

MCA Ist YEAR

Uttar Pradesh Technical University
Master of Computer Application Ist year(Isem)

Course Code

Course

CA-101

Problem solving and Computer Programming with C

UNIT 1:

Introduction to Computer System: Hardware, Software-system software & application software; Introduction to Computing Environment; Introduction to Problem solving and notion of algorithm: Flow charting, Pseudo code, corresponding sample C-program, Testing the code; Number Systems and their conversion: Decimal, Binary and Hexadecimal representations, bit, byte; Character representation: ASCII, sorting order; System software re-visited: machine language, symbolic language, higher level languages, what is a compiler, what is an operating system, what is a linker, what is an editor, error handling; Introduction to program development.

UNIT 2:

Structure of a C-program, comments, identifiers; Fundamental Data Types: Character types, Integer, short, long, unsigned, single and double-precision floating point, complex, boolean, constants; Basic Input/Output: printf, formatting, scanf, eof errors; Operators and Expressions: Using numeric and relational operators, mixed operands and type conversion, Logical operators, Bit operations, Operator precedence and associativity, Functions in C: standard function, defining a function, inter-function communication- passing arguments by value, scope rules and global variables; Top-down program development.

UNIT 3:

Conditional Program Execution: Applying if and switch statements, nesting if and else, restrictions on switch values, use of break and default with switch; Program Loops and Iteration: Uses of while-do and for loops, multiple loop variables, assignment operators, using break and continue; Arrays: Array notation and representation, manipulating array elements, using multidimensional arrays, arrays of unknown or varying size

UNIT 4:

Sequential search, Sorting arrays; Strings, Recursion; Text files, file Input/Output - fopen, fread, etc Structures: Purpose and usage of structures, declaring structures, assigning of structures, Pointers to Objects: Pointer and address arithmetic, pointer operations and declarations, using pointers as function arguments

UNIT 5:

Familiarization with Linux OS environment: basic OS commands, directory creation, editing, storing and protecting access to files; Text files in Indian languages: keyboarding, editing, searching; The Standard C Preprocessor: Defining and calling macros, utilizing conditional compilation, passing values to the compiler, string handling functions.

Uttar Pradesh Technical University
Master of Computer Application Ist year(Isem)

Course Code

CA-102

Course

MATHEMATICAL FOUNDATION OF

COMPUTER SCIENCE

UNIT-I

Set Theory: Definition of sets, countable and uncountable sets, Venn Diagrams, proofs of some general identities on sets

Relation: Definition, types of relation, composition of relations, Pictorial representation of relation, equivalence relation, partial ordering relation.

Function: Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions.

Mathematical Induction: Piano's axioms, Mathematical Induction Discrete Numeric Functions and Generating functions Simple Recurrence relation with constant coefficients, Linear recurrence relation without constant coefficients.

UNIT-II:

Algebraic Structures: Properties, Semi group, Monoid, Group, Abelian group, properties of group, Subgroup, Cyclic group, Cosets, Permutation groups, Homomorphism, Isomorphism and Automorphism of groups

Propositional Logic: Proposition, First order logic, Basic logical operations, Tautologies, Contradictions, Algebra of Proposition, Logical implication, Logical equivalence, Normal forms, Inference Theory, Predicates and quantifiers.

Posets, Hasse Diagram and Lattices: Introduction, ordered set, Hasse diagram of partially ordered set, isomorphic ordered set, well ordered set, properties of Lattices, and complemented lattices.

UNIT-III

Graphs: Simple graph, multi graph, representation of graphs, Bipartite, Regular, Planar and connected graphs, Euler graphs, Hamiltonian path and circuits, Graph coloring, chromatic number, isomorphism and Homomorphism of graphs.

Tree: Definition, Rooted tree, properties of trees, binary search tree, tree traversal.

UNIT-IV

Theory of computation: Introduction, Alphabets, Strings and Languages, Kleene Closure, NFA, DFA, , Conversion of NFA to DFA, Optimizing DFA FA with output: Moore machine, Mealy machine, Conversions. Regular expression (RE) , Definition, Regular expression to FA, Arden Theorem, DFA to Regular expression, Non Regular Languages, Pumping Lemma for regular Languages. Application of Pumping Lemma, Closure properties of Regular Languages.

UNIT-V

Chomsky Hierarchy of language, Context-free grammar (CFG) , Pushdown Automata (PDA), equivalence of PDA's and CFG's, Introduction Turing Machine(TM), construction of TM for simple problems. TM as Computer of Integer functions, Universal TM, Recursive and recursively enumerable languages, Halting problem, Introduction to Undecidability, Undecidable problems about TMs.

Uttar Pradesh Technical University
Master of Computer Application Ist year(Isem)

Course Code

CA-103

Course

PRINCIPLES OF MANAGEMENT

UNIT 1.

HISTORICAL DEVELOPMENT

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organization.

UNIT 2.

PLANNING

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Forecasting.

UNIT 3.

ORGANISING

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT 4.

DIRECTING

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques – Job Enrichment – Communication – Process of Communication – Barriers and Breakdown – Effective Communication – Electronic media in Communication.

UNIT 5.

CONTROLLING

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

Uttar Pradesh Technical University
Master of Computer Application Ist year(Isem)

Course Code

CA-104

Course

COMPUTER SYSTEM DESIGN

UNIT-1

Data Representation in Computer Systems

Introduction, Positional Numbering Systems, Converting Between Bases, Signed Integer Representation, Floating-Point Representation

Arithmetic

Overview, Fixed Point Addition and Subtraction, Fixed Point Multiplication and Division, Floating Point Arithmetic, High Performance Arithmetic

Boolean algebra and Digital Logic:

Introduction, Boolean algebra, Boolean Expressions, Boolean Identities, Logic Gates, Digital Components, Combinational Circuits, Sequential Circuits, Karnaugh Maps

UNIT 2

Register and Register transfer :

Part1- Registers, Micro-operations and Implementations, Part 2 - Counters, Register Cells, Buses, & Serial Operations, Part 3 - Control of Register Transfers

Processor Organization and Performance:

Introduction, Number of Addresses, Flow of Control, Instruction Set Design Issues, Micro-programmed Control, Performance

Computer Design Basics:

Part 1 – Data-paths, Part 2 – A Simple Computer

UNIT-3

Memory:

Overview, The Memory Hierarchy, Random Access Memory, Memory Chip Organization, Case Study: Rambus Memory, Cache Memory, Virtual Memory, Advanced Topics, Case Study: The Intel Pentium 4 Memory System.

UNIT-4

Buses and Peripherals

Parallel Bus Architectures, Bridge-Based Bus Architectures, Internal Communication Methodologies, Case Study: Communication on the Intel Pentium Architecture, Serial Bus Architectures, Mass Storage, RAID - Redundant Arrays of Inexpensive Disks, Input Devices, Output Devices, Case Study: Graphics Processing Unit, Case Study: How a Virus Infects a Machine.

UNIT- 5

Languages and the Machine:

The Compilation Process, The Assembly Process, Linking and Loading, Macros, Quantitative Analyses of Program Execution, From CISC to RISC, Pipelining the Datapath, Overlapping Register Windows, Low Power Coding.

Performance Measurement and Analysis:

Introduction, Computer Performance Equations, Mathematical Preliminaries, Benchmarking, CPU Performance Optimization, Disk Performance.

Uttar Pradesh Technical University
Master of Computer Application Ist year(Isem)

Course Code

CA-105

Course

ENERGY, ENVIRONMENT AND ECOLOGY

UNIT 1 Introduction:

- Definition of environment.
- Need of public awareness.
- Segments of environment.
- Importance of Environment.
- Ecosystem- definition, classification and components.
- Function of ecosystem.
Nitrogen and sulphur cycle.

UNIT 2 Sustainable Development:

- Definition, principle, parameter and its challenges.
- Biodiversity: classification, measurement and conservation.
- Natural resources: availability & problems.
- Minerals & Energy Resources
Seed suicide and sustainable agriculture.

UNIT 3 Energy:

- Classification of energy resources.
- Fossil fuels, nuclear and hydroelectric energy.
Solar, wind, biomass, biogas and hydrogen fuel energy.

UNIT 4 Pollution:

- Environment pollution.
- Water pollution,
- Solid waste management & hazards waste management.
- Current environmental issues
- Problem with urbanization and automobile pollution and their control.
Adverse effects of Pollution: Climate change; Green house effect, Global warming, Acid rain and ozone layer depletion.

UNIT 5 Environmental protection & Control Measures Government initiatives i.e. air, water and environmental protection act.

- Role of NGOs.
- Environment Impact Assessment (EIA): definition, methodology and process.
- Environmental education: its principle and objectives.
- Case Studies – Bhopal Gas Tragedy, London Smog. Water Borne and water induce disease, arsenic
- problem in drinking water

Uttar Pradesh Technical University
Master of Computer Application Ist year(Isem)

Course Code

CA-106

Course

PROFESSIONAL COMMUNICATION

Key Concepts:

Context of Communication, as means of sharing, Speaker- Listener and Writer – Reader relationship, medium of communication, barriers to communication, accuracy, brevity, clarity and appropriateness in communication.

Writing Skills: Words for general purpose use . Sentence formation and using given set of words. Transforming word usage for different tenses, using words for narrative in first, second & third person. Semantics of connectives, modifiers and models, sentence variety and paragraphs, Cohesion and coupling, structure of basic letters, reports & document preparation – introduction to conclusion. Referencing & listing of references.

Speaking Skills: Speech and verbal communication, articulation, paralinguistic's, Pause and its use, formal and informal speaking, debate, extempore and discussion. Task oriented , personal and inter-personal communication.

Reading Comprehension: Kinds and types of texts , abstracting , précis writing and summarizing.

Listening Comprehension: Fluency & speed, impact of pronunciation on comprehension, Intelligent listening,

Uttar Pradesh Technical University

Master of Computer Application Ist year(IIsem)

Course Code Course

CA-201 COMPUTER BASED NUMERICAL AND STATISTICAL TECHNIQUES

Unit-I

Floating point Arithmetic: Representation of floating point numbers, Operations, Normalization, Pitfalls of floating point representation. Errors in numerical computation.

Iterative Methods: Zeros of a single transcendental equation and zeros of polynomial using Bisection Method, Iteration Method, Regula-Falsi method, Newton Raphson method, Secant method, Rate of convergence of iterative methods.

Unit-II

Finite differences and Interpolation: Finite Differences, Difference tables. Polynomial Interpolation: Newton's forward and backward formula Central Difference Formulae: Gauss forward and backward formula, Sterling's, Bessel's, Everett's formula. Lagrange's Interpolation, Newton Divided difference formula, Hermit's Interpolation for unequal intervals.

Unit-III

Numerical Differentiation and Integration: Introduction, Numerical Differentiation, Numerical Integration, Trapezoidal rule, Simpson's rules, Boole's Rule, Weddle's Rule Euler- Maclaurin Formula.

Simultaneous Linear Equations: Solutions of system of Linear equations, Gauss Elimination direct method and pivoting, Ill Conditioned system of equations, Refinement of solution. Gauss Jacobi and Gauss Seidel iterative methods, Rate of Convergence.

Solution of differential equations: Picard's Method, Euler's Method, Taylor's Method, Runge-Kutta methods, Predictor-corrector methods.

Unit-IV

Curve fitting, Approximations and Regression Analysis: Method of least squares, fitting of straight lines, polynomials, exponential curves etc. Approximation of functions by Chebyshev polynomials. Linear, Non-linear and Multiple regressions.

Time series and forecasting: Moving averages, smoothening of curves, forecasting models and methods.

Unit-V

Statistical methods: **Sample distributions, Test of Significance: Chi-Square Test, t and F test.**

Analysis of Variance: Definition, Assumptions, One-way classification, ANOVA Table, Two-way classification.

Uttar Pradesh Technical University
Master of Computer Application Ist year(IISem)

Course Code **Course**
CA-202 **Computer Networks**

UNIT 1: Introduction

Goals and Applications of Networks, Network structure and architecture, the historical **background of computer networks**, type of networks and their classification on the basis of transmission technology (Broadcast, Point-to-point and Internet) and Scale (LAN, MAN, WAN), concepts of layering, an introduction of OSI layered architecture (Open System Interconnection Reference Model)., concept of service access points and information exchange between two peer layers, transmission media Data Communication Fundamentals (Physical Layer)

UNIT 2 : Basic elements of communication such as data, signal and channel characteristics, Signal Representation (Time & frequency), Channel characteristics (Bandwidth, Bit interval, Bit rate etc), various sources of impairments (attenuation, distortion and noise), concept of channel capacity, , transmission of digital signals-Encoding of digital data (uni polar, polar, and bipolar and block coding techniques),, encoding of analog data (PCM, delta Modulation), Transmission of analog signal- Analog/ digital data to analog signal conversion(amplitude, pulse and frequency modulation),multiplexing techniques.

UNIT 3: Data Link control, Switched /Broadcast Communication Networks 8 Hrs

Framing and synchronization, Error control technique(detection and error correction), flow control , Medium Access Control Techniques, IEEE LAN standards, HDLC, switching techniques-circuit switching(PSTN as special case), switching techniques- circuit switching(PSTN as special case)message switching, packet switching (X.25 and Frame Relay) and virtual circuit switching- ATM

Unit 4: Network Layer, Transport Layer and Internetworking

Internetworking devices such as repeater/hub, bridge, router and gateway, TCP/IP protocol suite, IP addressing and subnetting, various protocols at the IP layer- ARP, RARP, ICMP, IGMP, Routing and congestion control, Transport Layer –Design Issues , Connection management, Unreliable Connectionless Transfer: UDP, reliable Connectionless Transfer: TCP

Unit 5 : Network Security and Application layer Application layer protocols such as HTTP, Electronic mail, File transfer, DNS, WWWand Remote login, cryptography –introduction and basic principles, Substitution cipher, transposition cipher , symmetric- Key Algorithms – DES, AES, Public key Algorithms- RSA, digital Signature, Communication security- IPSec, Firewall, VPN

Uttar Pradesh Technical University
Master of Computer Application Ist year(IIsem)

Course Code Course

CA-203 FUNDAMENTALS OF E-COMMERCE

Unit 1

Introduction: Electronic Commerce - Technology and Prospects, Definition of E- Commerce, Category of E-Commerce applications(Electronic Market, Electronic Data Interchange, (EDI), Internet Commerce), Electronic Commerce and Trade Cycle, Economic potential of electronic commerce, Incentives for engaging in electronic commerce, forces behind E-Commerce, Advantages and Disadvantages of EC, Limitations of Electronic Commerce, E-Business, Architectural framework of EC, Impact of E- commerce on business, E-Commerce Business model.

Unit II

Network Infrastructure for E- Commerce: Internet and Intranet based E-commerce-Issues, problems and prospects, Components of I-way, Network Access Equipments, Broadband telecommunication (ATM, ISDN, FRAME RELAY).

Internet and World Wide Web: An overview of basic network architecture of Internet, layered architecture (Link, Network, Transport, Application layer), Next generation Internet features (IPV6).

Web: Brief history of Web, Web system Architecture, URL, Overview of HTTP.

Mobile Commerce: Introduction of M-Commerce, Mobile Computing Devices, Mobile Computing Software, Wireless Application Protocol, WAP technology.

Unit III

Web Security: Security Issues on web, Categories of Internet Data and Transaction (public, copyright, confidential, secret data), WWW based security schemes (Secure HTTP, SSL), Firewall, Importance of Firewall, Different Types of Firewall (Packet filtering, Application proxy gateway, Circuit level gateway), Limitations of Firewall, Security concerns in E-Commerce (Client-Server, Data and Transaction security), Difference security threats, attacks and security schemes.

Unit IV

Cryptography: Introduction to Cryptography and its need in EC, Simplified model of conventional Encryption, Encryption techniques: Symmetric Encryption- Data Encryption Standard, Triple DES, Asymmetric Encryption- Secret key encryption, public and private pair key encryption, Digital Signatures, Certificate Authority, Digital Certificate, Message Digest.

Unit V

Electronic Payments: Overview, The SET protocol, SET network architecture, categories of EPS, Digital token based EPS, e-cash, e-check, Smart Card, Credit / Debit Card based EPS ,Online banking and impact of EC over CRM, SCM, Virtual Private Network.

Uttar Pradesh Technical University
Master of Computer Application Ist year(IIsem)

Course Code	Course
CA-204	DATA STRUCTURES AND FILE HANDLING

Unit -I

Introduction and overview: Basic Terminology, Elementary Data Organization, Data Structure operations, Algorithm Complexity and Time-Space trade-off. **Arrays:** Ordered List, Linear and Multidimensional Arrays, Representations of Array, Operations on Array: Traversal, Insertion, Deletion, Sorting, Searching: Linear Search, Binary Search, Sparse Matrix . **Stacks:** Definition and operations, Representations of stack, Operations on Stack: Push and Pop, Application of stack: Conversion of Infix to Prefix and Postfix Expressions, Evaluation of postfix expression using stack. Implementation of Multiple stacks. **Recursion:** Recursive definition, Divide and Conquer, The Tower of Hanoi, Principles of Recursion: Guidelines for using Recursion, How Recursion works, Tail Recursion, When not to use Recursion.

Unit -II

Queues: Representations of queues, Operations on Queue: Create, Add, Delete, Full and Empty. Implementation of Multiple queues , Circular queue, Dequeue and Priority Queue. **Linked list:** Representation and Implementation of Singly Linked Lists, Two-way Header List, Traversing and Searching of Linked List, Overflow and Underflow, Insertion and deletion to/from Linked Lists, Insertion and deletion Algorithms, Doubly linked list, Linked List in Array, Polynomial representation and addition, Generalized linked list, Garbage Collection and Compaction.

Unit - III

Trees: Basic terminology, Binary Trees, Binary tree representation, Complete Binary Tree. Extended Binary Trees , Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees. Traversing Threaded Binary trees, Huffman algorithm. **Binary Search Trees:** Binary Search Tree (BST), Insertion and Deletion in BST, Complexity of Search Algorithm, Path Length, AVL Trees, B-trees.

Unit -IV

Searching and Hashing: Sequential search, binary search, comparison and analysis, Hash Table, Hash Functions, Collision Resolution Strategies, Hash Table Implementation.
Sorting: Insertion Sort, Selection Sort, Quick Sort, Two Way Merge Sort, Heap Sort, Sorting on Different Keys, Practical consideration for Internal Sorting.

Unit - V

Graphs: Terminology & Representations, Graphs & Multi-graphs, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.
File: File, Queries and Sequential organizations, Index Technique: Primary, secondary and hash indexing, B Tree index files, B+ Tree index files, File organization: sequential, random and linked organization.

Uttar Pradesh Technical University
Master of Computer Application Ist year (IIsem)

Course Code	Course
CA-205	Object Oriented Systems and Programming with C++

Unit – I

Object Modeling: Objects and classes, links and association, generalization and inheritance, Aggregation, abstract class, multiple inheritance, metadata, candidate keys, constraints.

Dynamic Modeling: Events and states, operations, nested state diagrams and concurrency, advanced dynamic modeling concepts, a sample dynamic model.

Unit – II

Functional Modeling: Data flow diagram, specifying operations, constraints, a sample functional model. OMT (object modeling techniques) methodologies, examples and case studies to demonstrate methodologies, comparison of methodologies: OMT with SA/SD, JSD.

Unit – III

Modeling with UML: UML terminology, Introduction of Things, Relationships and Diagrams of UML.
Testing Object Oriented Systems: Introduction, State Based testing.

Unit – IV

Introduction: History of C++, Advantage, Need, C++ Program Structure. **Classes and objects:** Class and Objects Creation, Constructors and Destructors, Access Specifiers, Inline Functions, Default Function Arguments, Static keyword, Function overloading Arrays as Class Member. Arrays of Object. String. The Standard C++ String Class. **Operator Overloading:** Overloading Unary Operators. Overloading. Binary Operators. Friend Functions, Friend Classes, **Pointers and Class Objects:** This Pointer, Pointers to objects, **Memory Management:** New and Delete, Garbage collection **Inheritance:** Concepts, Access Modifiers, Inheritance Types.

Unit – V

Polymorphism Concepts: Virtual methods, Compile time Polymorphism, Run time Polymorphism. **Streams and File I/O** File streams, Streams with file handling, String streams, Built-in streams. **Templates and Exceptions:** Function Templates, Class Templates, Exceptions, throw () and catch (), **The Standard Template Library:** Introduction Algorithms, Sequence Containers, Iterators, Specialized Iterators, Associative Containers, Storing User- Defined Object, Function Objects.

MCA II YEAR

Uttar Pradesh Technical University
Master of Computer Application Ist year(IIIsem)

Course Code	Course
CA-301	Operating Systems

Unit-I

Introduction: Definition and types of operating systems, 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.

Unit-II

Process Management: Process concept, Process scheduling, Cooperating processes, Threads, Interprocess communication, CPU scheduling criteria, Scheduling algorithms, Multiprocessor scheduling, Real-time scheduling and Algorithm evaluation.

Unit-III

Process Synchronization and Deadlocks: The Critical-Section problem, synchronization hardware, Semaphores, Classical problems of synchronization, Critical regions, Monitors, Deadlocks-System model, Characterization, Deadlock prevention, Avoidance and Detection, Recovery from deadlock, Combined approach to deadlock handling.

Unit-IV

Storage management: Memory Management-Logical and Physical Address Space, Swapping, Contiguous Allocation, Paging, 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, File systems, secondary Storage Structure, File concept, access methods, directory implementation, Efficiency and performance, recovery, Disk structure, Disk scheduling methods, Disk management, Recovery, Swap-Space management, Disk reliability.

Unit-V

Security & Case Study: Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Revocation of Access Rights, language based protection, The Security problem, Authentication, One Time passwords, Program threats, System threats, Threat Monitoring, Encryption.

Windows NT-Design principles, System components, Environmental subsystems, File system, Networking and program interface, Linux system-design principles, Kernel Modules, Process Management, Scheduling, Memory management, File Systems, Input and Output, Interprocess communication, Network structure, security .

Uttar Pradesh Technical University
Master of Computer Application Ist year(IIIsem)

Course Code	Course
CA-302	Modelling and Simulation

Unit-I

System definition and components, stochastic activities, continuous and discrete systems, system modelling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

Unit-II

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

Unit-III

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random numbers, test for randomness, Monte-Carlo computation vs. stochastic simulation.

Unit-IV

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams
Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

Unit-V

Simulation of PERT Networks, critical path computation, uncertainties in activity duration, resource allocation and consideration.

Simulation languages and software, continuous and discrete simulation languages, expression based languages, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

Uttar Pradesh Technical University
Master of Computer Application Ist year(IIIsem)

Course Code	Course
CA-303	Software Engineering

Unit-I: Introduction

Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II: Software Requirement Specifications (SRS)

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modelling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III: Software Design

Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halstead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV: Software Testing and Maintenance

Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Inspections), Walk Through, Code Inspection, Compliance with Design and Coding Standards. Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering.

Unit-V: Software Project Management and Other Software Engineering methodologies

Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management. Component based software engineering, Aspect oriented software engineering, Agile software development: extreme programming.

Uttar Pradesh Technical University
Master of Computer Application Ist year(IIIsem)

Course Code	Course
CA-304	DATABASE MANAGEMENT SYSTEMS

Unit- I

Introduction: An overview of database management system, Database System Vs File System, Database system concepts and architecture, data models schema and instances, data independence and data base language and interfaces, Data definitions language, DML, Overall Database Structure. **Data Modelling using the Entity Relationship Model:** ER model concepts, notation for ER diagram, mapping constraints, keys, Concepts of Super Key, candidate key, primary key, Generalization, aggregation, reduction of an ER diagrams to tables, extended ER model, relationships of higher degree.

Unit- II

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus. **Introduction to SQL:** Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, SQL operators and their procedure, Tables, views and indexes, Queries and sub queries, Aggregate functions, Insert, update and delete operations, Joins, Unions, Intersection, Minus, Cursors in SQL. PL/SQL, Triggers and clusters.

UNIT-III

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Unit- IV

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Unit- V

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version schemes, Recovery with concurrent transaction. Transaction Processing in Distributed system, data fragmentation. Replication and allocation techniques for distributed system, overview of concurrency control and recovery in distrusted database.

Uttar Pradesh Technical University
Master of Computer Application Ist year(IIIsem)

Course Code **Course**
CA-305 **Web Technology -1**

Unit I

Introduction to Java programming : Brief history of JAVA, The Java Virtual Machine, The Byte Code. **Identifiers, Keywords, and Types, Expressions and Flow Control, Object-Oriented Programming concepts:** Class, object ,member, static member, method, nesting method ,constructor, overloading, overriding, final variables and method, final classes, abstract method and classes. array, string, vector , interface, inheritance, package, **Exception handling:** Fundamental, Exception Types, try catch block, nested try statements, throw ,throws and finally, Java's built-in exceptions, creating user defined exception **Multithreading:** Introduction, Life cycle of a Thread, Creating threads, Thread priority, Synchronization, Inter-thread Communication. **Applets:** introduction, difference between application and applet, applet lifecycle, building applet code.

Unit II

Input/ Output Files: concepts of streams, Stream classes, Byte stream classes, character stream classes, using the File class, creation of Files, concatenating and Buffering Files **Collections and Generics Framework:** Collection overview, collection interfaces and Collection **classes. Networking:** Socket programming using TCP and UDP

Unit III

GUIs Using the Swing and JDBC Database Connectivity: The design of JDBC, JDBC drivers, Connection to database using JDBC API classes and interfaces: concepts of Statement, Prepared Statement interface and Batch Update. **Event Handling :** The Delegation Event Model, Event classes, Event Listener interfaces, Using the delegation Event Model: Handling Mouse Events, Handling Keyboard Events, Adapter classes **Building Java GUIs Using the Swing API:** What are Java Foundation Classes(JFC), Swing features, swing packages and classes, Model-View Controller Architecture, Describe the GUI building blocks: containers, components, and layout managers, Build a GUI using Swing components

Unit IV

JAVA Script Introduction to JavaScript: Introduction to Scripting, Difference between Java and JavaScript, JavaScript Characteristics, JavaScript and Common Programming Concepts: Variables, JavaScript Expressions, Operators, Inline Scripting, Keywords and Reserved Words, control flow, array, built-in functions, user defined function, dialog box. **The JavaScript Document Object Model (DOM):** Introduction, java script assisted style sheets DOM(JSSS DOM), Handling events using JavaScript, Built-in objects in JavaScript, session and cookies.

Unit V

Client Side Scripting: Introduction HTML: HTML Tags, list, table, images, frames, forms, Introduction to CSS. **XML:** Introduction ,transition from HTML to XML,DTD, XML schemas, building blocks of XML document, creating elements, creating attributes, creating entities.

JavaScript and AJAX: Introduction to AJAX, How Ajax works, Ajax-Form, Ajax-Browser support, Ajax-JavaScript.

Uttar Pradesh Technical University
Master of Computer Application Ist year(IIIsem)

Course Code	Course
AU-301/AU-401	Human Values & Professional Ethics

Unit-I

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

1. Understanding the need, basic guidelines, content and process for Value Education.
2. Self Exploration-what is it? - its content and process; 'Natural Acceptance' and Experiential Validation-as the mechanism for self exploration
3. Continuous Happiness and Prosperity-A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facilities-the basic requirements for fulfillment of aspirations of every human being with their correct priority
5. Understanding Happiness and Prosperity correctly-A critical appraisal of the current scenario
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Unit-II

Understanding Harmony in the Human Being-Harmony in Myself

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
8. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvridha
9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
10. Understanding the characteristics and activities of 'I' and harmony in 'I'
11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail
12. Programs to ensure Sanyam and Swasthya
-Practice Exercised and Case Studies will be taken up in Practice Sessions.

Unit-III

Understanding Harmony in the Family and Society -Harmony in Human-Human

- Relationship**
13. Understanding harmony in the Family- the basic unit of human interaction
 14. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti;
Trust (Vishwas) and Respect (Samman) as the foundational values of relationship
 15. Understanding the meaning of Vishwas; Difference between intention and competence
 16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship
 17. Understanding the harmony in the society (society being an extension of family):
Samadhan, samridhi, Abhay, Sah-astitva as comprehensive Human Goals
 18. Visualizing a universal harmonies order in society-Undivided Society (Akhand Samaj),
Universal Order (Sarvabhaum Vyawastha) - from family to world family.
-Practice Exercise and Case Studies will be taken up in Practice Sessions.

Unit-IV

Understanding Harmony in the Nature and Existence - Whole existence as Co-existence

19. Understanding the harmony in the Nature
20. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulations in nature
21. Understanding existence as Co-existence (Sah-astitva) of mutually interacting unites in all-pervasive space.
22. Holistic perception of harmony at all levels of existence
-Practice Exercise and Case Studies will be taken up in Practice Sessions.

Unit-V

Implications of the above Holistic Understanding of Harmony on Professional Ethics

23. Natural acceptance of human values
24. Definitiveness of Ethical Human Conduct
25. Basis of Humanistic Education, Humanistic Constitution and Humanistic Universal Order
26. Competence in professional ethics;
 - a. Ability to utilize the professional competence for augmenting universal human order.
 - b. Ability to identify the scope and characteristics of people friendly eco-friendly production systems
 - c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
27. Case studies of typical holistic technologies, management models and production systems
28. Strategy for transition from the present state to universal Human Order;
 - a. At the level of individual: as socially and ecologically responsible engineers, technologies and managers.
 - b. At the level of society: as mutually enriching institutions and organizations.

Uttar Pradesh Technical University
Master of Computer Application IInd year(IVsem)

Course Code	Course
CA-401	DESIGN AND ANALYSIS OF ALGORITHMS

Unit-I

Introduction: Algorithms, Analysis of Algorithms, Design of Algorithms, Complexity of Algorithms ,Growth of functions, Recurrences and their solution methods . Sorting in polynomial Time: Insertion sort, Selection Sort, Merge sort, Heap sort, and Quick sort Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort

Unit-II

Advanced Data Structures: B Trees, Binomial Heaps, Fibonacci Heaps, Red-Black Trees, Data Structures for Disjoint Sets. All kinds of Algorithms on these data structures

Unit-III

Advanced design and analysis techniques: Dynamic Programming: Matrix Chain Multiplication, Elements of Dynamic Programming, Longest Common Subsequence. Greedy Algorithm: Activity Selection Problem, Elements of Greedy Strategy, Huffman Codes, Task Scheduling Problem
Amortized Analysis

Unit-IV

Graph Algorithms: Elementary Graph Algorithms, Minimum Spanning Trees, Single Source Shortest Paths, All Pairs Shortest Paths, Maximum Flow

Unit-V

Selected Topics: Sorting Network, Matrix Operations, Polynomials and FFT, String Matching, Approximation Algorithms, Number Theoretic Algorithms, Theory of NP-Hard and NP-Completeness

Uttar Pradesh Technical University
Master of Computer Application IInd year(IVsem)

Course Code	Course
CA-402	COMPUTER BASED OPTIMIZATION TECHNIQUES

Unit -I

Origin & development of Operation Research: Nature & Characteristic features of O.R., Models & Modeling in operation research, Methodology of O.R., General methods for solving O.R. & decision making, Application, use & limitations of O.R.

Linear Programming Problems (LPP): Definition of LPP, Canonical and Standard forms of linear programming problems, Mathematical formulation of LPP, Graphical Solutions of Linear Programming Problems, Simplex Method, and Artificial Variable Method, Two Phase Method, Big-M Method, Sensitivity Analysis, Duality, Dual Simplex Method.

Unit -II

Integer Linear Programming Problems: Integer Linear Programming Problems Mixed Integer Linear Programming Problems, Cutting Plane Method, Branch and Bound Method.

Transportation Problems: Introduction to Transportation Model, Applications of TP Models, Basic Feasible Solution of a TP, Degeneracy in TP, Formation of Loops in TP, Solution Techniques of TP, Different Methods for Obtaining Initial Basic Feasible Solutions viz. Matrix Minima Method, Row Minima Method, Column Minima Methods, Vogel's Approximation Method, Techniques for Obtaining Optimal Basic Feasible Solution – MODI Method.

Assignment Problems: Definition, Hungarian Method for AP.

Unit- III

Network analysis: CPM & PERT- Network minimization, shortest route problem, maximal-flow problem, project scheduling, critical path calculation, PERT calculation.

Dynamic Programming: Bellman's Principle of optimality of Dynamic Programming, Multistage decision problem and its solution by Dynamic Programming with finite number of stages, Solution of linear programming problems as a Dynamic Programming problem

Unit- IV

Inventory Models and Replacement problems: Inventory models –various costs-deterministic inventory models, Single period inventory model with shortest cost, stochastic models, Application of inventory models, Economic lot sizes-price breaks, Replacement problems-capital equipment-discounting costsreplacement in anticipation of failure- group replacement.

Unit V

Queuing Theory Introduction to Queues, Basic Elements of Queuing Models, Queue Disciplines, Role of Exponential and Poisson Distributions, Markovian Process, Erlang Distribution, Symbols and Notations, Distribution Of Arrivals, Distribution of Service Times, Definition of Steady and Transient State, Poisson queuing models: $\{(M/M/1): (\infty/FIFO)\}$, $\{(M/M/1): (\infty/SIRO)\}$, $\{(M/M/1): (N/FIFO)\}$, $\{(M/M/c): (\infty/FIFO)\}$, $\{(M/M/c): (N/FIFO)\}$, Non-Poisson queuing models: $\{(M/E/1): (\infty/FIFI)\}$, $\{(M/E/1): (1/FIFI)\}$, $\{(M/G/1): (\infty/GD)\}$.

Uttar Pradesh Technical University
Master of Computer Application IInd year(IVsem)

Course Code	Course
CA-403	COMPUTER GRAPHICS AND MULTIMEDIA

UNIT- I

Introduction of computer graphics system: Application areas of computer graphics, Input Devices, Display Technologies- Cathode Ray Tube Basics, Raster Refresh (Raster-Scan) and Random Scan Graphics Displays , Color CRT Raster Scan Basics, LCD displays, Raster Scan System- Video Controller, Raster Scan Display Processor, Random-Scan Systems.

Scan conversion- line, circle and ellipse: Line drawing algorithms- DDA Algorithm, Bresenham's Line Algorithm, Frame Buffers, Aliasing effects & anti-aliasing, Circle and ellipse generating algorithms- Midpoint Circle Algorithm, Midpoint Ellipse Algorithm.

UNIT -II

Polygon Filling and Clipping Algorithms:

Filled Area Primitives, Scan-Line Polygon Fill Algorithm, Inside-Outside Tests, Boundary-Fill Algorithm, Flood - Fill Algorithm. Two-Dimensional Viewing- Viewing Pipeline, Window to Viewport Mapping, Clipping Operations:- Point Clipping, Line Clipping, Clipping Lines algorithms– Cohen-Sutherland, Clipping Polygons- Sutherland-

Hodgeman Polygon Clipping, problem with multiple components.

2-D Geometric Transformations- Basic Transformations: Translation, Scaling, Rotation. Homogeneous Coordinates and Matrix Representation of 2D Transformations, Composite Transformation: Translation, Scaling, Rotation, Rotation about fixed point, fixed-point Scaling, Reflection and shearing transformations.

UNIT- III

3-D Geometric Transformations-Basic Transformation: Introduction, Three-Dimensional Translation, Scaling & Rotation transformation with matrix representation. Multiple Transformation- Fixed point Scaling, fixed point Rotation about an Arbitrary Axis in Space, 3D Reflection & reflection through an arbitrary Plane, Three-Dimensional Concepts: Three-Dimensional Display Methods- Parallel Projection, Perspective Projection.

UNIT -IV

Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Classifications of algorithms, Back-face removal, Depth-buffer algorithm, A-Buffer Algorithm, Scan-line method, Three-Dimensional Object Representations: Representing Spline- Interpolation & Approximation Splines, Parametric & geometric continuity, Bezier Curves and surfaces, B-Spline Curves.

UNIT -V

Multimedia: Introduction to Multimedia, Scope of multimedia in business & work, Multimedia Skills, Introduction to multimedia building blocks- Text, Audio, Images, Animation & Video, Introduction to authoring Concepts.

Uttar Pradesh Technical University
Master of Computer Application IInd year(IVsem)

Course Code **Course**
CA-404 **Web Technology- 2**

Unit -I EJB: Introduction to EJB, Types of EJB, Advantages of EJB, Lifecycle of enterprise beans, Working with Session Bean, Introduction to Java message service(JMS), JMS Architecture, JMS Programming API, Steps for writing JMS clients (sender and receiver), JMS and message driven bean, Entity bean, session bean, Message driven bean

Unit -II

J2EE: Overview of J2EE Technologies, Why J2EE?, J2EE Architecture, J2EE APIs, J2EE Containers, Java Server Pages: Basic JSP Architecture, Life Cycle of JSP (Translation, compilation), JSP Tags and Expressions, Role of JSP in MVC-2, JSP with Database, JNDI: The Java Naming and Directory Interface, Java Mail: An overview of the Java Mail API.

Unit -III

Servlets: Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Handling Request and Response, Initializing a Servlet, The Servlet API, , HTTP Servlets, HTTP request and Response, Developing and Deploying Servlets , Accessing Database, Session Tracking & Management, Dealing with cookies, Transferring Request, Accessing Web Context, Passing INIT and CONTEXT Parameter, Sharing information using scope object, Controlling concurrent access, User Authentication

Unit -IV

PHP : Introduction, Benefits Of Using PHP ,MYSQL, Server /Client Environment, Development Concept: How PHP Script Work, PHP Syntax, Write your First PHP Program, Embed PHP In HTML/HTML In PHP, PHP Data Types, Variable In PHP, Operator in PHP, Control Structure, Looping Structure, Function, File Inclusion: Include()/ Require(), Array, String Function: Chr()/ strlen()/ strpos()/ strcmp(), State Management : Creating Cookies, Set Cookies, Destroying Cookies, Creating Session, Set Session, Destroying Session Working with MYSQL Admin: Working with PHP My Admin: Types Data Type, Creating Database & Tables, Dropping Database & Tables, Adding Fields, Selecting Table

MySQL Function in PHP : Database Connections, Managing Database Connections, Performing Queries, Closing Connection.

Unit -V

Internet Business: Introduction to IT Business and Careers, Web Browsing, Databases and Web Search Engines, Protecting Yourself Online, Internet Services and Tools for Business, IT Project and Program Management

Web Security: Elements of Security, Applied Encryption, Types of Attacks, General Security Principles, Firewalls and Virtual Private Networks, Levels of Firewall Protection, Detecting and Distracting Hackers, Incident Response.

Uttar Pradesh Technical University
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LIST OF ELECTIVES-I

Course Code	Course
CA-405	ADVANCED COMPUTER ARCHITECTURE

Unit -I

Introduction & Fundamentals:

The concept of computer Architecture: Interpretation of concept of computer architecture at different level abstraction, Multi level hierarchical frame work, description of computer architecture, **Introduction to parallel processing:** Basic concept, types of level of parallelism, classification of parallel architecture, Basic parallel techniques, relationship between language and parallel architecture. **Principles of scalable performance:** Performance Metrics and Measures, Speedup Performance Law, Scalability Analysis & approaches **Processor and memory hierarchy:** Design Space of Processor, ISA, CISC & RISC, Memory Hierarchy Technology, Virtual Memory Technology

Unit -II

Instruction Level Parallel Processor (Parallelism) Pipelined Processors: Basic concept, ILP: Basics, Exploiting ILP, Limits on ILP, design space of pipelines, performance of pipeline, reservation table, And DLX Case Study. **VLI Warchitecture, Superscalar Processor:** Super Scalar and super-pipeline Design

Unit -III: Data parallel Architecture

SIMD Architecture: Design space, fine grain SIMD architecture, coarse grain SIMD Architecture **Associative and Neural Architecture, Systolic Architecture, Vector Architectures:** Word length, vectorization, pipelining, and vector instruction format

Unit -IV

Thread and Process Level Parallel Architecture (MIMD Architecture) Multi-threaded Architecture: Design space, computational model, Data flow architecture, hybrid multi shared architecture **Distributed memory MIMD Architecture:** Design space, interconnection networks, topology, fine grain system, medium grain system, coarse grain system, Cache Coherence and Synchronization Mechanism **Shared memory MIMD Architecture.**

Unit -V

Parallel Algorithm and Programming MPI: Basics of MPI **Open MP:** Open MP Implementation in 'C', Directives: Conditional Compilation, Internal Control Variables, Parallel Construct, Work Sharing Constructs, Combined Parallel Work- Sharing Constructs, Master and Synchronization Constructs **POSIX thread:** IEEE POSIX Threads: Creating and Exiting Threads, Simultaneous Execution of Threads

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LIST OF ELECTIVES

Course Code	Course
CA-406	NETWORK SECURITY AND CRYPTOGRAPHY

UNIT -I

Introduction to Cryptography: Introduction To Security: Attacks, Services & Mechanisms, Security, Attacks, Security Services. **Conventional Encryption:** Classical Techniques, Conventional Encryption Model, and Steganography, Classical Encryption Techniques.

Modern Techniques: Simplified DES, Block Cipher Principles, DES Standard, DES Strength, Differential & Linear Cryptanalysis, Block Cipher Design Principles, Block Cipher Modes Of Operation.

UNIT -II

Conventional Encryption Algorithms: Triples DES, Blowfish, International Data Encryption Algorithm, RCS, CAST-128, RC2 **Placement & Encryption Function:** Key Distribution, Random Number Generation, Placement Of Encryption Function.

UNIT - III

Mathematics of Cryptography: Primes, Primality testing, Chinese Remainder Theorem. Fermat's & Euler's Theorem. **Public-Key Cryptography:** Principles Of Public-Key Cryptosystems, RSA Algorithm, Key Management.

UNIT - IV

Message Authentication & Hash Functions: Authentication Requirements, Authentication Functions, Message Authentication Codes, Hash Functions, Birthday Attacks, Security Of Hash Function & MACS **Cryptographic Hash Algorithm:** MD5 Message Digest Algorithm, Secure Hash Algorithm (SHA), Digital Signatures: Digital Signatures, Authentication Protocol, Digital Signature Standard (DSS), Proof Of Digital Signature Algorithm.

UNIT - V

Authentication Applications: Kerberos, Public key distribution X.509, Directory Authentication Service. **Security at the Application layer:** Electronic Mail Security, Pretty Good Privacy (PGP), S / Mime. **IP Security:** Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management. **Web Security:** Secure Socket Layer & Transport Layer Security, Secure Electronic Transaction (Set). **System Security:** Intruders, Viruses, Firewall Design Principles, Trusted Systems.

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LIST OF ELECTIVES

Course Code	Course
CA-407	DATA WARE HOUSING AND DATAMINING

UNIT-I

Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems. Major issues in Data Mining, Data Warehouse and OLAP Technology for Data Mining Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation. Further Development of Data Cube Technology, From Data Warehousing to Data Mining,

UNIT-II

Introduction to OLTP and OLAP, Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches. Data Preprocessing: Needs Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction

UNIT-III

Mining Frequent Patterns, Associations: Basic Concepts, Efficient and Scalable Frequent Item set Mining methods (Apriori Algorithm, improving efficiency of Apriori, Mining frequent Item sets without Candidate generation, using vertical data formats, closed frequent item sets). Mining various kinds of association rules, from association analysis to Correlation analysis, constraint-based association mining

UNIT-IV

Classification and Prediction: What is classification? What is Prediction? Classification by Decision tree Induction, Bayesian classification, Rule based classification, Prediction: Linear Regression, non-linear regression Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Outlier Analysis.

UNIT-V

Mining Complex Types of Data: Multidimensional Analysis and Descriptive Mining of Complex, Data Objects, Mining Spatial Databases, Mining Multimedia Databases, Mining Time-Series and Sequence Data, Mining Text Databases, Mining the World Wide Web. Introduction to Interactive Visual Data Analysis.

Uttar Pradesh Technical University
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LIST OF ELECTIVES

Course Code	Course
CA-408	SOFTWARE TESTING

Unit -I

Introduction: - Purpose of testing, Dichotomies, model for testing, consequences of bugs, taxonomy of bugs, Flow graphs and Path testing:- Basics concepts of path testing, predicates, path predicates and achievable paths, path sensitizing, path instrumentation, application of path testing.

Unit -II

Transaction Flow Testing:-transaction flows, transaction flow testing techniques. Dataflow testing:- Basics of dataflow testing, strategies in dataflow testing, application of dataflow testing, Domain Testing:- domains and paths, Nice & ugly domains, domain testing, domains and interfaces testing, domain and interface testing, domains and testability.

Unit -III

Paths, Path products and Regular expressions:- path products & path expression, reduction procedure, applications, regular expressions & flow anomaly detection. Logic Based Testing:- overview, decision tables, path expressions, kv charts, specifications.

Unit- IV

State, State Graphs and Transition testing:- state graphs, good & bad state graphs, state testing, Testability tips

Unit -V

Graph Matrices and Application:-Motivational overview, matrix of graph, relations, power of a matrix, node reduction algorithm, building tools. (Student should be given an exposure to a tool like JMeter or Win-runner).

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LIST OF ELECTIVES

Course Code	Course
CA-409	IMAGE PROCESSING AND PATTERN RECOGNITION

UNIT -I

BASIC CONCEPTS Pattern Recognition Systems, Fundamental Problems in pattern recognition system design, Design concepts and Methodologies: Character recognition ,Speech recognition, Finger print Recognition. Pattern Recognition Model **DECISION FUNCTIONS:** Linear Decision functions, Distance functions. Minimum distance and Maximum distance classification, clustering concepts, Cluster seeking algorithms, K- means Algorithms.

UNIT –II

BAYE'S CLASSIFIER Bayes classified decision function for Baye's classifier, Baye's Classifier for normal patterns. Trainable pattern classifiers — deterministic approach, perception, approach - reward — punishment concept **GRADIENT APPROACH :** Gradient approach, Gradient Descent algorithms, LMSE Algorithms, Multi category classification.

UNIT- III

TRAINABLE PATTERN CLASSIFIERS Trainable pattern classifiers, statistical approach, stochastic approximation methods, Robbin Minro algorithms, increment correction algorithms, LMSE algorithms. Syntactic patter recognition, formulation— syntax directed recognition — picture descript.

UNIT –IV

DIGITAL IMAGE FUNDAMENTALS Representation, elements. Image transforms: Fast Fourier transform, DCT and DWT. **IMAGE ENHANCEMENT:** Spatial domain, frequency domain methods, Histogram equalization, Modification techniques: Image Smoothing, image sharpening.

UNIT –V

IMAGE ENCODING Fidelity criteria, Encoding process, Mapping — Quantizer coder — Image Segmentation — Masks — Point detection — Line Detection — Edge Detection.

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LIST OF ELECTIVES

Course Code	Course
CA-410	COMPILER DESIGN

UNIT – I

INTRODUCTION TO COMPILER

Introduction to compiler-The structure of compiler, Lexical analysis-The Role of Lexical analyzer, Input Buffering, Specification of tokens , Recognition of tokens , Lexical analyzer generator

UNIT- II

LEXICAL ANALYSIS

Finite Automata, Regular expressions to an NFA, Optimization of DFA , The Role of parser Context free grammars, Writing a Grammar, Top Down parsing -Recursive Descent Parsing Predictive parsing , Bottom up parsing-Shift reduce parsing , Operator Precedence parsing

UNIT – III

SYNTAX ANALYSIS

Introduction to LR parsing & SLR parser, Canonical LR parser and LALR parser generator, intermediate languages, Declarations ,control flow and Boolean expressions, Switch statements Back patching

UNIT – IV

CODE GENERATION

Issues in the design of code generator, The target Language, Addresses in target code, Basic Blocks and Flow Graphs, A simple Code generator, DAG representation of Basic Blocks

UNIT – V

CODE OPTIMIZATION AND RUN TIME ENVIRONMENTS

Introduction– Principal Sources of Optimization, Peephole optimization, Optimization of basic Blocks, Loops in Flow Graphs, Run time environments-Storage organization, Stack allocation of space, Access to non local data on the stack

Uttar Pradesh Technical University
Master of Computer Application IInd year(IVsem)

LIST OF ELECTIVES

Course Code	Course
CA-411	Component Based Programming

Unit -I

Introduction to Component Based Software Engineering (CBSE): Introduction to CBSE, Objective of CBSE, Advantages and Disadvantages of CBD , Future of CBSE, Software Components,, Component Models, Elements of Component Model, Component Based Software Life Cycle Process. Business Case for Components, Software Component Project Management, Challenges in Maintaining Component- Based System.

Unit-II

Engineering of Component-Based Systems: Engineering of Component Based System ,Component-Based Software Engineering Process, Domain Engineering: Domain Analysis and Design Process, Domain Modeling, Component Engineering, Component Adaptation Techniques, Selection Methodology of Commercial Off-The-Shelf (COST) Software, Measurement and Metrics for Software Component, Analysis and Design for reuse. Role-Based Component Engineering for Web Apps.

Unit- III

Component-Based Design and Reuse: Principles of Component Design and Reuse, Component Design Layers, Designing Class-Based Components, Designing Modularity Models for Software Components, Techniques for Designing Component Infrastructures: Connector Design, Designing Interaction Standards, Designing Component Interfaces, Component-Based Reuse Metrics, Reusable Components and its implementation, Component-Based Software Reuse, Challenges with Reusing Components.

Unit- IV

Component-Based Software Development: Software Development Challenges, Component-Based Development Process, Software Component Specification, Component Model and Software Architecture, Component Service, Component Selection, Component Qualification, Component Adaptability, Component Certification, Component Integration and Composition, Trusted Components, Composition predictability, Component Configurations, Software Component Testing, Maintenance and Management of Component-Based System

Unit -V

Component-Based Technology: Component Object Model (COM), Distributed Component Object Model (DCOM), COM+, Java-Based Component Models: Java Beans, Remote Method Invocation (RMI), Enterprise Java Beans, Common Object Request Broker Architecture (CORBA), Software Agents as Next Generation Software Componentss, An OPEN Process for Component Based Development.

Uttar Pradesh Technical University
Master of Computer Application IInd year(IVsem)

LIST OF ELECTIVES

Course Code	Course
CA-412	HUMAN COMPUTER INTERACTION AND USER INTERFACE DESIGN

Unit- I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design. The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

Unit -II

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, and understanding business junctions.
Screen Designing:- Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.

UNIT -III

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

UNIT -IV

Software tools – Specification methods, interface – Building Tools. Interaction Devices Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers.

Uttar Pradesh Technical University
Master of Computer Application IInd year(IVsem)

LIST OF ELECTIVES

Course Code	Course
CA-413	Mini Project

A student shall submit the Mini Project on a given topic under the guidance of a faculty member of the College/ Institute. The Mini Project shall be evaluated by the concerned faculty member and Head of the Department.

MCA IIIrd YEAR

Uttar Pradesh Technical University
Master of Computer Application IIIrd year(Vsem)

Course Code **Course**
MCA-511 **Web Technology**

Unit I: Introduction:

Introduction to web, protocols governing the web, web development strategies, Web applications, web project, web team.

Unit II: Web Page Designing:

HTML: list, table, images, frames, forms, CSS; XML: DTD, XML schemes, presenting and using XML

Unit III: Scripting:

Java script: Introduction, documents, forms, statements, functions, objects; event and event handling; introduction to AJAX, VB Script

Unit IV: Server Site Programming:

Introduction to active server pages (ASP), ASP.NET, java server pages (JSP), JSP application design, tomcat server, JSP objects, declaring variables, and methods, debugging, sharing data between JSP pages, Session, Application: data base action , development of java beans in JSP, introduction to COM/DCOM.

Unit V: PHP (Hypertext Preprocessor):

Introduction, syntax, variables, strings, operators, if-else, loop, switch, array, function, form ,mail, file upload, session, error, exception, filter, PHP-ODBC.

Uttar Pradesh Technical University
Master of Computer Application IIIrd year(Vsem)

Course Code **Course**
MCA-512 **Dot Net Framework and C#**

Unit-1

The .Net framework: Introduction, The Origin of .Net Technology, Common Language Runtime (CLR), Common Type System (CTS), Common Language Specification (CLS), Microsoft Intermediate Language (MSIL) , Just-In –Time Compilation, Framework Base Classes.

Unit-II

C -Sharp Language (C#): Introduction, Data Types, Identifiers, Variables, Constants, Literals, Array and Strings, Object and Classes, Inheritance and Polymorphism, Operator Overloading, Interfaces, Delegates and Events. Type conversion.

Unit-III

C# Using Libraries: Namespace- System, Input-Output, Multi-Threading, Networking and sockets, Managing Console I/O Operations, Windows Forms, Error Handling.

Unit-IV

Advanced Features Using C#: Web Services, Window Services, Asp.net Web Form Controls, ADO.Net. Distributed Application in C#, Unsafe Mode, Graphical Device interface with C#.

Unit-V

.Net Assemblies and Attribute: .Net Assemblies features and structure, private and shareassemblies, Built-In attribute and custom attribute. Introduction about generic.

Uttar Pradesh Technical University
Master of Computer Application IIIrd year(Vsem)

Course Code **Course**
MCA-513 **Software Engineering**

Unit-I

Introduction Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.

Unit-II

Software Requirement Specifications (SRS)

Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. **Software Quality**

Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.

Unit-III

Software Design Basic Concept of Software Design, Architectural Design, Low Level Design:

Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead's Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.

Unit-IV

Software Testing Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding Standards.

Unit-V

Software Maintenance and Software Project Management Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various

Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Uttar Pradesh Technical University
Master of Computer Application IIIrd year(Vsem)

List of Elective Subjects

Course Code **Course**
MCA-E21 **Computer Graphics and Animation**

Unit – I

Introduction and Line Generation: Types of computer graphics, Graphic Displays- Random scan displays, Raster scan displays, Frame buffer and video controller, Points and lines, Line drawing algorithms, Circle generating algorithms, Mid point circle generating algorithm, and parallel version of these algorithms.

Unit – II

Transformations: Basic transformation, Matrix representations and homogenous coordinates, Composite transformations, Reflections and shearing.

Windowing and Clipping: Viewing pipeline, Viewing transformations, 2-D Clipping algorithms- Line clipping algorithms such as Cohen Sutherland line clipping algorithm, Liang Barsky algorithm, Line clipping against non rectangular clip windows; Polygon clipping – Sutherland Hodgeman polygon clipping, Weiler and Atherton polygon clipping, Curve clipping, Text clipping.

Unit – III

Three Dimensional: 3-D geometric primitives, 3-D Object representation, 3-D Transformation, 3-D viewing, projections, 3-D Clipping.

Unit – IV

Curves and Surfaces: Quadric surfaces, Spheres, Ellipsoid, Blobby objects, Introductory concepts of Spline, Bspline and Bezier curves and surfaces.

Hidden Lines and Surfaces: Back Face Detection algorithm, Depth buffer method, A- buffer method, Scan line method, basic illumination models – Ambient light, Diffuse reflection, Specular reflection and Phong model, Combined approach, Warn model, Intensity Attenuation, Color consideration, Transparency and Shadows.

Unit – V

Computer Animations : Conventional and computer assisted animation, design of animation sequences, interpolation, simple animation effects, animation languages (Key Frame System, Parameterized systems), motion specifications, methods of controlling animation.

Uttar Pradesh Technical University
Master of Computer Application IIIrd year(Vsem)

List of Elective Subjects

Course Code	Course
MCA-E22	Simulation and Modeling

Unit-1

System definition and components, stochastic activities, continuous and discrete systems, system modeling, types of models, static and dynamic physical models, static and dynamic mathematical models, full corporate model, types of system study.

Unit-II

System simulation, why & when to simulate, nature and techniques of simulation, comparison of simulation and analytical methods, types of system simulation, real time simulation, hybrid simulation, simulation of pure-pursuit problem, single-server queuing system and an inventory problem, Monte-Carlo simulation, Distributed Lag models, Cobweb model.

Unit-III

Simulation of continuous systems, analog vs. digital Simulation, Simulation of water reservoir system, Simulation of a servo system, simulation of an autopilot, Discrete system simulation, fixed time-step vs. even to even model, generation of random Numbers , test for randomness, Monte-Carlo computation vs. stochastic simulation.

Unit-IV

System dynamics, exponential growth models, exponential decay models, modified exponential growth models, logistic curves, generalization of growth models, system dynamic diagrams Introduction to SIMSCRIPT: Program, system concepts, origination, and statements, defining the telephone system model.

Unit-V

Simulation of PERT Networks, critical path computation, uncertainties in activity duration , resource allocation and consideration. Simulation languages and software, continuous and discrete simulation languages, expression based languages, object oriented simulation, general purpose vs. application - oriented simulation packages, CSMP-III, MODSIM-III.

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List of Elective Subjects

Course Code	Course
MCA-E23	Advanced Database Management Systems

UNIT-I

Transaction and schedules, Concurrent Execution of transaction, Conflict and View Serializability, Testing for Serializability, Concepts in Recoverable and Cascadeless schedules.

UNIT –II

Lock based protocols, time stamp based protocols, Multiple Granularity and Multiversion Techniques, Enforcing serializability by Locks, Locking system with multiple lock modes, architecture for Locking scheduler

UNIT III

Distributed Transactions Management, Data Distribution, Fragmentation and Replication Techniques, Distributed Commit, Distributed Locking schemes, Long duration transactions, Moss Concurrency protocol.

UNIT –IV

Issues of Recovery and atomicity in Distributed Databases, Traditional recovery techniques, Log based recovery, Recovery with Concurrent Transactions, Recovery in Message passing systems, Checkpoints, Algorithms for recovery line, Concepts in Orphan and Inconsistent Messages.

UNIT V

Distributed Query Processing, Multiway Joins, Semi joins, Cost based query optimization for distributed database, Updating replicated data, protocols for Distributed Deadlock Detection, Eager and Lazy Replication Techniques

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List of Elective Subjects

Course Code Course
MCA-E24 Artificial Intelligence

Unit-I

Introduction : Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents. Computer vision, Natural Language Processing.

Unit-II

Introduction to Search : Searching for solutions, Uniformed search strategies, Informed search strategies, Local search algorithms and optimistic problems, Adversarial Search, Search for games, Alpha - Beta pruning.

Unit-III

Knowledge Representation & Reasoning: Propositional logic, Theory of first order logic, Inference in First order logic, Forward & Backward chaining, Resolution, Probabilistic reasoning, Utility theory, Hidden Markov Models (HMM), Bayesian Networks.

Unit-IV

Machine Learning : Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data – EM algorithm, Reinforcement learning,

Unit-V

Pattern Recognition : Introduction, Design principles of pattern recognition system, Statistical Pattern recognition, Parameter estimation methods - Principle Component Analysis (PCA) and Linear Discriminant Analysis (LDA), Classification Techniques – Nearest Neighbor (NN) Rule, Bayes Classifier, Support Vector Machine (SVM), K – means clustering.

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List of Elective Subjects

Course Code **Course**
MCA-E25 **Information Security and Cyber Laws**

UNIT-I

History of Information Systems and its Importance, basics, Changing Nature of Information Systems, Need of Distributed Information Systems, Role of Internet and Web Services, Information System Threats and attacks, Classification of Threats and Assessing Damages Security in Mobile and Wireless Computing- Security Challenges in Mobile Devices, authentication Service Security, Security Implication for organizations, Laptops Security Concepts in Internet and World Wide Web: Brief review of Internet Protocols-TCP/IP, IPV4, IPV6. Functions of various networking components-routers, bridges, switches, hub, gateway and Modulation Techniques

UNIT-II

Basic Principles of Information Security, Confidentiality, Integrity Availability and other terms in Information Security, Information Classification and their Roles. Security Threats to E Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E Cash, Credit/Debit Cards.

UNIT-III

Physical Security- Needs, Disaster and Controls, Basic Tenets of Physical Security and Physical Entry Controls, Access Control- Biometrics, Factors in Biometrics Systems, Benefits, Criteria for selection of biometrics, Design Issues in Biometric Systems, Interoperability Issues, Economic and Social Aspects, Legal Challenges
Framework for Information Security, ISO 27001, SEE-CMM, Security Metrics, Information Security Vs Privacy

UNIT-IV

Model of Cryptographic Systems, Issues in Documents Security, System of Keys, Public Key Cryptography, Digital Signature, Requirement of Digital Signature System, Finger Prints, Firewalls, Design and Implementation Issues, Policies Network Security- Basic Concepts, Dimensions, Perimeter for Network Protection, Network Attacks, Need of Intrusion Monitoring and Detection, Intrusion Detection Virtual Private Networks- Need, Use of Tunneling with VPN, Authentication Mechanisms, Types of VPNs and their Usage, Security Concerns in VPN

UNIT-V

Laws, Investigation and Ethics: Cyber Crime, Information Security and Law, Types & overview of Cyber Crimes, Cyber Law Issues in E-Business Management Overview of Indian IT Act, Ethical Issues in Intellectual property rights, Copy Right, Patents, Data privacy and protection, Domain Name, Software piracy, Plagiarism, Issues in ethical

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List of Elective Subjects

Course Code Course
MCA-E26 Information Storage & Management

Unit-I

Introduction to Storage Technology Data proliferation and the varying value of data with time & usage, Sources of data and states of data creation, Data center requirements and evolution to accommodate storage needs, Overview of basic storage management skills and activities, The five pillars of technology, Overview of storage infrastructure components, Evolution of storage, Information Lifecycle Management concept, Data categorization within an enterprise, Storage and Regulations.

Unit-II

Storage Systems Architecture Intelligent disk subsystems overview, Contrast of integrated vs. modular arrays, Component architecture of intelligent disk subsystems, Disk physical structure components, properties, performance, and specifications, Logical partitioning of disks, RAID & parity algorithms, hot sparing, Physical vs. logical disk organization, protection, and back end management, Array caching properties and algorithms, Front end connectivity and queuing properties, Front end to host storage provisioning, mapping, and operation, Interaction of file systems with storage, Storage system connectivity protocols.

Unit-III

Introduction to Networked Storage JBOD, DAS, SAN, NAS, & CAS evolution, Direct Attached Storage (DAS) environments: elements, connectivity, & management, Storage Area Networks (SAN): elements & connectivity, Fibre Channel principles, standards, & network management principles, SAN management principles, Network Attached Storage (NAS): elements, connectivity options, connectivity protocols (NFS, CIFS, ftp), & management principles, IP SAN elements, standards (SCSI, FCIP, FCP), connectivity principles, security, and management principles, Content Addressable Storage (CAS): elements, connectivity options, standards, and management principles, Hybrid Storage solutions overview including technologies like virtualization & appliances.

Unit-IV

Introduction to Information Availability Business Continuity and Disaster Recovery Basics, Local business continuity techniques, Remote business continuity techniques, Disaster Recovery principles & techniques.

Unit-V

Managing & Monitoring Management philosophies (holistic vs. system & component), Industry management standards (SNMP, SMI-S, CIM), Standard framework applications, Key management metrics (thresholds, availability, capacity, security, performance), Metric analysis methodologies & trend analysis, Reactive and pro-active management best practices, Provisioning & configuration change planning, Problem reporting, prioritization, and handling techniques, Management tools overview.

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List of Elective Subjects

Course Code	Course
MCA-E31	ERP Systems

UNIT - I

ERP Introduction, Benefits, Origin, Evolution and Structure: Conceptual Model of ERP, The Evolution of ERP, The Structure of ERP.

UNIT - II

Business Process Reengineering, Data ware Housing, Data Mining, Online Analytic Processing(OLAP), Product Life Cycle Management(PLM),LAP, Supply chain Management.

UNIT - III

ERP Marketplace and Marketplace Dynamics: Market Overview, Marketplace Dynamics, The Changing ERP Market. ERP- Functional Modules: Introduction, Functional Modules of ERP Software, Integration of ERP, Supply chain and Customer Relationship Applications.

UNIT - IV

ERP Implementation Basics, ERP Implementation Life Cycle, Role of SDLC/SSAD, Object Oriented Architecture, Consultants, Vendors and Employees,

UNIT - V

ERP & E-Commerce, Future Directives- in ERP, ERP and Internet, Critical success and failure factors, Integrating ERP into organizational culture. Using ERP tool: either SAP or ORACLE format to case study

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List of Elective Subjects

Course Code **Course**
MCA-E32 **Software Project Management**

UNIT-I

Introduction and Software Project Planning Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope document, Project Management Cycle, SPM Objectives, Management Spectrum, SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of project plan, Structure of a Software Project Management Plan, Software project estimation, Estimation methods, Estimation models, Decision process.

UNIT-II

Project Organization and Scheduling Project Elements, Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle, Ways to Organize Personnel, Project schedule, Scheduling Objectives, Building the project schedule, Scheduling terminology and techniques, Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.

UNIT-III

Project Monitoring and Control Dimensions of Project Monitoring & Control, Earned Value Analysis, Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI), Interpretation of Earned Value Indicators, Error Tracking, Software Reviews, Types of Review: Inspections, Desk checks, Walkthroughs, Code Reviews, Pair Programming.

UNIT-IV

Software Quality Assurance and Testing Testing Objectives, Testing Principles, Test Plans, Test Cases, Types of Testing, Levels of Testing, Test Strategies, Program Correctness, Program Verification & validation, Testing Automation & Testing Tools, Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM), SQA Activities, Formal SQA Approaches: Proof of correctness, Statistical quality assurance, Clean room process.

UNIT-V

Project Management and Project Management Tools Software Configuration Management: Software Configuration Items and tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control, Risk Management: Risks and risk types, Risk Breakdown Structure (RBS), Risk Management Process: Risk identification, Risk analysis, Risk planning, Risk monitoring, Cost Benefit Analysis, Software Project Management Tools: CASE Tools, Planning and Scheduling Tools, MS-Project.

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List of Elective Subjects

Course Code	Course
MCA-E33	Real Time System

UNIT-I

Introduction Definition, Typical Real Time Applications: Digital Control, High Level Controls, Signal Processing etc., Release Times, Deadlines, and Timing Constraints, Hard Real Time Systems and Soft Real Time Systems, Reference Models for Real Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency.

UNIT-II

Real Time Scheduling Common Approaches to Real Time Scheduling: Clock Driven Approach, Weighted Round Robin Approach, Priority Driven Approach, Dynamic Versus Static Systems, Optimality of Effective-Deadline-First (EDF) and Least-Slack-Time-First (LST) Algorithms, Rate Monotonic Algorithm, Offline Versus Online Scheduling, Scheduling Aperiodic and Sporadic jobs in Priority Driven and Clock Driven Systems.

UNIT-III

Resources Sharing Effect of Resource Contention and Resource Access Control (RAC), Non-preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling Protocols, Stack Based Priority- Ceiling Protocol, Use of Priority-Ceiling Protocol in Dynamic Priority Systems, Preemption Ceiling Protocol, Access Control in Multiple-Unit Resources, Controlling Concurrent Accesses to Data Objects.

UNIT-IV

Real Time Communication Basic Concepts in Real time Communication, Soft and Hard RT Communication systems, Model of Real Time Communication, Priority-Based Service and Weighted Round-Robin Service Disciplines for Switched Networks, Medium Access Control Protocols for Broadcast Networks, Internet and Resource Reservation Protocols

UNIT-V

Real Time Operating Systems and Databases Features of RTOS, Time Services, UNIX as RTOS, POSIX Issues, Charecteristic of Temporal data, Temporal Consistency, Concurrency Control, Overview of Commercial Real Time databases

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List of Elective Subjects

Course Code	Course
MCA-E34	Mobile Computing

Unit – I

Introduction, issues in mobile computing, overview of wireless telephony: cellular concept, GSM: air-interface, channel structure, location management: HLR-VLR, hierarchical, handoffs, channel allocation in cellular systems, CDMA, GPRS.

Unit - II

Wireless Networking, Wireless LAN Overview: MAC issues, IEEE 802.11, Blue Tooth, Wireless multiple access protocols, TCP over wireless, Wireless applications, data broadcasting, Mobile IP, WAP: Architecture, protocol stack, application environment, applications.

Unit – III

Data management issues, data replication for mobile computers, adaptive clustering for mobile wireless networks, File system, Disconnected operations.

Unit - IV

Mobile Agents computing, security and fault tolerance, transaction processing in mobile computing environment.

Unit – V

Adhoc networks, localization, MAC issues, Routing protocols, global state routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, applications

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List of Elective Subjects

Course Code	Course
MCA-E35	Neural Networks

Unit-I

Neurocomputing and Neuroscience Historical notes, human Brain, neuron Mode I, Knowledge representation, AI and NN. Learning process: Supervised and unsupervised learning, Error correction learning, competitive learning, adaptation, statistical nature of the learning process.

Unit-II:

Data processing Scaling, normalization, Transformation (FT/FFT), principal component analysis, regression, covariance matrix, eigen values & eigen vectors. Basic Models of Artificial neurons, activation Functions, aggregation function, single neuron computation, multilayer perceptron, least mean square algorithm, gradient descent rule, nonlinearly separable problems and bench mark problems in NN.

Unit-III

Multilayered network architecture, back propagation algorithm, heuristics for making BP algorithm performs better. Accelerated learning BP (like recursive least square, quick prop, RPROP algorithm), approximation properties of RBF networks and comparison with multilayer perceptron.

Unit-IV

Recurrent network and temporal feed-forward network, implementation with BP, self organizing map and SOM algorithm, properties of feature map and computer simulation. Principal component and Independent component analysis, application to image and signal processing.

Unit-V

Complex valued NN and complex valued BP, analyticity of activation function, application in 2D information processing. Complexity analysis of network models. Soft computing. Neuro-Fuzzy-genetic algorithm Integration.

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List of Elective Subjects

Course Code	Course
MCA-E36	Pattern Recognition

Unit-I

Introduction: Basics of pattern recognition, Design principles of pattern recognition system, Learning and adaptation, Pattern recognition approaches, Mathematical foundations – Linear algebra, Probability Theory, Expectation, mean and covariance, Normal distribution, multivariate normal densities, Chi squared test.

Unit-II

Statistical Patten Recognition: Bayesian Decision Theory, Classifiers, Normal density and discriminant functions,

Unit – III

Parameter estimation methods: Maximum-Likelihood estimation, Bayesian Parameter estimation, Dimension reduction methods - Principal Component Analysis (PCA), Fisher Linear discriminant analysis, Expectation-maximization (EM), Hidden Markov Models (HMM), Gaussian mixture models.

Unit - IV

Nonparametric Techniques: Density Estimation, Parzen Windows, K-Nearest Neighbor Estimation, Nearest Neighbor Rule, Fuzzy classification.

Unit - V

Unsupervised Learning & Clustering: Criterion functions for clustering, Clustering Techniques: Iterative square - error partitional clustering – K means, agglomerative hierarchical clustering, Cluster validation.

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Course Code	Course
MCA-611	Colloquium

Guidelines & General Instruction:

The aim of the subject is to develop ability of a student to carryout literature survey & independent study of an advanced subject/topic/matters in the field of Computer Science and Information technology. At the beginning of semester a list of colloquium topic should be displayed on the notice board by the department and/or on the institution web site. Every Student must select a topic of his choice. The student is required to conduct rigorous study/survey on the subject under the supervision of the faculty member of the department, prepare a report and present this in presence of all the students of his class at the end of semester. The comments & criticism of the topic/subject will be discussed for the benefit of all the students. The evaluation will be carried out by the department based on the presentation.

MCA 612 Project

Guidelines & General Instruction:

Every student is required to carry out project work under the supervision of a faculty member of the department. However, a student may also opt to pursue his project work in a reputed industry/institution with the consent of Department/Institute. In such cases, the department must look into the suitability of the projects and assign one internal guide/supervisor. The internal supervisor shall monitor progress of the student continuously. A candidate is required to present the progress of the project work (at least twice) during the semester at an appropriate time decided by the Department . There will a final presentation of the project work at the end of the semester.

