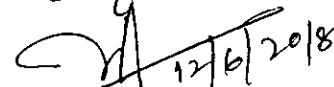



Minutes of the meeting held on 12/6/18 (10:30AM) regarding review of Syllabus and accordingly implementation of CBCS in MCA and M.Sc. (Comp. Sc.) programmes.

The committee gone through the entire syllabus of MCA and M.Sc. (Computer Science) provided by the office and prepared by T.M. B.U, Bhagalpur and recommends as follows :-

- i) The eligibility criteria for admission in M.Sc. (Comp. Sc.) / MCA programme be given in detail, thereafter the committee can examine the courses offered in different semester is feasible or not.
- ii) The soft copy of the detailed syllabus provided in hard form be also given through mail as soon as possible to work out on the following points:-
 - a) To finalize the background of Credit System.
 - b) To finalize the detailed syllabus in the courses of the given programme, the committee feels that the syllabus should be well descriptive especially in M.Sc. (Comp. Sc.)
 - c) The syllabus of Cyber security (DSE-I, M.Sc. Comp. Sc.) is missing in the hard copy.

once we get the soft copy as suggested above, the committee will consult through mail and after final resolve the aforesaid issues will sit again on 21st June 18 (9:00 PM)


12/6/2018
Prof. A.K. Nayak
IIMM, Patna.


12/6/18
Rajeev Ranjan
CoE, AKU Patna

Final recommendation regarding review of Syllabus and accordingly implementation of CBCS in MCA and M.Sc. (Comp. Sc.)

Suggestions in course structure of M.Sc. (Comp. Sc.):

- 1) The new detailed Syllabus of DBMS and implementation (CC4) is being recommended as
Basic Concept: Database Systems, Characteristics, Data Models, Database Languages, DBMS Architecture, Database Users and Data Independence.

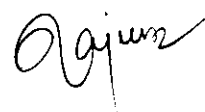
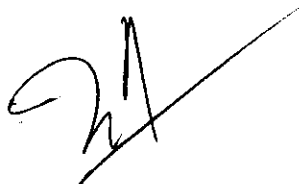
Database Design using ER Model: ER Modeling, relation types, role and Structural Constraints, Extended ER Modeling Features, Design of an ER Database Schema, Reduction of ER Schema to Tables. **Relational Model:** Codd's rules, Relational Model Concepts, Relational Algebra, Relational Calculus.

Introduction to SQL: SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Queries and sub queries, Aggregate functions, Cursors in SQL.

Relational Database Design: Functional and multi-valued Dependencies, Desirable Properties of Decomposition, Normalization up to 5 NF.

Selected Database Issues: Security, Transaction Management, Basic Algorithms to Query Processing and Query Optimization, Concurrency Control, Recovery Techniques, Case Study: Oracle/MS-SQL.

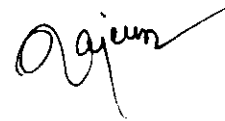
- 2) In paper Design and Analysis of Algorithms (CC1), Unit – Graph Algorithm 2 more topics namely DFS and BFS be added.
- 3) In paper Numerical Computing (EC1), Unit – Interpolation "Newton's divided differences interpolation formula" be replaced by Newton's Forward's and Backwards differences interpolation formula.



Suggestions in course structure of MCA:

- 1) In paper Compiler Design (CS- 45(I) , Unit 2 – Lexical & syntax Analysis "LR Parser concepts" be added and in unit 3 – Intermediate Code Generation "Type Checking and Symbol table" be added.

In the syllabus credit distribution in the form of L-T-P is not given and that should be designed by the respective institutions without any changes in the Credit of that paper.

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TilkaManjhi Bhagalpur University
Bhagalpur – 812007

MASTER OF COMPUTER APPLICATIONS (MCA)

Three Years (Six Semesters) Full Time Course

Curriculum and Syllabus

(For Students admitted from academic year 2018 – 2019 onwards)

(UNDER CHOICE BASED CREDIT SYSTEM)



UNIVERSITY DEPARTMENT OF COMPUTER APPLICATIONS

FACULTY OF SCIENCE

T. M. BHAGALPUR UNIVERSITY, BHAGALPUR- 812007

21

MASTER OF COMPUTER APPLICATIONS
3-YEAR FULL-TIME PROGRAMME

STRUCTURE OF CURRICULUM

The structure of MCA programme consists of six semesters as per UGC/AICTE norms, where each semester is having six courses each of 4 credits hours, except the 6th semester which is of 20 credit industrial project course. The total credit for MCA programme is 140 credit hours (Total marks = 3400). 1 Credit = 10 Contact hours.

The choice based credit system (CBCS) facilitates students to choose inter-disciplinary and skill oriented courses according to their learning needs and interests.

This MCA programme with CBCS offer at least two choices based course in each semester. There are five courses for CBCS, one each CBCS courses in each semester.

MCA programme also offer a CBCS course from SWAYAM portal in which students are required to register for appropriate course, as per UGC/AICTE guideline.

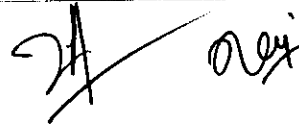
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CODIFICATION OF PAPERS

The schedule of papers prescribed for various semesters shall be as follows:

MCA SEMESTER – I					
Code	Title	External	Internal	Credit	Total Marks
CS-11	Information Technology	70	30	4	100
CS-12	Programming & Data Structure with 'C'	70	30	4	100
CS-13	Discrete Mathematical Structure	70	30	4	100
CS-14	Digital Logic & Computer Design	70	30	4	100
CS-15	Elective – I	70	30	4	100
CS-16	Practical	50	50	4	100
Total				24	600
MCA SEMESTER – II					
Code	Title	External	Internal	Credit	Total Marks
CS-21	Object Oriented Programming in C++	70	30	4	100
CS-22	Statistical & Numerical Computing	70	30	4	100
CS-23	Operating System & Shell Programming	70	30	4	100
CS-24	Formal Language and Automata Theory	70	30	4	100
CS-25	Elective-II	70	30	4	100
CS-26	Practical	50	50	4	100
Total				24	600
MCA SEMESTER – III					
Code	Title	External	Internal	Credit	Total Marks
CS-31	Advance Java Programming using J2EE	70	30	4	100
CS-32	Data Communication and Computer Network	70	30	4	100
CS-33	Database Management System	70	30	4	100
CS-34	Optimization Technique	70	30	4	100
CS-35	Elective-III	70	30	4	100
CS-36	Practical	50	50	4	100
Total				24	600
MCA SEMESTER – IV					
Code	Title	External	Internal	Credit	Total Marks
CS-41	Web Technologies	70	30	4	100
CS-42	Software Engineering	70	30	4	100
CS-43	Computer Graphics	70	30	4	100
CS-44	Big Data Analysis & Cloud Computing	70	30	4	100
CS-45	Elective-IV	70	30	4	100
CS-46	Practical	50	50	4	100
Total				24	600
MCA SEMESTER – V					
Code	Title	External	Internal	Credit	Total Marks
CS-51	Design and Analysis of Algorithm	70	30	4	100
CS-52	Data Mining & Data Warehousing	70	30	4	100
CS-53	Artificial Intelligence	70	30	4	100
CS-54	Advanced Computer Architecture	70	30	4	100
CS-55	Elective-V	70	30	4	100
CS-56	Practical	50	50	4	100
Total				24	600
MCA SEMESTER – VI					
Code	Title			Credit	Total Marks
CS-61	Project & Dissertation			20	400
G. Total				140	3400

LIST OF ELECTIVE PAPERS	
Code	Select any one of the following for each Elective
Elective – I CS-15	(I) Principles of Management (II) Organizational Behavior (III) SWAYAM
Elective – II CS-25	(I) Financial Accounting (II) E-Commerce (III) SWAYAM
Elective – III CS-35	(I) Parallel & Distributed Computing (II) Managerial Economics (III) SWAYAM
Elective – IV CS-45	(I) Compiler Design (II) Digital Image Processing & Multimedia (III) Information Security
Elective – V CS-55	(I) Cryptography (II) Quantum Computing (III) Visual Programming (IV) Satellite and Mobile Communication Networks (V) Machine Learning and Soft Computing



MCA SEMESTER - I

CS-11: Information Technology**Credit: 4**

Unit-1. Introduction to computers: Computer system concept, characteristics of computer, generations and types of computer, components of computer system, Booting process, classification of digital computer system. organization of computers.

Unit-2. Computer software and hardware: Software-System Software, application software, firmware, Programming languages classification: machine language, assembly language & high-level language. Evolution of programming languages: first generation, second generation, third generation & fourth generation Language, Language translator - Compiler, Interpreter, Assembler. Hardware-Input and Output devices, Storage devices

Unit-3. Operating System: Definition, Job, Objective and evolution of operating system, Types of operating system, Network operating system (NOS) .

Unit-4. Network Communication and Internet: Definition, Criteria, advantages and limitations of computer networking. Communication process, Communication types, Electronic data interchange (EDI), Types of computer network, Network topology, LAN and other network related protocols, OSI model. TCP/IP model, Networking Hardware & Software. Internet: Introduction, Internet basic, Internet protocols, Internet addressing, Browser WWW, E-mail, telnet, ftp, application, benefits and limitation of internet, electronic conferencing, and teleconferencing.

Unit-5. Latest IT Trends and Role of IT: IT Trends - E-Commerce, M-Commerce, Artificial Intelligence, Computational Intelligence, Geographic Information System (GIS), Data Mining . Role of IT: Role of IT in different Area – Education, Industry, Banking, Marketing, Public Services and others.

Reference Books:

1. Reema Thareja, Information Technology and its Applications in Business, OUP.
2. V. Rajaraman, Fundamental of Computers, PHI.
3. Ray & Acharya, IT Principles & Application, PHI.
4. Leon & M. Leon, Fundamental of IT, Vikas Publication.

CS-12: Programming and Data Structure with C**Credit: 4**

Unit-1. Introduction to Programming Language C: Data Types, Instruction and its Types, Storage Classes, Operators and Hierarchy of Operations, Expressions in C, Control and Repetitive Statements, break, continue. Functions: User Defined Functions and Library Functions, Local and Global Variables. Parameter Passing, Pointers, Arrays, Strings, C Preprocessors, Structures, Input and Output in C, C-Library.

Unit-2. Data Structure & Algorithm concept: Definition, characteristics, classification, Operations, Complexity: Big O- Notation. time space trade-off.

Unit-3. Linear Data Structure: Linked List-Singly, circular, doubly, doubly & circular Linked List; Stack and Queue-Push, Pop. Conversion from infix to postfix evaluation of

postfix expression. Stack representation using array & linked list, Queue, insert, delete, representation using array & linked list, circular queue, deque, priority queue.

Unit-4. Non-Linear Data Structure: Tree-Definition, traversal, Threaded tree, heap tree, AVL tree-balancing, B-tree, Binary search tree, Huffman algorithm, Creation of Heap, Graph-Graph representation, Warshall algorithm, Shortest path, Kruskal & Dijkstra algorithm, Linked representation of graph. Traversing a graph.

Unit-5. Searching and Sorting: Search- Linear & Binary, Sorting-bubble, merge, quick, selection, insertion, shell, tournament, radix, heap.

Reference Books:

1. ReemaThareja, Programming in C, OUP.
2. Y. Kanetkar, Let us C, BPB.
3. Kernighan & Ritchie, C Programming Language, PE.
4. Langsam, Augustein & Tanenbaum, Data Structures Using C and C++, PHI.
5. D. Samanta, Classical Data Structure. PHI
6. S. Lipschutz, Data Structures, TMH

CS-13: Discrete Mathematical Structure

Credit: 4

Unit-1. Sets, Relations & Functions: Property of binary relations, equivalence, compatibility, partial ordering relations. hasse diagram. functions, inverse functions, composition of functions, recursive functions.

Unit-2. Mathematical Logic: Logic operators, Truth tables, Theory of inference and deduction, mathematical calculus, predicate calculus, predicates and quantifiers. Groups & Subgroups: Group axioms, Monoids, semi groups, Isomorphism, homomorphism, automorphism.

Unit-3. Lattices & Boolean Algebra: Truth values and truth tables, the algebra of propositional functions, Boolean algebra of truth values.

Unit-4. Combinatorics & Recurrence Relations: Permutation, Combination, Principle of Inclusion and Exclusion, Recurrence Relations. Generating Functions.

Unit-5. Graph Theory: Basic Concepts of Graphs and Trees, Adjacency and Incidence Matrices, Spanning Tree, Transitive Closure. Shortest Path, Planar Graphs, Graph Coloring, Eulerian and Hamiltonian graphs, Applications of Graph Theoretic Concepts to Computer Science.

Reference Books:

1. Chakraborty & Sarkar, Discrete Mathematics, OUP.
2. Kolman & Rehman, Discrete Mathematical Structures, PE.
3. C.L. Liu, Elements of Discrete Mathematics, TMH
4. Iyenger, Discrete Mathematics, Vikas Pub.

CS-14: Digital Logic & Computer Design**Credit: 4**

Unit-1. Digital logic fundamentals: Number systems, Boolean algebra, gates, simplification of Boolean expressions. Combinational logic: adders, subtractors, Decoders, encoders multiplexer / demultiplexers. Sequential Logic: Flip-flops, Counters.

Unit-2. Introduction to Intel s 8086/88: Register model, Bus interface Unit, Execution unit, Control Unit: hardwired and microprogrammed control. Memory organization: Basic memory cell RAM, ROM and DRAM associative, cache and virtual memory organizations.

Unit-3. Assembly Language Programming: Instruction formats, addressing modes, Intel 8086/88 instruction mnemonics, timing, data transfer, arithmetic and machine control instructions - Introduction to Macro assembler.

Unit-4. Input/Output organization: Input interface, Data transfer techniques: synchronous, asynchronous, Interrupt driven, Intel 8086/88 interrupt organization, types, DMA, I/O processors, serial communication.

Unit-5. Processor organization: General register organization, stack organization. IBM PC architecture: Mother board, display adapters. add on cards, power supply. Architectural overview of Pentium, P-II, P-III and P-4.

Reference Books:

1. Mano, Computer Systems Architecture. PE.
2. Gibson, Microcomputer Systems the 8086/88 family, PHI.
3. Ray and Bhurchandi, Advanced Microprocessors and Peripherals, TMH.
4. Abel, IBM PC Assembly language and Programming, PHI.

CS-15(I): Elective-1: Principles of Management**Credit: 4**

Unit-1. Overview of management: Definition, Management, Role of managers, Evolution of Management thought, Organization and the environmental factors, Trends and Challenges of Management in Global Scenario.

Unit-2. Planning: Nature and purpose of planning, Planning process, Types of plans, Objectives, Managing by objective (MBO) Strategies, Types of strategies, Policies, Decision Making, Types of decision, Decision Making Process, Rational Decision Making.

Unit-3. Organizing: Nature and purpose of organizing, Organization structure, Formal and informal groups organization, Line and Staff authority, Departmentation, Span of control, Centralization and Decentralization, Delegation of authority, Staffing, Selection and Recruitment. Orientation, Career Development, Career stages, Training, Performance Appraisal.

Unit-4. Directing: Creativity and Innovation, Motivation and Satisfaction, Motivation Theories, Leadership Styles, Leadership theories, Communication, Barriers to effective communication, Organization Culture. Elements and types of culture, Managing cultural diversity.

Unit-5. Controlling: Process of controlling, Types of control, Budgetary and non-budgetary control, Q-techniques, Managing Productivity, Cost Control, Purchase Control, Maintenance Control, Quality Control, Planning operations.

Reference Books:

1. Bhatt, Principle of Management, OUP.
2. Massie, Organization and Management, PHI.
3. Robbins and Coulter, Management, PHI.
4. Hill and McShane, Principles of Management, TMH.

CS-15(II): Elective-1: Organizational Behavior

Credit: 4

Unit-1. Introduction to Organization Behavior: Historical roots of Organizational Behavior, Fundamental concepts, Nature, Emerging trends in the organizational behavior, Limitation of Organization Behavior, Challenges & Opportunities for Organization Behavior.

Unit-2. Motivation: Importance of motivation at work, approaches to motivation, content theories, process theories, motivation and its effects, McGreoger theory X and Y, Maslow's need hierarchy, Herzberg's two factor theory, Vroom expectancy theory, OB modification.

Unit-3. Power and Politics: Definition and nature of Power, Types of Power, Contingencies of Power, Organizational Politics, Where does it occur, Types of political activity, Political strategies for power acquisition in modern organization, Coping with organizational politics, Empowerment, Organizational politics and its effects, Organizational politics and ethics.

Unit-4. Conflicts and negotiation: Conflict, Historical perspective behind conflict or approaches to conflict, Nature and type of conflict, Conflict Processes, Interpersonal Conflict Management Styles, Levels of conflict, Perceptual Errors Responsible For conflict, Consequences of conflict, coping strategies, Negotiation, strategies, processes, issues on negotiation.

Unit-5. Communication, feedback, Stress and Leadership: Transactional analysis, Johari window, job analysis and job design: issues, techniques and methodology. Stress: Nature of stress, causes, and consequences, Individual differences in resistance to stress; techniques of managing stress. Leadership: Concept and style, Fiedler's contingency mode, path-goal theory, leadership effectiveness.

Reference Books:

1. Chadha, Perspectives in Organizational Behavior, Galgotia Publications.
2. Luthans, Organizational Behavior, TMH.
3. Greenberg, Behavior in Organizations, PE.
4. McShane and VanGlinow, Organizational Behavior, TMH.

CS-16: Practical based on Paper CS-12

Credit: 4



MCA SEMESTER - II

CS-21: Object Oriented Programming in C++**Credit: 4**

Unit-1. Principal of Object Oriented Programming: Procedure oriented Vs Object oriented, OOP paradigm. Features of OOP, Basic Data types Tokens, Keywords, Constant, Variables, Operator I/O statements, Structure of C++ program, Arrays, pointers, Object modeling technique (OMT).

Unit-2. Object and Class: Defining class, Abstract class, Function prototype, Function with parameter. Passing object as a parameter, Constructor function, Types of constructor, Destructor Friend function, Friend class, Dynamic allocation operator new and delete.

Unit-3. Polymorphism and Inheritance: Types of polymorphism, Constructor overloading, Operator overloading, Template function Template class, Types of inheritance, private, protected and public derivation of class. Resolving ambiguity. Pointer to object, this pointer, Virtual class. virtual function.

Unit-4. Input - output and File handling I/O classes: File and stream classes, Opening and closing file Detecting end of file, String I/O, Char I/O, Object I/O. I/O with multiple object, File pointer. Disk I/O.

Unit-5. Exception handling, Name spaces and Standard Template library (STL): Need of Exception handling, try, catch and throws keywords, defining namespace, benefit of namespace. Component of STL.

Reference Books:

1. Reema Thareja, Object Oriented Programming with C++. OUP.
2. Deitel, C++ How to Program, PE.
3. Bajarnestroustroup. Object Oriented Programming Using C++, PE
4. Herbert Schildt, C++ - A Complete Reference, TMH.

CS-22: Statistical & Numerical Computing**Credit: 4**

Unit-1. Basic Statistics: measure of central tendency, dispersion, Probability, distribution, introduction to mass function, density function, distribution function, estimation of parameters. Regression Analysis: Linear and Non linear regression, Multiple regression, Testing of Hypothesis: Test of Significance, Chi-square test, t-test, ANOVA, F-test.

Unit-2. Interpolation: Newtons Forward, Backward, Sterling & Bessel's Interpolation formula, Lagrange's Interpolation.

Unit-3. Integration: Trapezoidal, Simpson's 1/3 rd, Weddel's Rule, Romberg Integration, Gauss-Legendre two & three point formula, Newton Cotes Formula. Gram-Schmidt orthogonalisation, Tchebycheff Polynomial.

Unit-4. Solution of transcendental and system of linear equations: Method of Iteration, Method of Bisection, Newton - Raphson Method, Regula-Falsi method, Secant Method; Gauss Elimination Method, Gauss-Jacobi, Gauss-Seidel. LU factorization, Tri-diagonalisation, Inverse Interpolation. Least Square Curve fitting: linear & non-linear.

Unit-5. Solution of Differential Equations: Picard's method, Euler-modified method, Taylor's Series method, Runge-Kutta method, Milne's Predictor-Corrector method.

Reference Books:

1. Pal, Numerical Methods, OUP.
2. Balaguruswamy, Numerical and Statistical methods, TMH.
3. V. Rajaraman, Introductory methods of Numerical Analysis, PHI.
4. A.M. Goon, M.K. Gupta and T.S. Dasgupta, Fundamentals of Statistics, The World Press Pvt. Ltd.

CS-23: Operating System & Shell Programming

Credit: 4

Unit-1. Introduction: Definition, Design Goals, Evolution; Concept of User, job and Resources; Batch processing, Multi-programming, Time sharing; Structure and Functions of Operating System.

Unit-2. Process Management: Process states, State Transitions, Process Control block, Context Switching, Process Scheduling, Scheduling algorithm, Threads, Inter process synchronization and communication-need, Mutual exclusion, semaphore, Monitors, Messages, Deadlock, Deadlocks Prevention, Deadlocks Avoidance, Deadlocks Detection.

Unit-3. Memory Management: Address Binding, Dynamic Loading and Linking Concepts, Logical and Physical Addresses, Contiguous Allocation, Fragmentation, Paging, Segmentation, Combined Systems, Virtual Memory, Demand Paging, Page fault, Page replacement algorithms, Global Vs Local Allocation, Thrashing, Working Set Model, Paging.

Unit-4. File and Secondary Storage Management: File Attributes, File Types, File Access Methods, Directory Structure, File System Organization and Mounting, Allocation Methods, Free Space management; Disk Structure, Logical and Physical View, Disk Head Scheduling, Formatting, Swap Management, Operating System Security, Case Study of UNIX/ LINUX and WINDOWS Operating systems.

Unit-5. Shell programming: Need of Shell programming, types of Shells in Linux/Unix, Shell variables: User Defined Variables, environment variables, predefined variables, reading values into user defined variables, command substitution computation on shell variable , handling shell variables, passing arguments to the shell, shift command, conditional execution operators, conditional statements , test command, Iterative statements : for, while, until, break, continue statements , practical examples on shell programming, Exercises on shell programming.

Reference Books:

1. Chauhan, Principles of Operating System, OUP.
2. A. Tanenbaum, Operating System, PE.
3. W. Stalling, Operating System, PHI.
4. Yashwant Kanitkar, Unix Shell Programming, BPB.
5. Silberschatz and Galvin, Operating System Concepts, Addison Wesley.

CS-24: Formal Language and Automata Theory**Credit: 4**

Unit-1. Theory of Automata: Definition of an automaton, Transition system, Acceptability of a string by FA, Nondeterministic finite state machine, equivalence of DFA and NFA, Mealy and Moore models. Minimization of Finite Automata.

Unit-2. Formal Languages, Regular Sets and Regular Grammars: Definition, Languages and their relation, Chomsky classification of language, Recursive and recursively enumerable sets, Regular expression, and Finite automaton, Pumping Lemma for regular sets, Application of Pumping lemma, Closure property of regular sets, Regular sets and regular grammar.

Unit-3. Context-free Language: Context free language and derivation trees, ambiguity in context free languages, Simplification of context free languages: (left recursion, unit production elimination, eliminating null values), Normal forms of context free languages, Pumping lemma.

Unit-4. Pushdown Automation: Definition, Acceptance by PDA, Push down automation and Context free languages, Parsing and Pushdown automata.

Unit-5. Turing Machine: Turing Machines model, Representation of TM, Languages acceptability by TM, design of TM, Universal Turing Machines (UTM), Turing machine and type, grammars, Halting problem, Linear bounded automata and languages.

Reference Books:

1. Hopcraft, Motwani and Ullman, Introduction to Automata Theory, Languages and Computation, PE.
2. Cohen, Introduction to Computer Theory, John Wiley.
3. Martin, Theory of Computation, TMH.
4. Papadimitrou, Elements of the Theory of Computation, PHI.

CS-25(I): Elective-II: Financial Accounting**Credit: 4**

Unit 1. Introduction: Definition and objectives of Accounting. Accounting Equation, Basic Accounting Terms Theory Base of Accounting- GAAP Dual Aspect of Accounting, account process, drafting of financial statement- Journal, Ledger, Book.

Unit 2. Financial Statements: Trial Balance, Types of Errors, Rectification of Errors, Suspense Account, Financial Statements- Preparation of Trading A/C, Profit & Loss A/C and Balance sheet.

Unit 3. Cost Accounting: Costing, Marginal and Absorption Costing, Cost, Volume and Profit (C-V-P) Analysis, Break-Even Analysis, Determination of Break-Even Point, Profit-Volume (PV) Ratio, Margin of Safety..

Unit 4. Financial Management: Concept of Funds and relevant Inflow & Out flow, Capital Budgeting, Traditional Techniques, Discounted Cash-Flow or Time-Adjusted Techniques, Present Value Concept, Payback Period, Average Rate of Return (ARR), Present Value (PV), Net Present Value (NPV), Internal Rate of Return (IRR) Methods, Profitability Index.

Unit-5. Introduction to Computerized Accounting System: Coding logic and codes required, master files, transaction files; introduction to documents used for data collection,

processing of different files and outputs obtained (The concepts may be explained using available accounting package).

Reference Books:

1. Ambrish Gupta, Financial Accounting, PE.
2. Bhattacharyya, Financial Accounting for Business Managers, PHI.
3. Khan & Jain, Financial Management, TMH.
4. I.M. Pandey, Financial Management, Vikas Pub.

CS-25(II): Elective-II: E-Commerce

Credit: 4

Unit-1. Introduction: Definition, Objectives, Advantages and disadvantages. Forces driving E-Commerce, Traditional commerce Vs. E-Commerce, E-Commerce opportunities for industries, Growth of E-Commerce.

Unit-2. E-Commerce Models: Business to consumer, Business to Business, Consumer to Consumer, other models – Brokerage Model, Aggregator Model, Info-mediary Model, Community Model and value chain Model.

Unit-3. Electronic Payment Systems: Special features required in payment systems, Types of E-payment systems, ECash, E-cheque, credit card, Smart Card, Electronic Purses.

Unit-4. E-Marketing: E-Customer Relationship Management, E-Supply Chain Management.

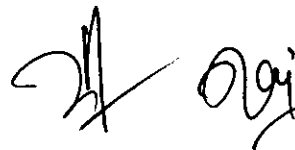
Unit-5. Security Issues in E-Commerce: Security risk of E-Commerce, Types of threats, Security tools and risk management approach, Cyber laws, Business Ethics, IT Acts.

Reference Books:

1. Bhaskar, Electronic Commerce – Frameroork Technologies and Applications, TMH.
2. Kalakota & Whinston, Frontiers of Electronic Commerce, PE.
3. Kamlesh, and Deeksha. Business on the Net Introduction to the E-Com., Macmillan India.
4. Joseph, E-Commerce: A Managerial Perspective, PHI.

CS-26: Practical based on Paper CS-21

Credit: 4



MCA SEMESTER - III

CS-31: Advance Java Programming**Credit: 4**

Unit-1. Introduction to Java: Review of Java Basic Features, Applets, AWT Controls, Event Handling, Multithreading, I/O files. Swing: Features, components, swing vs AWT, swing containers, controls, using Dialogs, sliders, progress bars, tables, creating user interface using swing.

Unit-2. Java Database Connectivity: Connectivity model, Java.SQL package, JDBC Exception classes, Database connectivity, Data manipulation and navigation, creating database applications. Java RMI: Distributed object technologies, RMI architecture, creating RMI applications.

Unit-3. Java Networking: Java Servlets: Servlets vs CGI, Servlet lifecycle, creating and running simple servlets. Networking: Networking basics, Client/server model, Java and the Net, TCP/IP client sockets, TCP/IP server sockets, Inet Address, URL, Data grams, creating simple networking applications.

Unit-4. Java Beans: Component architecture, Advantages of Beans, Bean Developer kit (BDK), JAR files, introspection. developing Beans, Using Bound properties, The Java Beans API, Introduction to EJB (Enterprise Java Beans), Types of EJB, Uses of EJB.

Unit-5. Java Server Pages: Introduction, JSP Architecture, JSP objects, developing simple Web Applications.

Reference Books:

1. Roy, Advance Java Programming. OUP.
2. H. Schildt, Java 2: The Complete Reference, TMH.
3. Deitel, Java- How to Program, PHI.
4. Seth & Juneja, Java, OUP.

CS-32: Data Communication and Computer Network**Credit: 4**

Unit-1. Introduction: Data Transmission concepts, transmission impairments, switching, modulation, multiplexing; Network Hardware-LAN, MAN, WAN, Wireless networks, Internet-works; Network Software- Layer, Protocols, interfaces and services; Reference Models-OSI, TCP/IP and their comparison. Physical Layer: Transmission Media : Magnetic, twisted pair, coaxial cable, fiber optics. wireless transmission (radio, microwave, infrared), ATM, ISDN, Cellular radio and communication satellites.

Unit-2. Data Link Layer: Framing, Error control, Sliding window protocols (one bit, Go back n, selective repeat), Examples of DLL Protocols-HDLC, PPP. Medium Access Sub layer : Channel Allocation, MAC protocols – ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols. Wireless LAN protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison.

Unit-3. Network Layer: Design issues. Routing algorithms (shortest path, flooding, flow based, distance vector. hierarchical, broadcast, multicast, for mobile hosts), Congestion



control algorithms (Leaky bucket, Token bucket, Choke Packet, Load shedding), Internetworking, IP Protocol, ARP, RARP.

Unit-4. Transport Layer: Addressing, establishing and releasing connection, flow control, buffering, Internet Transport Protocol (TCP and UDP).

Unit-5. Application Layer: Domain name system, E-mail, File transfer protocol, HTTP, HTTPS, World Wide Web.

Reference Books:

1. Trivedi, Computer Network, OUP.
2. Tanenbaum, Computer Networks. PHI.
3. Stallings, Data and Computer Communications, PHI.
4. Forouzan, Data Communications and Networks, TMH.

CS-33: Database Management System

Credit: 4

Unit-1. Basic Concept: Database Systems, Characteristics, Data Models, Database Languages, DBMS Architecture, Database Users and Data Independence.

Unit-2. Database Design using ER Model: ER Modeling, relation types, role and Structural Constraints, Extended ER Modeling Features, Design of an ER Database Schema, Reduction of ER Schema to Tables. Relational Model: Codd's rules, Relational Model Concepts, Relational Algebra, Relational Calculus.

Unit-3. Introduction to SQL: SQL data types and literals, Types of SQL commands, SQL operators, Tables, views and indexes, Queries and sub queries, Aggregate functions, Cursors in SQL.

Unit-4. Relational Database Design: Functional and multi-valued Dependencies, Desirable Properties of Decomposition, Normalization up to 5 NF.

Unit-5. Selected Database Issues: Security, Transaction Management, Basic Algorithms to Query Processing and Query Optimization, Concurrency Control, Recovery Techniques, Case Study: Oracle/MS-SQL.

Reference Books:

1. Silberschatz, Database System Concepts, TMH.
2. Raghuram Krishnan, Database Management Systems, TMH.
3. Elmsari and Navathe, Fundamentals of Database Systems, PE.

CS-34: Optimization Technique

Credit: 4

Unit-1. Introduction: Nature and Meaning, History, Management Applications, Modeling, Principles. Characteristics, Scope, Development of OR In India, Role of Computers in OR.

Unit-2. Linear Programming: Introduction and Applications of LP, Limitations of LP Formulation of a LP Model, Graphical Solution of a LPP, Simplex Method, Two Phase Method, Big-M Method.

Unit-3. Transportation, Assignment and Replacement Problem: Introduction to Transportation Problem, Mathematical Formulation, Feasible Solution and Optimum Solution; Introduction to Assignment Problem, Mathematical Formulation, Traveling Salesman Problem; Introduction to Replacement Problem, Capital Equipment, Discounted Cost, Replacement in Anticipation of Failure.

Unit-4. Queuing Problems: Classification of self problems, processing of n jobs through two machines. three machines, processing of two jobs through m machines.

Unit-5. Project Management by PERT-CPM: Introduction, History & Applications, Basic Steps, Network Diagram Representation, Rules, Time Estimates and Critical Path in Network Analysis. Uses and Applications of PERT/CPM.

Reference Books:

1. Pai, Operation Research, OUP.
2. Panerselvam, Operation Research. PHI.
3. Hillier & Lieberman, Operations Research, TMH.

CS-35(I): Elective-III: Parallel & Distributed Computing

Credit: 4

Unit-1. Introduction: Need for Computational speed; Applications of parallel computers in various fields including Mathematics, Physics, Chemistry and Computer Science; Configuration of some existing Mainframe and Super Computers for parallel processing; issues in parallel processing.

Unit-2. Parallel Processing Architectures: Parallelism in Sequential Machines, Abstract model of parallel computer, multiprocessor architecture, programmability issues.

Unit-3. Data Dependency Analysis: Introduction, Types of Dependencies, Loop and Array Dependence, Loop Dependence Analysis, Solving Diophantine Equations.

Unit-4. Shared Memory Programming: General Model, Process Model under UNIX, Thread Management, Thread Implementation.

Unit-5. Distributed Computing: Message passing model, Parallel Virtual Machine (PVM), Remote procedure call, Algorithms for Parallel Machines: Speedup, Complexity and Cost, Parallel Reduction. Quadrature Problem, Matrix Multiplication, Parallel Sorting Algorithms and Solving Linear System.

Reference Books:

1. Sasikumar, Shikhara, Dinesh and Prakash, Introduction to Parallel Processing, PHI.
2. Rajaraman, Elements of Parallel Computing, PHI.
3. Susann, Parallel Programming, TMH.

CS-35(II): Elective-III: Managerial Economics

Credit: 4

Unit-1. Demand and Supply: Concept of demand, determinants of individual and market demand functions, elasticity of demand - price, income and cross elasticity. concept of

supply, determinants of individual and market supply functions, elasticity of supply, Equilibrium price.

Unit-2. Production: Production function in short run – law of variable proportion, production function in the long run – isoquants, isocosts, ridge lines, returns to scale; producer's equilibrium - optimum combination, Cost function – short run costs, long run average cost, long run marginal cost. Reasons of 'U' shape of short and long run cost curves, economies and diseconomies of scale.

Unit-3. Market Structure: Price and output determination under perfect competition and monopoly, Comparison between perfect competition and monopoly with respect to Efficiency.

Unit-4. Pricing: Demand and supply of factors of production, pricing of a single variable factor under perfect competition and monopoly; modern theory of rent, quasi-rent.

Unit-5. Macroeconomics: Meaning of macroeconomics, Keynesian theory of determination of income and employment in the three sector economy, multiplier analysis, IS-LM model of equilibrium income and interest rate, Meaning and objectives of fiscal and monetary policies.

Reference Books:

1. Damodaran, Managerial Economics, OUP.
2. Petersen, Managerial Economics, PHI.
3. Mote, Managerial Economics-Concepts and Cases, TMH.
4. Pindyck, Rubinfeld and Mehta, Microeconomics, PE.

CS-36: Practical based on Paper CS-31 & CS-33

Credit: 4



MCA SEMESTER - IV

CS-41: Web Technologies**Credit: 4**

Unit 1. Internet Concept: Fundamental of Web, History of Web, Web development overview, Domain Name System (DNS), DHCP, and SMTP and other servers, Internet service provider (ISP), Concept of IP Address, Internet Protocol, TCP/IP Architecture and protocol (IP), Web Browser and Web Server.

Unit-2. HTML & CSS: HTML Tag, Rules of HTML, Text Formatting & Style, List, Adding Graphics to Html Document, Tables and Layout, Linking Documents, Frame, Forms, Project in HTML, Stylesheet, types of style sheets- Inline, External, Embedded CSS; text formatting properties, CSS Border, margin properties, Positioning, color properties, Use of classes in CSS.

Unit-3. Scripting Language: Java Script, Advantage of Java Script, JS object model and hierarchy, Handling event, Operators and syntax of JS, Function, Client side JS Vs Server side JS, JS security.

Unit-4. XML: Introduction to XML, XML in Action, Commercial Benefits of XML, Gaining Competitive advantage with XML, Programming in XML, XML Schema, XSLT, DOM structure model, XML quires and transformation.

Unit-5. PHP: Overview of PHP, Capabilities PHP, HTML embedding tags & syntax, PHP Language Core Variables, constants, data type, operators, flow control & loops Arrays, string, functions, Include & require statements, Simple File & Directory access operations Error handling Processing HTML form using GET, POST, SESSION, COOKIE variables Sending E-mail, Introduction of Object-oriented PHP, Database Operations with PHP, Built in functions, Connecting to My-SQL, Selecting a database, building & Sending Query, retrieving, updating & inserting data.

Reference Books:

1. Roy, Web Technologies, OUP.
2. Sabesta, Programming the World Wide Web, PE.
3. Godbole & Kahate, Web Technologies, TMH.

CS-42: Software Engineering**Credit: 4**

Unit-1. Introduction to Software Engineering: Definition, Software development and life-cycle models, CMM, Software Quality, role of metrics and measurement, Requirements Analysis and Specification: SRS Building Process, Specification Languages, Validation of SRS, metrics, monitoring and control, Object Oriented analysis.

Unit-2. Software Project Planning: Software Cost Estimation Techniques, Project Scheduling & Tracking, Project Team Standards, software configuration management, management.

Unit-3. System Design and Implementation: Design Concepts and Notations, Functional & Object Oriented Design Concepts, Design Strategies, Design specification and verification, Metrics, Design Translation Process.

