GURUGRAM UNIVERSITY, GURUGRAM

(Established under Haryana Act 17 of 2017)

MASTER OF COMPUTER APPLICATIONS

(MCA)

(Two Year (four semesters) Post Graduate Program)

(Under Choice Based Credit System)

(Structure & Syllabi)

Effective from the Academic Session 2020-2021

Department of Computer Sceince
Gurugram University
Gurugram- 122018 HARYANA
(INDIA)

GURUGRAM UNIVERSITY, GURUGRAM

REVISED MCA ORDINANCE AS PER AICTE GUIDELINES 2020-21

W.E.F. Session 2020-21

Eligibility for Admission to MCA 2-year Programme:

BCA/Bachelor Degree in Computer Science Engineering or equivalent Degree/Bachelor Degree (B.Sc) with Computer Science as one of the major subjects with at least 50% marks (45% marks in case of candidates belonging to SC/ST category).

OR

Passed B.Sc./B.Com./B.A. with Mathematics at 10+2 Level or at Graduation Level with at least 50% marks (45% marks in case of candidates belonging to SC/ST category) with additional bridge Courses i.e. one year Diploma after graduation such as PGDCA or equivalent.

OR

Passed B.Sc./B.Com./B.A. with Mathematics at 10+2 Level or at Graduation Level with at least 50% marks (45% marks in case of candidates belonging to SC/ST category), along with the students admitted with this eligibility will have to simultaneously undertake additional ***Bridge Course*** as prescribed by the University during the first semester.

Note: * It is compulsory for each student to pass out Bridge Course (two additional theory papers and two practical as prescribed in scheme of examination of Bridge Course) as per University norms during the 1st year of MCA-2 year course and the degree will be awarded after the completion of Bridge Course. However, these papers under Bridge Course will be taught only in the 1st semester of the course.

Scheme of Examinations and Syllabus
for
Bridge Course to Regular MCA 2- year programme
With effect from the Session 2020-21

Programme Specific Outcomes:
The students upon completion of bridge course will be able to:

PSO1: To prepare students from non - computer science background for the Programme.
PSO2: Acquire basic computer knowledge and problem solving with computers
PSO3: To understand the concept of computer languages and learn how to program.
PSO4: Honing basic computer science skills for advancing career in the field of computer science.

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Course Code	Course Name	Credits* (L:T:P)	External Marks	Internal Marks	Total
MCA 001	Computer Fundamentals and Programming in C	4:0:0	80	20	100
MCA 002	Rapid Application Development with Visual Basic	4:0:0	80	20	100
MCA 003	Lab based on MCA 001	0:0:3	80	20	100
MCA 004	Lab based on MCA 002	0:0:3	80	20	100
Total Credits/Marks		**29(20:3:6)**	**320**	**80**	**400**

** Mapping of Credits to Teaching Hours & Group Size for Practical/Tutorials shall be one adopted by the Gurugram University or existing Maharshi Dayanand University, Rohtak CBCS Ordinance uptill.*

Note: It is compulsory for each student to pass out Bridge Course (two additional theory papers and two practical as prescribed in scheme of examination of Bridge Course) as per University norms during the 1st year of MCA-2 year course and the degree will be awarded after the completion of Bridge Course. However, these papers under Bridge Course will be taught only in the 1st semester of the course.

SEMESTER - I

Course Code	Course Title	Credits* (L:T:P)	Maximum Marks		
			Internal Assessment	End-semester Examination	Total
MCA 101	Data Structures and Algorithms	4:0:0	20	80	100
MCA 102	System Software and Operating System	4:0:0	20	80	100
MCA 103	Object Oriented Programming Using C++	4:0:0	20	80	100
MCA 104	Data Communication and Computer Networks	4:1:0	20	80	100
MCA 105	Artificial Intelligence	4:0:0	20	80	100
MCA 106	Software Lab-01** Based on MCA 101 & MCA 102	0:0:3	20	80	100
MCA 107	Software Lab-02** Based on MCA 103 & MCA 105	0:0:3	20	80	100
MCA 108	Seminar/Discussion	0:2:0	50		50
Total Credits/Marks		**29(20:3:6)**	**190**	**560**	**750**

**Note: Mapping of Credits to Teaching Hours & Group Size for Practical/Tutorials shall be one adopted by the Gurugram University or existing Maharshi Dayanand University, Rohtak CBCS Ordinance uptill.*

*** Both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.*

SEMESTER - II

Course Code	Course Title	Credits* (L:T:P)	Maximum Marks		
			Internal Assessment	End-semester Examination	Total
MCA 201	Database Management Systems	4:0:0	20	80	100
MCA 202	Theory of Computation and Compilers	4:0:0	20	80	100
MCA 203	The JAVA Programming Language	4:0:0	20	80	100
MCA 204	Elective-I (Any One)	4:1:0	20	80	100
MCA 204A	Software Engineering				
MCA 204B	Soft Computing				
MCA 204C	Discrete Structures and Optimization				
MCA 204D	Wireless Networks & Mobile Computing				
MCA 205	Elective-II (Any One)	4:0:0	20	80	100
MCA 205A	Computer System Architecture				
MCA 205B	Internet of Things				
MCA 205C	Programming Languages and Computer Graphics				
MCA 205D	Advanced Algorithms				
MCA 206	Software Lab-03** Based on MCA 201 & MCA 202	0:0:3	20	80	100
MCA 207	Software Lab-04** Based on MCA 203 & MCA 205	0:0:3	20	80	100
MCA 208	Project Report/Industry Internship Report/ Dissertation –I	0:3:0	20	80	100
FE-201	Foundation Elective***	2:0:0	20	80	100
Total Credits/Marks		**32(22:4:6)**	**180**	**720**	**900**

**Note: Mapping of Credits to Teaching Hours & Group Size for Practical/Tutorials shall be one adopted by the Gurugram University or existing Maharshi Dayanand University, Rohtak CBCS Ordinance uptill.*

*** Both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.*

SEMESTER - III

Course Code	Course Title	Credits* (L:T:P)	Maximum Marks		
			Internal Assessment	End-semester Examination	Total
MCA 301	Machine Learning with Python	4:0:0	20	80	100
MCA 302	Object Oriented Analysis & Design with UML	4:0:0	20	80	100
MCA 303	Enterprise Architecture with .NET	4:0:0	20	80	100
MCA 304	Elective-I (Any One)	4:0:0	20	80	100
MCA 304A	Advanced JAVA				
MCA 304B	Server-Side Web Programming with PHP and MySQL				
MCA 304C	Statistical Computing				
MCA 304D	Network Programming				
MCA 304E	Modelling & Simulation				
MCA 305	Elective-II (Any One)	4:1:0	20	80	100
MCA 305A	Cloud, Edge & Fog Computing				
MCA 305B	Storage Area Networks & Data Centres				
MCA 305C	Data Mining & Warehouse				
MCA 305D	Advanced Computer Architecture				
MCA 305E	Advanced Software Engineering				
MCA 306	Software Lab-05** Based on MCA 301 & MCA 302	0:0:3	20	80	100
MCA 307	Software Lab-06** Based on MCA 303 & MCA 304	0:0:3	20	80	100
MCA 308	Seminar/Report on Digital India or any other area where Computers have made an impact	0:2:0	50	0	50
OE-309	OPEN ELECTIVE*** ENV02	3:0:0	20	80	100
Total Credits/Marks		**32(23:3:6)**	**210**	**640**	**850**

**Note: Mapping of Credits to Teaching Hours & Group Size for Practical/Tutorials shall be one adopted by the Gurugram University or existing Maharshi Dayanand University, Rohtak CBCS Ordinance uptill.*

*** Both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.*

SEMESTER - IV

Course Code	Course Title	Credits* (L:T:P)	Maximum Marks		
			Internal Assessment	End-semester Examination	Total
MCA 401	Android Programming	4:0:0	20	80	100
MCA 402	Client-Side Web Programming	4:0:0	20	80	100
MCA 403	Computer Security & Block Chain Technology	4:0:0	20	80	100
MCA 404	Elective-I (Any One)	4:0:0	20	80	100
MCA 404A	Advanced DBMS				
MCA 404B	Big Data Analytics				
MCA 404C	Image Processing and Computer Vision				
MCA 404D	Deep Learning				
MCA 404E	Advanced Networking				
MCA 405	Elective-II (Any One)	4:1:0	20	80	100
MCA 405A	Quantum Computing				
MCA 405B	Natural Language Processing				
MCA 405C	Bio Informatics				
MCA 405D	Internet of Everything				
MCA 405E	Software Testing & Quality Assurance				
MCA 406	Software Lab-07** Based on MCA 401 & MCA 403	0:0:3	20	80	100
MCA 407	Software Lab-08** Based on MCA 402 & MCA 404	0:0:3	20	80	100
MCA 408	Project Report/Industry Internship Report/	0:3:0	20	80	100
Total Credits/Marks		**30(20:4:6)**	**160**	**640**	**800**
GRAND TOTAL (For 2 Year Course)		**123(85:14:24)**	**740**	**2560**	**3300**

**Note: Mapping of Credits to Teaching Hours & Group Size for Practical/Tutorials shall be one adopted by the Gurugram University or existing Maharshi Dayanand University, Rohtak CBCS Ordinance uptill..*

*** Both practical exams of a semester may be conducted on the same day in 2 sittings each maximum of 3 hours.*

MCA-001

Computer Fundamentals and Programming in C

Max. Marks: 100 (80+20) *Time: 3Hrs*

Note: *Examiner will be required to set NINE questions with all questions carrying equa marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner wil set two questions from each Unit with internal choice. Student will be required to attemp FIVE questions in all, selection one question from every unit apart from the Questio Number 1.*

UNIT-I

Computer Fundamentals: Concept of data and information. Components of Computer Input and Output Device, Components of CPU, Memory and Storage Devices, Classificatio of Computers, Advantages and Limitations of Computer, Applications of Computer, Socia concerns of Computer Technology: Positive and Negative Impacts, Computer Crimes Viruses and their remedial solutions.

Computer Software: System and Application Software, Overview of Operating Syste Programming Languages Machine. Assembly. High Level Language, 4GL. Languag Translator, Linker and Loader.

UNIT-II

Problem Solving: Problem Identification. Analysis, Algorithms, Flowcharts. Pseudo codes Decision Tables. Program Coding. Program Testing and Execution.

C Programming Fundamentals: Keywords, Variables and Constants, Structure of a C program.

UNIT-III

Operators & Expressions: Arithmetic, Unary, Logical. Bit-wise, Assignment & Conditiona Operators.

Decision Making: Decision making using if...else. Else If Ladder; Switch, break. Continue and Goto statements.

UNIT-IV

Loops: Looping using while, do...while, for statements. Nested loops.

Functions: Defining & Accessing User defined functions. Library Functions, Functio Prototype, Passing Arguments, Passing array as argument. Recursion, Use of Librar Functions. Macro vs. Functions, Pointers in C.

Textbooks & Reference Books:

1. E. Balaguruswamy: Programming in C. Tata McGraw Hill.
2. Rajender Singh Chhillar: Application of IT to Business, Ramesh Publishers, Jaipur.

MCA-002

Rapid Application Development with Visual Basic

Max. Marks: 100 (80+20) *Time: 3Hrs*

Note: *Examiner will be required to set NINE questions with all questions carrying equa marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner wil set two questions from each Unit with internal choice. Student will be required to attemp FIVE questions in all, selection one question from every unit apart from the Questio Number 1.*

UNIT-I

Introduction to Visual Basic: VB IDE & Components, Feature of VB, VB for Rapid Applicatio Development, VB as event-driven & object-based language, An overview of VB projec types.

Programming with VB: Variables, Constants, Data types. Variable Scope.

UNIT-II

VB Controls: Default Controls in Tool Box: Label Box, Text Box, Command Button. List Box Combo Box. Picture & Image Box, Shape box. Timer. Option button. Check Box & Frames Exploring Project Properties.

VB Operations & Control Structures: Arithmetic operations, String Operations. Built-i Functions, I/O in VB. Branching & Looping statements.

UNIT-III

Menu in VB: Adding Menu, Modifying and Deleting Menu Items. Creating Submenus.

Forms in VB: Working with Forms: Working with multiple forms; Loading. Showing an Hiding forms; Creating Forms at Run Time, Drag and Drop operation. MDI form Arrangin MDI Child Windows. Coordinating Data between MDI Child Forms.

UNIT-IV

Advanced Controls in VB: Introduction: Scroll Bar, Slider Control, Tree View, List View, Ric Text Box Control Toolbar, Status Bar, Progress Bar, Cool bar, Image List, Tab Strip.

VB & Databases: VB as perfect Front-End Language, The Data Controls and Data-Boun Controls, Using DAO, RDO, ADO.

Textbooks & Reference Books:

1. Visual Basic 6 Programming: Black Book By Steven Holzner, dreamtech PRESS
2. Mastering Visual Baisc 6 By Evangelos Petroutsos, BPB
3. Programming in Visual Basic 6.0 By Julia Case Bradley & Anita C. Millspaugh Tata

MCA-101
Data Structures and Algorithms

Time: 3Hrs

Max. Marks: 100 (80+20)

Note: *Examiner will be required to set NINE questions with all questions carrying equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner will set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions in all, selection one question from every unit apart from the Question Number 1.*

UNIT-I

Introduction: Data Types: Primitive, Composite and Abstract Data Types, Data Structures: Concept, Classification, and Importance; Data Structures v/s Data Types, Linear v/s Non-Linear Data Structures.

Arrays: Single and Multidimensional arrays; Address Calculation using Column and Row major ordering; Various operations on Arrays; Vectors; Sparse Matrix; Application of Arrays; Implementation of Arrays in C/C++.

UNIT-II

Stacks and Queues: Representation of stacks and queues using arrays and linked-list. Circular queues. Priority Queue and D-Queue. Applications of stacks: Conversion from infix to postfix and prefix expressions. Evaluation of postfix expression using stacks; Implementation in C/C++.

Linked list: Singly Linked List; Operations on Linked Lists. Linked Stacks and Queues. Polynomial Representation and Manipulation using Linked Lists. Circular Linked Lists. Doubly linked lists; Implementation in C/C++.

UNIT-III

Trees: Concept, Representation and Applications of Trees, Forest, Binary Tree, Threaded Binary Tree; Binary tree representation of a general tree; Conversion of forest into tree; Binary search tree: Height balanced (AVL) tree, B-trees, B+ Tree, B* Tree.

Binary tree traversal methods: Pre-order. In-order. Post-ordered traversal. Recursive Algorithms.

Heap: Heap operations. Binomial heaps. Fibonacci heaps. Skew heaps, heap set.

UNIT-IV

Graphs: Representation: Adjacency matrix, Adjacency lists; Type of Graphs; Paths: Euler Graphs, Hamiltonian Paths & Circuits; Cut-sets, Connectivity and Separability, Planar Graphs, Isomorphism, Graph Coloring, Covering and Partitioning.

Graph Algorithms: Breadth-First Search, Depth-First Search; Minimum Spanning Trees: Prim's and Kruskal's algorithms; Shortest-path Algorithms: Dijkstra's and Floyd's algorithm; Topological sort, Maxflow: Ford-Fulkerson algorithm, max flow -min cut.

Textbooks & References:

1. Hubbard JR: Schaum's outline of Data Structures with C++. TMH.
2. R.Kruse, C.LTonodo and B.Leung: Data Structures and Program Design in C, Pearson Education.
3. S.Chottopadhyay, D.Ghoshdastidar & M.Chottopadhyay: Data Structures Through 'C Language. BPB Publication.
4. E. Horowitz, Sahni and D. Mehta: Fundamentals of Data Structures in C++. Galgotia Publiction.
5. Y Langsaiil, M J Augenstein and A M Tanenbaum: Data Structures Using C and C++

MCA-102

System Software and Operating System

Max. Marks: 100 (80+20) *Time: 3Hrs*

Note: *Examiner will be required to set NINE questions with all questions carrying equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner will set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions in all, selection one question from every unit apart from the Question Number 1.*

UNIT-I

Introduction: System V/s Application Software, Relative advantage and disadvantages of Machine, Assembly and High-Level Languages; Language Translators: Assembler, Compiler and Interpreter; Macros, Debuggers, Text editors, Debug monitor; Overview of Loading, Linking and Relocation.

Basics of Operating Systems: Evolution, Objectives & Functions, Characteristics; Classification of Operating Systems, Windows v/s Linux Operating Systems, Mobile Operating Systems, Network based Operating Systems.

Process Concepts: Definition, Process Relationship, Process states, Process State transitions, Process Control Block, Context switching.

UNIT-II

Threads: Multicore Programming, Multithreading Models, Threading Issues.

Process Scheduling: Definition, Preemptive v/s Non-preemptive Scheduling, Scheduling Criteria, Scheduling Algorithms: FCFS, SJF, RR etc; Multiprocessor scheduling, Scheduling Algorithm Evaluation.

Process Synchronization: Critical Section Problem, Peterson's Solution, Hardware Solution, Semaphores, Classical Problems of Synchronization: Reader's & Writer Problem, Dinning Philosopher Problem; Monitors.

UNIT-III

Deadlocks - System Model. Deadlock Principles, Deadlock Characterization. Methods for Handling Deadlocks Deadlock Prevention, Deadlock Avoidance: Resource Allocation Graph Algorithm, Banker's Algorithm; Deadlock Detection, Recovery from Deadlock.

Memory Management: Basic Memory Management, Logical and Physical address map, Memory allocation, Fragmentation and Compaction, Paging and its disadvantages, Virtual Memory, Locality of reference, Page Fault, Working Set, Demand paging concept, Page Replacement policies.

Overview of Input/Output & File Management, Disk Scheduling Algorithms.

UNIT-IV

Linux Operating System: Design Principles, Kernel Modules, Shells, Editors, Process Management, Scheduling, Memory Management, File Systems, Input and Output; Interprocess Communication, Network Structure.

Linux Utilities: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text Processing utilities and backup utilities.

Shell programming: Introduction, shell responsibilities, pipes and Redirection, Running a shell scripts, The shell as a programming language, Shell meta characters, File name substitution, Shell variables, Command substitution, Shell commands, The environment, Quoting, Test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts.

Object Oriented Programming Using C++

Max. Marks: 100 (80+20) *Time: 3Hrs*

Note: *Examiner will be required to set NINE questions with all questions carrying equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner will set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions in all, selection one question from every unit apart from the Question Number 1.*

UNIT-I

Introduction: Software crisis, Evolution of Programming Paradigms: - Procedural, Structured, Function-oriented, Object based and Object-Oriented Programming Languages; Functional Abstraction v/s Data Abstraction, Object Oriented Programming Paradigm: concept of Classes, Objects, Data Encapsulation, Inheritance, Polymorphism, Dynamic Binding and Message Passing.

Recap of C++: C vs C++, Why named C++, Tokens, Keywords, Identifiers, Constants, Data Types: Basic, User Defined and Derived, Type Compatibility, Declaring Variable, Dynamic Initialization of Variables, Reference Variables, Operators not in C but available in C++, Operator Precedence, Special Assignment Expressions, Implicit Conversion, Control Structures in C++, Structure of C++ program.

Functions in C++: Role of Main Function, Function Prototyping, Call by Reference and Return by Reference, Default Arguments, const Arguments, Function Overloading.

UNIT-II

Classes & Objects: C struct v/s C++ struct, Specifying Class, Implementing Data Hiding and Data Encapsulation through **private** and **public** Access Specifiers, Defining Member Functions, Inline Functions, Nesting of Member Functions, Arrays within Class, Creating Objects, Array of Objects, Memory Allocation for Objects, Static Data Members and Member Functions, Objects as Function Arguments, Returning Objects, Friendly Functions, **const** Member Functions, Pointers to Members, Local Classes.

Constructors: Concept, Purpose and Usage, Type of Constructors in C++: Default, Parameterized and Copy Constructors, Overloading of Constructors and Multiple Constructors, Constructors with Default Arguments, Dynamic Initialization of Objects, Dynamic Constructors, **const** Objects.

Destructors: Concept, Purpose and Usage.

UNIT-III

Inheritance: Concept of Reusability, Defining Derived Class, **protected** Access Specifier, Inheritance Types in C++: Single, Multilevel, Multiple, Hierarchical and Hybrid Inheritance; Ambiguity Resolution in Multiple Inheritance, Virtual Base Class, Abstract Class, Constructors in Derived Classes, Member Classes.

Operator Overloading: Concept, Operators that can't be overloaded, Defining Operator Overloading, Overloading Unary Operators, Overloading Binary Operators using Member Functions and Friend Functions, Rules for Operator Overloading, Operators where Friend Function cannot be used, Overlading Assignment Operator, Type Conversions.

Polymorphism: Concept, Compile Time Vs Run Time Polymorphism, Pointers in C++, **this** Pointer, Pointers to a Derived Class, Virtual and Pure Virtual Functions, Late Binding with Virtual Functions.

UNIT-IV

I/O in C++: C++ Streams and Stream Classes, Overloading '>>' and '<<' Operators,

Textbooks & References:

1. Bjarne Stroustrup: The C++ Programming Language, Addision-Wesley.
2. E. Balaguruswamy: Object Oriented Programming and C++, TMH.
3. Herbert Schildt: C++ - The Complete Reference. Tata McGraw Hill Publications
4. R.Rajaram: Object Oriented Programming and C++, New Age International.
5. Subburaj: Object-Oriented Programming with C++, VIKAS Publishing House.
6. Robert Lafore: Object Oriented Programming in C++, Galgotia.
7. V. Aklecha: A Comprehensive Guide to C++, BPB.

MCA-104
Data Communication and Computer Networks

Max. Marks: 100 (80+20) *Time: 3Hrs*

Note: *Examiner will be required to set NINE questions with all questions carrying equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner will set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions in all, selection one question from every unit apart from the Question Number 1.*

UNIT-I

Computer Networks: Why Computer Networks; Network Topologies; Classification based on Size: Personal Area Networks, Local Area Networks, Metropolitan Area Networks, Wide Area Networks; Internetworks, Network Software: Protocol and Protocol Hierarchy, Design Issues for Layers; Connection Oriented Vs Connectionless Service, Service Primitives, The Relationship of Services to Protocols, Reference Models: The OSI Reference Model, The TCP/IP Reference Model, Comparison of OSI and TCP/IP Models; The ARPANET; Architecture of the Internet; Network Standardization.

Data Communication: Components of a Data Communication System, Simplex, Half-Duplex and Duplex Modes of Communication, Analog and Digital Signals, Noiseless and Noisy Channels, Bandwidth, Throughput and Latency, Digital and Analog Transmission, Repeaters, Hubs, Bridges, Switches, Routers and Gateways.

UNIT-II

The Physical Layer: Fourier Analysis, The Maximum Data Rate of a Channel: Nyquist's Theorem v/s Shannon Capacity; Guided Transmission Media: Magnetic Media, Twisted Pairs, Coaxial Cable, Power Lines, Fiber Optics; Wireless Transmission: The Electromagnetic Spectrum, Radio Transmission, Microwave Transmission, Infrared Transmission, Light Transmission; Communication Satellites; Satellite v/s Fiber; Digital Modulation and Multiplexing: Baseband Transmission, Passband Transmission, Frequency Division Multiplexing, Wavelength Division Multiplexing, Time Division Multiplexing, Code Division Multiplexing; Switching: Circuit Switching, Packet Switching, Message Switching;

The Data Link Layer: Design Issues: Service to Network Layer, Framing, Error Control, Flow Control; Error Detection and Correction: Error Correcting Codes v/s Error Detecting Codes, Hamming Codes, Convolution Codes, Reed Solomon Codes, Checksum, CRC; Elementary Data Link Protocols: A Utopian Simplex Protocol, A simplex Stop and Wait Protocol; Sliding Window Protocols: A One Bit Sliding Window Protocol, A Protocol Using Go-Back-N, A Protocol Using Selective Repeat; ADSL, HDLC.

UNIT-III

The MAC Sublayer: Purpose; The Channel Allocation Problem: Static v/s Dynamic Channel Allocation; Multiple Access Protocols: ALOHA, CSMA, CSMA/CD, Collision Free Protocols, Limited Contention Protocols; Wireless LAN Protocols: Hidden Terminal and Exposed Terminal Problems; Ethernet, Virtual LANs.

The Network Layer: Design Issue: Store and Forward Packet Switching, Service to Transport Layer, Connectionless v/s Connection Oriented Service; Routing Algorithms: Adaptive v/s Nonadaptive Algorithms, The Optimality Principle, Shortest Path Algorithm, Flooding, Distance Vector Routing and the Count to Infinity Problem, Link State Routing, Hierarchical Routing, Broadcast v/s Multicast Routing, Unicast v/s Anycast Routing;

The Internet Transport Protocols: TCP, UDP and SCTP Protocols; Flow Control, Error Control and Congestion Control in TCP and SCTP.

The Application Layer: The Domain Name System (DNS); Resolution: Mapping Names to Addresses and Addresses to Names; HTTP, Electronic Mail Architecture, SMTP, POP and IMAP, TELNET, FTP.

Textbooks & References:

1. A.S. Tanenbaum: Computer Networks, Prentice-Hall of India.
2. Behrouz Forouzan and S.C. Fegan: Data Communications and Networking, McGraw Hill.
3. W. Tomasi: Introduction to Data Communications and Networking, Pearson Education.
4. P.C. Gupta: Data Communications and Computer Networks, Prentice-Hall of India.
5. L. L, Peterson and B. S. Davie: Computer Networks: A Systems Approach, Morgan Kaufmann.
6. William Stallings: Data and Computer Communications, Pearson Education.

MCA-105
Artificial Intelligence

Max. Marks: 100 (80+20) *Time: 3Hrs*

Note: *Examiner will be required to set NINE questions with all questions carrying equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner will set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions in all, selection one question from every unit apart from the Question Number 1.*

UNIT-I

Introduction: Definition and applications of Artificial Intelligence; Approaches to AI: Turing Test and Rational Agent Approaches; Problem solving: Problem characteristics, Defining the problem as state space, Production System.

Search techniques: Brute Force v/s Heuristic Search, Hill climbing and issues, Best first search, A* algorithm, Problem reduction; Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures.

UNIT-II

Expert Systems: Definition, Role of knowledge in expert system, Architecture of Expert Systems.

Expert System Development Life Cycle: Problem selection, Prototype construction, Formalization, Implementation, Evaluation.

Knowledge: Definition and Importance of Knowledge; Knowledge Based Systems.

Knowledge acquisition: Knowledge engineer, Cognitive behavior, Acquisition techniques.

Knowledge representation: Level of representation, Knowledge representation schemes, Formal logic, Inference Engine, Semantic net, Frame, Rules, Scripts, Conceptual Dependency and Ontologies, Handling Uncertainty in Knowledge.

UNIT-III

Artificial Neural Networks (ANN): Introduction, ANN v/s Biological Neural Networks; Learning in neural networks: Supervised, Unsupervised and Reinforcement Learning; Perceptions: Single Perceptron, Multi-Layer Perceptron; Back propagation networks, Self-Organizing Maps, Hopfield Network; Application of neural networks,

Fuzzy logic: Definition, Difference between Boolean and Fuzzy logic; Fuzzy Sets: Notion of Fuzziness, Membership Functions, Fuzzification and Defuzzification; Operations on Fuzzy Sets, Fuzzy Functions and Linguistic Variables; Fuzzy Relations, Fuzzy Rules and Fuzzy Inference; Fuzzy expert system, Inference process for fuzzy expert system, fuzzy controller; Fuzzy Control System and Fuzzy Rule Based Systems.

UNIT-IV

Programming in Logic (PROLOG): Introduction. Prolog variables, Using rules, Input and Output predicates. Fail and cut predicates, Recursion, Arithmetic operation. Compound object. Dynamic database, Lists, String. File operations.

Textbooks & References:

1. Elaine Rich, Kevin Knight: Artificial Intelligence. Tata McGraw Hill.
2. V.S. Janakiraman: Foundations of Artificial Intelligence and Expert Systems, Trinity Press
3. David W. Rolston: Principles of Artificial Intelligence and Expert System

MCA 301

Machine Learning with python

UNIT-1

Basic concepts, Designing a learning system, Issues in machine learning .Types of machine learning: Learning associations. Tools and software for machine learning Introduction to Machine learning Paradigms:
Supervised Learning , Introduction to Supervised learning , Supervised Learning concepts , Linear Regression , Logistic regression , K-NN classification , Naïve Bayesian classifiers ; SVM - (Support Vector Machines) , Multiclass SVM , Regression Algorithms , Model Evaluation , Model Evaluation: Overfitting & Underfitting

UNIT-2

Unsupervised Learning , Unsupervised Learning concepts
Clustering approaches , K Means clustering , Hierarchical clustering , Introduction to Semi Supervised Learning , Self-learning , Co-training , Gaussian Model , Label Propagation , Graph Models , Decision Tree
Introduction to Ensemble Learning
Different Ensemble Learning Techniques , Bagging , Boosting , Random Forests , Stacking , Featurization, Model Selection & Tuning , Feature extraction , Model Defects & Evaluation Metrics , Model selection and tuning , Comparison of Machine Learning models , Reinforcement Learning , Introduction to Reinforcement Learning Reinforcement Learning framework , Dynamic programming , Monte Carlo , Temporal difference methods , Q-learning , Actor-Critic

UNIT-3

Python Programming:

Introduction to Python, Basic Syntax, Data Types, Variables, Operators, Input/output, Flow of Control , (Modules, Branching), If, If- else, Nested if-else, Looping, For, While, Nested loops, Control Structure, Break, Continue, Pass, Strings and Tuples, Accessing Strings, Basic Operations, String slices, Working with Lists, Introduction, Accessing list, Operations, Function and Methods, Files, Modules, Dictionaries, Functions and Functional Programming, Declare, assign and retrieve values from Lists, Introducing Tuples, Accessing tuples, matplotlib, seaborn,

UNIT-4

Advanced Python: Object Oriented, OOPs concept, Class and object, Attributes, Inheritance,Overloading, Overriding, Data hiding, Operations Exception, Exception Handling, Python Libraries,Data migration and visualization: Pandas and Matplotlib, Database Interaction in Python, Case Studies: Mathematical computing with Python, Data migration and visualization: Pandas andMatplotlib, Pycharm, Anaconda, Data manipulation with Pandas

MCA-302
Object Oriented Analysis & Design with UML

UNIT-I

INTRODUCTION TO UML: Introduction to object-oriented concepts like Inheritance, Polymorphism, Information Hiding, Importance of modelling, Principles of modelling, Object oriented modelling, An overview of UML, Conceptual model of the UML, Architecture, Software development life cycle.

BASIC STRUCTURAL MODELING: Classes: Terms and concepts, Common modelling techniques; Relationships Modelling simple dependencies, Single inheritance, and structural relationships; Common mechanisms and diagrams.

ADVANCED STRUCTURAL MODELING: Advance classes, Advance relationships, Interfaces, Types and Roles, Packages, Instances.

Unit-II

THE OBJECT-ORIENTED DESIGN PROCESS: The Object and Class concepts, identifying classes, Identifying responsibilities, Relationships between Classes, Use Cases, CRC cards, UML class diagrams, Sequence diagrams, State diagrams, Using Java doc for design documentation.

GUIDELINES FOR CLASS DESIGN: An overview of the date classes in the java library, designing a day class, the importance of encapsulation, analysing the quality of an interface, programming by contract, unit testing.

Unit-III

INTERFACE TYPES AND POLYMORPHISM: The icon interface type, polymorphism, drawing shapes, the comparable interface type, anonymous classes, frames and user interface components, user interface actions, timers, designing an interface type.

PATTERNS AND GUI PROGRAMMING: Iterators, the pattern concept, the observer pattern, layout managers and the strategy pattern, components, containers, and the composite pattern, scroll bars and the decorator pattern, how to recognize patterns, putting patterns to work.

Unit-IV

INHERITANCE AND ABSTRACT CLASSES: The concept of inheritance, graphics programming with inheritance, abstract classes, the template method pattern, protected interfaces, the hierarchy of swing components, the hierarchy of standard geometric shapes, the hierarchy of exception classes, when not to use inheritance.

FRAMEWORKS: Frameworks, applets as a simple framework, the collections framework, a graph editor framework, enhancing the graph editor framework.

MULTITHREADING: Thread basics, Thread synchronization, Animations.

Analysis and Design with theUnified Process, Cengage learning, India.

4. Any other book(s) covering the contents of the paper in more depth.

Note: Latest and additional good books may be suggested and added from time to time

MCA-303

The Enterprise Architecture with .NET

Time: 3Hrs

Max. Marks: 100 (80+20)

Note: *Examiner will be required to set NINE questions with all questions carrying equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner will set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions in all, selection one question from every unit apart from the Question Number 1.*

UNIT-I

[redacted]

Introduction: Understanding Previous Technologies, Benefits of .NET Framework, Architecture of .NET Framework 4.0, .NET Execution Engine, Components of .NET Framework 4.0: CLR, CTS, Metadata and Assemblies, .NET Framework Class Library, Windows Forms, ASP .NET and ASP .NET AJAX, ADO .NET, Windows workflow Foundation, Windows Presentation Foundation, Windows Communication

Creating a Simple C# Console Application, Identifiers and Keywords. System Data Types, Variables and Constants: Value Types, Reference Types, Understanding Type Conversions, Boxing and UnBoxing. Namespaces, The System namespace, .NET Array Types.

UNIT-II

Classes and Objects: Creating a Class, Creating an Object, Using this Keyword, Creating an Array of Objects, Using the Nested Classes, Defining Partial Classes and Method, Returning a Value from a Method and Describing Access Modifiers. Static Classes and Static Members, Properties: Read-only Property, Static Property, Indexers; Structs: Syntax of a struct and Access Modifiers for structs, System.Object Class, Encapsulation, Inheritance and Constructors, Polymorphism.

UNIT-III

Events: Event Sources, Event Handlers, Events and Delegates, Multiple Event Handlers

Exception Handling: The try/catch/throw/finally statement, Custom Exception, System.Exception, Handling Multiple Exception

Understanding ADO.NET: Describing the Architecture of ADO.NET, Entity Framework. Creating Connection. Syntax for Connection Strings. Creating a Connection to a Database: SQL Server Database, OLEDB Database, Creating a Command Object. Working with DataAdapters: Creating DataSet from DataAdapter.

UNIT-IV

Windows Forms: Introduction, Windows Forms, A Simple Event- Driven GUI, Control Properties and Layout, Multiple Document Interface (MDI) Windows.

Web Designing: Introduction, Web Basics, Multitier Application Architecture, Your First Web Application: Building Web-Time Application, Examining Web-Time. ASPX's Code-Behind File, Understanding Master pages, Standard Web Controls: Designing a Form, Validation Controls, GridView Control, Drop Down List, Session Tracking, ASP.NET.

AJAX: Exploring AJAX, Need for AJAX, AJAX and other Technologies, AJAX Server Controls, Script Manager control, Update Panel, Update Progress Control, Creating Simple Application using AJAX Server Controls.

Textbooks:

1. .NET 4.0 Programming (6-in-1), Black Book, Kogent Learning Solutions Inc., Wiley- Dream Tech Press. (Chapters: 1,10,11,12,13,14 and 19).
2. Paul Deitel and Harvey Deitel, "C# 2010 for Programmers.", 4th Edition, Pearson Education.

References:

1. Andrew Trolsen, "Pro C# 5.0 and the .NET 4.5 Framework.", 6th Edition, Wiley-Appress.
2. Bart De Smet, "C# 4.0 Unleashed.", Pearson Education- SAMS Series.
3. Herbert Schildt, "Complete Reference C# 4.0.", Tata McGraw Hill, 2010

MCA-304A
Advanced JAVA

Max. Marks: 100 (80+20) *Time: 3Hrs*

Note: *Examiner will be required to set NINE questions. All questions shall carry equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner shell set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions. Apart from compulsory Question Number 1 they will have to attempt one question from every unit.*

UNIT-I

Java Swing: Introduction to Swing, Swing features, Components Containers, Create Swing Applet, Exploring Swing: JLabel, JTextField, Swing buttons, JTabbedPane, JList, JTree, JTable. 5

Spring: Introduction, Architecture, Spring modules, Dependency Injection, IOC containers, Constructor Injection, Dependent Object: Constructor Injection with maps, collections, Bean Definition, Constructor Injection inheriting Bean, Developing simple Applications.

UNIT-II

JDBC: Types of JDBC Drivers, The Connectivity Model, Navigating the ResultSet object's contents, Manipulating records of a ResultSet Object through user Interface, Database Connectivity, Data Manipulation using prepared Statements;

JAVA RMI: Remote Method Invocation: RMI Architecture, A simple server client applications using RMI, Spring JDBC framework.

UNIT-III

SERVLETS: Background, Life cycle of servlet, A Simple servlet, Servlet API, Get and Post request, Accessing a Servlet using an HTML page;

JSP: – Basics and Overview , JSP architecture, JSP tags and JSP expressions, Lifecycle of a JSP Model, View Controller, JSP Objects, Working with Databases.

UNIT-IV

STRUTS AND HIBERNATE MVC Architecture: POJO class, Struts: Overview, Architecture, Struts Action Class, Using Struts HTML Tags, Developing Application with Struts, Struts –JDBC connection; Introduction to Hibernate, Hibernate Architecture, Hibernate Application.

Textbooks:

MCA-305C

Data Mining & Warehouse

Time: 3Hrs

Max. Marks: 100 (80+20)

Note: *Examiner will be required to set NINE questions. All questions shall carry equal marks. Question Number 1, covering the entire syllabus, will be compulsory. Examiner shall set two questions from each Unit with internal choice. Student will be required to attempt FIVE questions. Apart from compulsory Question Number 1 they will have to attempt one question from every unit.*

UNIT-I

Data Warehouse: Need for data warehouse, Definition, Goals of Data Warehouse, Challenges faced during Warehouse Construction, Advantages, Types of Warehouse: Data Mart, Virtual Warehouse and Enterprise Warehouse. Components of Warehouse: Fact data, Dimension data, Fact table and Dimension table, Designing fact tables. Pre-requisite Phases: Extract, Transform and load process. Warehouse Schema for Multidimensional data: star, snowflake and galaxy schemas.

UNIT-II

Data Warehouse and OLAP technology: Difference between OLTP and OLAP, Strengths of OLAP, Applications of OLAP. Multidimensional data models: Data Cubes & Data Cuboids, Lattice; OLAP operations: Advantages, Types (Roll up, Drill down, Pivot, Slice & Dice operations), Applications; OLAP Server: Need, Features, Types (ROLAP, MOLAP and HOLAP).

Data warehouse Implementation, Introduction to efficient computation of data cubes.

UNIT-III

Data Mining Concepts: Introduction to Data Mining Systems, Knowledge Discovery Process, Data Mining Techniques, Issues, Applications, Data Objects and Attribute types, Statistical description of data; Data Pre-processing – Cleaning, Integration, Reduction, Transformation and Discretization; Data Visualization, Data similarity and dissimilarity measures.

Frequent Pattern Analysis: Mining Frequent Patterns, Associations and Correlations; Mining Methods- Pattern Evaluation Method, Pattern Mining in Multilevel; Multi-Dimensional Space – Constraint Based Frequent Pattern Mining; Classification using Frequent Patterns.

UNIT-IV

Classification and Clustering: Decision Tree Induction, Bayesian Classification, Rule Based Classification, Classification by Back Propagation, Support Vector Machines, Lazy Learners, Model Evaluation and Selection, Techniques to improve Classification Accuracy, Clustering Techniques: Cluster analysis, Partitioning Methods - Hierarchical Methods, Density Based Methods, Grid Based Methods; Evaluation of clustering, Clustering high dimensional data, Clustering with constraints, Outlier analysis-outlier detection methods.

WEKA Tool: Introduction to Datasets, WEKA sample Datasets, Data Mining Using WEKA tool.

Semester –III
Open Elective

16ENVO2: Disaster Management Time : 3 Hours.
MM. Th 80+IA 20

Note: 1. Seven questions will be set in all.
2. Question No. 1 will be objective covering the entire syllabus & compulsory. The remaining six questions will be set with two questions from each unit. The candidate will be required to attempt five in total, Question 1 and four by selecting at least one from each unit.

UNIT- I

Disaster- Causes and phases of disaster, Rapid onset and slow onset disasters. Nature and responses to geo-hazards, trends in climatology, meteorology and hydrology. Seismic activities. Changes in Coastal zone, coastal erosion, beach protection. Coastal erosion due to natural and manmade structures.

UNIT- II

Floods and Cyclones: causes of flooding, Hazards associated with flooding. Flood forecasting. Flood management, Integrated Flood Management and Information System (IFMIS), Flood control. Water related hazards- Structure and nature of tropical cyclone, Tsunamis – causes and physical characteristics, mitigation of risks.

UNIT- III

Earthquakes: Causes and characteristics of ground-motion, earthquake scales, magnitude and intensity, earthquake hazards and risks, Volcanic land forms, eruptions, early warning from satellites, risk mitigation and training, Landslides.

Mitigation efforts: UN draft resolution on Strengthening of Coordination of Humanitarian Emergency Assistance, International Decade for Natural Disaster Reduction (IDNDR), Policy for disaster reduction, problems of financing and insurance.

Reference Books:

1. Bolt, B.A. Earthquakes , W. H. Freeman and Company, New York. 1988
2. Carter, N,W. Disaster Management: A Disaster Manager's Hand Book, Asian Development Bank, Manila. 1992
3. Gautam Ashutosh. Earthquake: A Natural Disaster, Ashok Publishing House, New Delhi. 1994
4. Sahni, P and Malagola M. (Eds.).Disaster Risk Reduction in South Asia, Prentice-Hall of India, New Delhi. 2003.
5. Sharma, V.K. (Ed.). Disaster Management, IIPA, New Delhi. 1995.
6. Singh T. Disaster management Approaches and Strategies, Akansha Publishing House, New Delhi. 2006
7. Sinha, D. K. Towards Basics of Natural Disaster Reduction, Research Book Centre, New Delhi. 2006
8. Smith, K. Environmental Health, Assessing Risk and Reduction Disaster, 3rd Edition, Routledge, London. 2001 21