforcing documentation discipline in an organization

(10 Hrs)

Unit-2

System Planning: Data and fact gathering techniques: Interviews, Group Communication - Questionnaires; Assessing Project Feasibility: Technical, Operational, Economic, Cost Benefits, Analysis, Schedule, Modern Methods for determining system requirements: Joint Application, Development Program, Prototyping, Business Process Re-engineering. System Selection Plan and Proposal

(10 Hrs)

Unit-3

System Design and Modeling: Process Modeling, logical and physical design, Conceptual Data Modeling: Entity Relationship Analysis, Entity-Relationship Modeling, DFDs, Concepts of Normalization. ,Process Description: Structured English, Decision Tree, Decision Tables. Data Dictionary, Recording Data Descriptions, Module specifications. Top-down and bottom-up design. Module coupling and cohesion. Structure Charts

(10 Hrs)

Unit-4

Input and Output: Classification of forms, Input/output forms design. User-interface design, Graphical interfaces. Standards and guidelines for GUI design. Designing integrity controls and security controls
System Implementation and Maintenance : Planning considerations. Conversion methods, procedures and controls. System acceptance criteria. System Evaluation and Performance. Testing and Validation. Preparing User Manual. Maintenance Activities and Issues

(10 Hrs)

Text Books :
1. J. Hoffer, "Modern Systems Analysis and Design", Fourth Edition, Joey George and Joseph Valacich, Pearson Education.
2. J. Whitten, L. Bentley and K. Dittman, "Systems Analysis and Design Methods", Fifth Edition, Tata McGraw Hill.

Reference Books :
1. Shelly, Cashman, Rosenblatt, "Systems Analysis and Design" Sixth Edition, Thompson Course Technologies
2. Kendall & Kendall, "Systems Analysis and Design", Seventh Edition, Pearson Education.