



Master of Computer Applications

Duration: 3 Years

Semester I

- 2101. Programming principles and 'C' Programming
- 2102. Computer Organisation and Architecture.
- 2103. Data Communication, Networking and the Internet.
- 2104. Discrete and Concrete Mathematics.
- 2105. Theory and Practice of Operating Systems.

Semester II

- 2201. Structured Systems Analysis and Design.
- 2202. Object Oriented Programming with C++.
- 2203. Database Management Systems and Applications.
- 2204. Data structures and Algorithms.
- 2205. Web Technologies.

Semester III

- 2301. Introduction to Microprocessors.
- 2302. Technical Communication.
- 2303. Systems Software and Component Technologies.
- 2304. Accounting and Financial Management.
- 2305. Java Technologies.

Semester IV

- 2401. Networking Programming and Network Security.
- 2402. Object Oriented Methodology and Design Patterns.
- 2403. Advanced Database Technologies
- 2404. Managerial Economics.
- 2405. Computer-Oriented Quantitative Techniques.

Semester V

- 2501. Information Technology Management.
- 2502. Distributed Computing.
- 2503. Software Engineering and Project Management.
- 2504. Elective I
- 2505. Elective II

Semester VI

- 2601. Seminar
- 2602. Project

DETAILED SYLLABUS

SEMESTER I

2101. Programming Principles and ‘C’ Programming

Overview of Programming Principles :

Design: Design of a Pseudo-Code; Implementation, Phenomenology of programming languages
Emphasis On Efficiency: Structural Organization, Data Structures; Name Structures; Syntactic Structures; Generality and Hierarchy: Control Structures; Syntax and Implementation of Block-structured Languages: Procedure call and return; Modularity and Data Abstraction, Procedures and Concurrency, Recursion.

Problem Solving

Introduction to problem solving using computers, Methods of problem solving, Strategies for problem solving, Concept and properties of algorithms, Representation of algorithms, Constructs to facilitate representation of algorithms, Methods to express algorithms

‘C’ Programming :

Introduction to programming, Programming process: problem definition; program design; coding; compilation and execution; testing and debugging; documentation; ‘C’ primitives, Sequential structure; Selective structure; Repetitive structure; Functions, Recursion, Arrays, File Processing, Pointers, Dynamic memory management, Structures and unions, Operations on Bits, Enumeration, Command line parameters, Advanced library functions, Macros, C pre-processor

References:

1. “Principles of Programming Languages”: Bruce J. Maclennan
2. “Schaum’s Outline of Theory and Problems of programming with C”: Gottfried
3. “The C Programming Language”: Kerningham and Ritchie
4. “Programming in ANSI C”: Ramkumar and Agrawal

2102. Computer Organisations and Architecture

Digital Principles Overview: Logical Design, Boolean algebra, Truth tables, Combinational circuits, Flip-flops, Registers, Counters, Multiplexers and Decoders, Arithmetic Circuits.

Representation of information: representation of characters, integers and fractions, binary and hexadecimal representations.

Binary arithmetic: addition, subtraction, division, multiplication, signed arithmetic and two’s complement arithmetic, floating point representation of numbers, normalized floating point representations, Number systems and character codes

Error detecting and correcting codes

Memory devices: Hierarchy, Core, semiconductor RAM and ROM, backup devices, Cache mapping, replacement algorithms and write policies.

Instruction Format: Zero, one, two and three address instructions, Addressing modes, Microprogramming
Input/output : Traps and interrupts, buses,

Programmed I/O, Interrupt-driven I/O, DMA, I/O processors

Basic Concepts in Advanced Architecture: SISD, SIMD, MIMD, RISC

References:

1. “Computer Organisation and Architecture”: William Stallings
2. “Computer System Architecture”: Morris Mano

2103. Data Communication, Networking and the Internet

Data Communication, Networking

Digital transmission, manchester, differential manchester and pcm encoding

Baud, symbols and bits, Analog transmission, frequency modulation, amplitude modulation, phase Modulation, Simplex, half duplex, full duplex, Fundamentals of networking, Multiplexing - frequency division, time division, Channel allocation - static allocation, dynamic allocation, Switching techniques - circuit switching, message switching,, packet switching and hybrid switching, Transporting of digital information - packaging, reassembling, sequencing and identification of digital information, Network Issues - framing, error control, flow control, routing, congestion Type of services - connection and reliability, Layered approach for network models, Very brief overview of the OSI model, Protocols v/s Interfaces, Concepts of collisions, slots, carrier sense, Medium access protocols: an overview of aloha, slotted aloha, CSMA, CSMA/CD, TCP/IP Reference model and working, Domain names and domain name lookup, Clients and servers in a TCP/IP Protocol suite, A look at socket programming

INTERNET

Fundamentals of Internet, Networking, Internetworking, Internet, Applications using the Internet, Accessing the Internet, Using common applications, and how they work, FTP: using a character based FTP program and an FTP program with a GUI, EMAIL: using an email program, sending mail with SMTP, Retrieving mail with POP3, and understanding MIME, BROWSER: using a browser to surf the Internet, Components of an URL, FTP URLs, HTTP URLs, Email URLs, Components of a web page: HTML page, links, pictures, sounds, Animations, Scripting, Objects, Forms and CGI-BIN. How a browser works (HTTP + MIME), Web based Email – HOTMAIL, Searching on the Internet (Search Engines v/s Directories) Setting up a website, Interactivity: Server side scripting (Perl, c/c++, Asp, Cold Fusion), Client side scripting (Javascript, VB Script), Embedded objects (Java applets, ActiveX Controls, Browser plugins, DHTML), Basic HTML: basic structure of an HTML document or a web page, Inserting links, images, horizontal rules, comments, Formatting text, headings, colours, fonts, sizes, Simple tables and forms, Issues for web design: cross browser issues, cross platform issues, aesthetics, structure v/s style Web Server, Security and Business on the Internet, Privacy on the Internet, Encryption, authentication and digital certificates, Business on the Internet and E-Commerce, Firewalls and proxy servers

References:

1. “How the Internet works”: Joshua Eddings
2. “Internet Information Server”: Allen Wyatt
3. “Web Programming Secrets with HTML, CGI and Perl”: Ed. Tittel, Mark Gaither, Sebastian Hassinger and Mike Erwin
4. “Data and Computer Communications”, 5th ed., W. Stallings

2104. Discrete and Concrete Mathematics

Overview of set theory, Functions, Relations, Posets, Lattices, Finite Boolean Algebra's, semi-groups and groups, rings and fields.

Theory of Matrices: Eigen values, eigen vectors, properties of eigen values Cayley Hamilton Theorem
Graphs, subgraphs, degree sequence, connectedness, walk, path, circuit Recurrent problems: The tower of Hanoi; lines in the plane; the Josephus problem.

Sums: Notation; Sums and recurrences; Manipulation of sums; Multiple sums; General methods; Finite and infinite calculus; Infinite sums, Integer functions: Floors and Ceilings; Floor / Ceiling applications; Floor / Ceiling Recurrences; 'mod': The Binary Operation; Floor / Ceiling Sums Number Theory: Divisibility; Primes; Prime examples; Factorial factors; Relative primality; 'mod': The congruence relation; Independent residues; Additional applications; Phi and Mu Special numbers: Stirling numbers; Eulerian numbers; Harmonic numbers; Harmonic summation; Bernoulli numbers; Fibonacci numbers; Continuants Discrete probability: Definitions; Mean and variance; Probability generating functions; Flipping coins; Hashing Asymptotics: A Hierarchy; Notation; Manipulation; Two Asymptotic Tricks; Euler's summation Formula; Final Summations

References:

1. "Discrete Mathematical Structures for Computer Science": (2nd Ed.), B. Kolman, R. C. Busby, 1988.
2. "Concrete Mathematics":(2nd Ed.), R. L. Graham, D. E. Knuth, O. Patashnik, 1995.
3. "Graph Theory with Applications to Engineering And Computer Science": Narsingh Deo, 1986

2105. Theory and Practice of Operating Systems

Fundamentals of operating systems – OS services and components, multitasking, multiprogramming, timesharing, buffering, spooling.

Process and thread management - Concept of process and threads, process states, process management, context switching, user and kernel mode switching, interaction between processes and OS, multithreading user and kernel level threads.

Concurrency control - concurrency and race conditions, mutual exclusion requirements, software and hardware solutions, semaphores, monitors, classical IPC problems and solutions, deadlocks – characterization, detection, recovery, avoidance and prevention.

Memory management – memory partitioning, swapping, paging, segmentation, virtual memory, page replacement algorithms.

I/O – interrupt handlers, device drivers, device independent software subsystem.

File systems – file storage, access methods and free space management.

Security – Need and strategies for security in standalone and networked systems, concept of access control list and capabilities, password and encryption schemes.

Introduction to UNIX operating system, UNIX Internals

Using the shell, Command line, creating new commands, redirection, Looping, bundle, Filters

Shell Programming: While and until loops, process killing, Tracking file changes

Programming with standard input/output, UNIX system calls, Low-level input/output, device drivers, Program development

Case study of a suitable application system, Document Preparation

Study of Linux, Windows NT.

Overview of Distributed operating systems.

References:

1. “Design of UNIX Operating System”: Bach
2. “UNIX Shells”: Unadkant, Parmar
3. “UNIX Shell Programming”: Kochan, Patrickwood
4. “Systems programming”: Donovan
5. “Operating System Concepts”: Peterson, Silberschatz

SEMESTER II

2201. Structured Systems Analysis and Design

Concept of computerized information systems - PPSHP model; system Flow-charting
Definition of the systems
Types of information systems
Transaction processing
MIS, Decision support systems, Executive support systems
Process of system Development
SDLC, Structured SSAD methodology
DFD; Data Dictionary; Mini Specs; Pseudo Code;
Structured English; Decision tables, Decision trees
Structure Charts, Module Specifications
Input output design
Database design and normalization;
Object Oriented Analysis and Design overview
Application Project

References:

1. “Workbook on System Analysis and Design”: Vinod Kumar Garg and S. Srinivasan,
2. “System Analysis and Design Methods”: Whitten, Bentley, Barlow
3. “Structured Systems Analysis Tools and Techniques”: Gane Chris, Sarson Trish
4. “Systems Analysis and Design: A Case Study Approach”: Thierauf
5. “Structured Design: Fundamentals of a Discipline of Computer Program and Systems Design”:
Yourdon, Constantine

2202. Object Oriented Programming with C++

Introduction to Object oriented paradigm

Classes and Objects: Relationships among objects, Relationships among classes
Classification: Importance of Proper Classification, Identifying Classes and Objects
Key Abstraction and Mechanisms, The Notation, Elements of the Notation, Class Diagrams, State
Transition Diagrams, Object Diagrams, Interaction Diagrams, Module Diagrams, Process Diagrams,
Applying the Notation, The Process, The Micro Development Process, The Macro Development Process

Moving from C to C++

Introduction to C++

Class, Access Specifiers, Operator overloading, Function overloading, Encapsulation, Data abstraction, Inheritance, Protected access specifier, Polymorphism, Derivation types, Abstract class/virtual class, Multiple inheritances, Exception handling, I/O stream library, Standard template library, Templates and container classes

References:

1. “C++ Programming Language”: B. Stroustrup (3rd Edition)
2. “Mastering C++”: KR Venugopal, et al.
3. “C++ Plus Data Structure”: Nell Dale (Narosa Publishing).
4. “Programming in C++”: Nell Dale, Chip Weems, Mark Headington (Narosa Publishing)
5. “A Treatise on Object Oriented Programming using C++”: B. Chandra (Narosa Publishing)
6. “Object-Oriented Analysis and Design with Applications”: Grady Booch (2nd Edition)

2203. Database Management Systems and Applications

Database Systems-Basic Concepts: Data, database, database systems, database management system; data models, data abstraction, data independence, three level architecture, data definition language, data manipulation language, overall system architecture of DBMS, data dictionary, schema processor, query processor, three classical data models (hierarchical, network and relational)

Relational data model: Relational structure- relations, tuples, domains, attributes, keys, candidate keys, primary key, entity integrity constraints, referential integrity constraints; query languages - relational algebra.

Database Design: Relational database design, normalisation based on functional dependencies and multi-valued dependencies, normal forms 1, 2, 3, BCNF, 4 and 5, conceptual design, entity-relationship model, translation of

E-R schemes to relational schemes (logical design), physical design

Query Processing: Query, expression trees, equivalence, query expression, tree optimisation, cost estimation, implementation of relational algebra operations

Transaction processing: Recovery, techniques, check pointing, concurrency control, serializability, lock-based concurrency control, strict two-phase locking, multiple granularity locking, time-stamp based concurrency control

Other Issues: Security and integrity, authorisation and views, security specification in SQL, types of integrity constraints, triggers in SQL, declarative constraints in SQL

SQL

References:

1. “Database Design”: Gio Wiederhold
2. “Fundamentals of Database Systems”: Elmasri and Navathe
3. “Database System Concepts”: Korth, Siberschatz

2204. Data structures and Algorithms

Abstract data types : Notion of abstract data types and data structures, simple data structures including arrays, stacks, queues and linked lists (linear, circular and doubly-linked).

Trees : Different types of trees including binary trees, complete binary trees, almost complete binary trees, binary search trees, balanced binary trees including AVL trees, heaps, multi-way search trees and B-trees; insertion and deletion of nodes and traversal in each of these types of trees.

Graphs : Representations, directed and undirected graphs, notion of path, path finding algorithms, Dijkstra's shortest-path algorithm, traversals and spanning trees, minimum spanning tree (algorithms of Kruskal and Prim), applications of graphs such as network flow problem and topological sort.

Algorithms : Order notation; notions of P, NP and NP-complete problems, basics of algorithms design, different classes of algorithms; the following algorithms and their complexity measures; bubble sort, quick sort, selection sort, heap sort and merge sort; searching algorithms including sequential search, ordered table search, binary search, binary tree search and multi-way search trees; hashing (hash collision, primary and secondary clustering, open addressing and chaining techniques, hash functions).

Recommended Books

- Data Structures and Algorithms in Java by Adam Drozdek, Thomson Learning.
- Data Structures and Algorithm Analysis in Java by Mark Allen Weiss, Addison Wesley
- Data Structures using C by AM Tanenbaum, Y Langsam and MJ Augenstein, Prentice-Hall, India, 1991.
- Data Structures and Program Design in C by RL Kruse, BP Leung and CL Tondo, Prentice-Hall, India, 1991.
- Data Structures and Algorithm Analysis in C by Weiss, Mark Allen, Addison Wesley.

2205. Web Technology

General:

HTTP:

Overview – HTTP Basics, Client request, Server response; HTTP Headers;
Session Management – Persistent connections, Cookies.

General concepts on web server:

Configuration & Administration; virtual hosting
General concepts of caching proxy server
Web security
SSL, Digital signatures; Authentication.

Client side technologies

HTML:

Structure of HTML Document – Meta tags, Links, Text, Lists, Tables, Inclusions (Objects, Images, and Multimedia contents);
Presentation of HTML document – Style sheets, Alignment, fonts, frames;
Interactive HTML document – Forms, Scripts.

XML:

Overview; Schemas – DTD (Document Type Definitions), XML Data, Namespaces; Document Object Model.

Java Applets:

Lifecycle of applets, applet context; Limitations of applets

Client Side JavaScript:

Object Reference – Objects, Methods and Properties, Event Handlers;
Language constructs – Statements and Operators.

Server Side Technologies

CGI

Java Servlets:

HTTP Servlet Basics, Servlet Life Cycle, Session Tracking, Interservlet Communication

Overview of ASP & JSP

SSI:

SSI Directives; SSI Environment Variables; SSI Formats.

Reference Books :

- 1) HTML : The Definitive Guide, 3rd Edition by Chuck Musciano & Bill Kennedy, O'Reilly and Associates.
- 2) Learning XML by Eric T. Ray & Christopher R. Maken, O'Reilly and Associates.
- 3) Webmaster in a Nutshell by Stephen Spainhour, O'Reilly and Associates.
- 4) Java Servlet Programming by Jason Hunter with William Crawford, O'Reilly and Associates.
- 5) Java Script: The Definitive Guide by David Flanagan, O'Reilly and Associates.
- 6) Professional JSP by Karl Avedal et al., Wrox Publications
- 7) ASP in a Nutshell 2nd Edition by Keyton Wessinger, O'Reilly and Associates.

SEMESTER III

2301. Introduction to Microprocessors

History and overview: Growth of microprocessor technology from SSI, MSI, LSI
Traps and interrupts to VLSI, Current global trends, RISC architecture
Intel microprocessors-8085 to Pentium-II performance and features comparisons
8085 Microprocessor, Internal architecture, Pinout, Memory addressing schemes, system bus structure, Data, address and control bus, multiplexing and demultiplexing
Interrupts: Introduction, Purpose of interrupts, Interrupt vectors, 8259 – internal organisation, Pin out, Single and cascaded operation
I/O Interface: Typical I/O interface, serial communication, 8251 A UART: Internal organisation and functioning, 8237 DMA: Internal organisation and functioning
Memory: Type of memory
ROM-PROM, EPROM, EEPROM (Flash ROM concept)
RAM-SRAM, DRAM, EDO, ECC, SDRAM
Packaging- DIP, SIMM, DIMM
Addressing, memory map, address decoding
Programming
Addressing modes, data movement, arithmetic and logic instructions, control instructions. Overview of 8086 / 8088 Overview of 80286, 80386, 80486, Pentium, Pentium II, Pentium III

References:

1. “Inside the PC”: Peter Norton (Sixth Edition)
2. “Microprocessor System-The 8086/8088 Family”: Yu-Cheng Liu & Glen A. Gibson
3. “The Intel Microprocessors: 8086/8088, 80286, 80386, 80486, Pentium, Pentium Pro, Pentium-II & III “: Barry Brey (Fourth Edition)

2302. Technical Communication

Technical communication

Fundamentals of technical communication

Oral and written communication

Preparing oral presentations and supporting materials

Standards of communication

Written communication

Essays, Technical leaflets, Term papers, Research Papers, White paper and technical summaries, Project proposals, Tenders, Contracts and quotations, Technical specifications, Monographs, Dissertations and Thesis,

Software project documentation of all kinds

References:

1. "Writing and Speaking in the Technology Professions": A Practical Guide, David F. Beer,
2. "Business Communication": Raymond V, Leiskar John D, Pettit J. V.
3. "Communications": Dr. C. S. Rayuder, Himalaya Publication.
4. "Communication Skills for Effective Management": Dr. Anjali Gnekar, Everest Publishing House.
5. "Media & Communication Today, Policy, Training and Development": Ved Prakash Gandhi.
6. "Powerful Presentation Skills": Career Press, USA.
7. "Developing Presentation Skills": Dr. R. L. Bhatia, Ernst & Young Publication.
8. "Management Information System": James A. O'Brien, Galgotia Publication Pvt. Ltd.
9. "Communicating Change": Bill Quirke Dale, Mc-Graw Hill Company.
10. "Business Presentation": Lani Arrendondo, Mc-Graw Hill Company.
11. "Communication & Management": Niraj Kumar, Gyan Publishing House Delhi
12. "Effective Communication": K. R. Balan, Beacon Book, Delhi.
13. "The Effective Executive": Peter F. Drucker, Harper Business, USA.
14. "Communicating at work": Tony Alessandu & Phil Hunsakar A Faresode Book.
15. "Communication in Organisation": Dalmar Fiher, Jaico Publishing House.

2303. Systems Software and Component Technology

Introduction to system software

Introduction to Assemblers

Overview

Single-Pass Assembler

Two-Pass Assembler

Assembly programming

Macro: Macro Call, Macro Expansion,

Table Management Techniques

Loaders and Linkage Editors

Overview

Loading Schemes

Program Relocation

Linking Schemes

Process of linking

Linking of Program Overlays

Compilers: Function; Process of Compilation;

Structure of the Compiler

Compiling Expressions

Compiler Data Structures
Syntactic specification of programming languages
Regular expressions
Context free grammars
Derivations and parse trees
Capabilities of context free grammars
Basic parsing techniques
Syntax-directed Translation
Symbol Tables
Run-time Storage management
Error Detection and Recovery
Introduction to code optimisation
Garbage collection
Data flow analysis
Loop optimisation
Code generation
Modules and separate compilation

References:

1. “Introduction to Systems Software”: Dhamdhere
2. “Systems Software”: 3rd ed., L. L. Beck
3. “Compiler Design” : Aho
4. “An Introduction to Formal Languages and Automata”: Peter Linz

2304. Accounting and Financial Management

Principles of accounting
Nature and scope of accounting and financial management
Double-Entry system of accounting
Introduction to basic books of accounts of sole proprietary concern
Closing of books of accounts
Preparation of trial balance
Final Accounts
Trading, profit and loss accounts
Balance Sheets of sole proprietary concern with normal closing entries
Introduction to manufacturing accounts
Final accounts of partnership firms and Limited companies
Control accounts for debtors, creditors
Ratio Analysis
Meaning, advantages
Limitations
Types of ratios and their usefulness
Fund flow statement
Meaning of the term fund: Flow of fund
Working capital cycle
Preparation and interpretation of statement
Costing
Nature, importance and basic principles
Budget and budgetary control

Nature and scope, Importance
Method of finalisation of master budget
Functional budget
Marginal costing
Nature and scope, Importance, Construction of break-even chart
Limitations and uses of break-even chart,
Practical applications of marginal costing
Standard Costing
Nature and scope of standard cost, Variance
Variance analysis with reference to material, labour
Overhead costs, Interpretation of the variance

References:

1. “Accounting & Book-Keeping”: Kishnadwala
2. “Book-Keeping & Accountancy”: Choudhari, Chopade.

2305. Java Technologies

Topics

Language Fundamentals : Data representation, Operators and Expressions, Control Flow and Looping Constructs, Classes and Objects, Interfaces, Inheritance, Exception handling, Packages.

Core API Packages (As specified in Java 2 Standard Edition v 1.4) : lang, util, io, math, awt, applet.

Concepts : Thread Management, Serialization Fundamentals, Distributed Object Computing, Remote Method Invocation, IDL, Bean Fundamentals, Security Model and Fundamentals, Collections, Framework, Java Database Connectivity, Java Transaction Management, JNDI, Enterprise Java Beans 2.0

It is assumed that the candidate is familiar with the Java programming language.

Recommended Books

- Java™ 2 : The Complete Reference, Third Edition, by Patrick Naughton and Herbert Schildt, Tata McGraw Hill Edition 1999.
- Java Enterprise in a Nutshell : A Desktop Quick Reference (Nutshell Handbook) or any other book with similar contents.

SEMESTER 1V

2401 Network Programming and Network Security

Basics of Networking covering TCP/IP protocol suite.
Basic networking architecture – layered approach and evolution of networks.
Detailed layered architecture of TCP/IP protocol suite covering protocols TCP, UDP, IP, ICMP, IGMP, etc.
UNIX Networking architecture.
Sockets API in UNIX
Preliminary system calls for TCP/UDP sockets.
I/O models in UNIX.
Socket Options.
Advance I/O system calls.
Broadcasting and Multicasting.
Raw Sockets and Data-link access.
Remote Procedure Calls
Basic architecture for RPC.

RPC runtime library – high level and low level calls.
XDR (eXtended Data Representation) format and
XDR filters.

Network Security

Conventional Encryption and Message Confidentiality
Public-Key Cryptography and Message Authentication
Authentication Applications
Electronic Mail Security
IP Security
Web Security
Network Management Security

References:

1. Introduction to Computer Networks - Andrew S. Tanenbaum
2. UNIX Network Programming, Volume I and II - W. Richard Stevens
3. Power Programming with RPC - John Bloomer
4. RPC handbook, Java Programming Language - Ken Arnold, James Gosling
5. JDK 1.2 Documentation
6. Network Security Essentials – William Stallings

2402 Object Oriented Methodology and Design Patterns

Basic Object Oriented Concepts

A review
Abstraction and Encapsulation, Inheritance
Multiple inheritance, polymorphism, overloading, overriding, container classes and STL
Object Oriented Programming languages—A review
Similarities and differences: Simula, Small talk, C++, Eiffel
Object libraries and Applications framework
Object Oriented Analysis, Methods of analysis with examples
Sharllor/ Meller, Coad/ Yourden, Rambaugh – OMT, Martin/Odell
Objectory and OOSE, OORASS
Desfray- class –relationship method
OSA
System Engineering Object Oriented
Texel
BON- Nerson
Fusion - Coleman
Other method
CASE tools and life cycle models
OMG abstract model
OOAD reference model
Object Oriented Design
The Notation: Elements of Notations
Class Diagram
State Transition Diagram
Object Diagram
Interaction Diagram
Module Diagram

Process Diagram
Object Oriented Design methods: GOOD

2403. Advanced Database Technologies

Database Warehousing

Introduction, evolution of data warehousing decision support systems; goals, benefit, and challenges of data warehousing; architecture; data warehouse information flows; software and hardware requirements; approaches to data warehouse design; creating and maintaining a data warehouse; multi-dimensional data, multi-dimensional modelling; view materialization; data marts; data warehouse metadata; data mining.

Data Mining

Extracting models and patterns from large databases, data mining techniques, classification, regression, clustering, summarization, dependency modelling, link analysis, sequencing analysis, mining scientific and business data.

Online Analytical Processing (OLAP)

2404. Managerial Economics

Economic analysis

Microeconomics and macroeconomics

Analysis of consumer behaviour

- Law of demand and supply
- Utility analysis/indifference curves
- Revealed preference theory
- Elasticity of demand
- Consumer surplus

The Firm

Theory of production

- Production function
- ISO product curves
- Cost analysis
- Optimum firm

Theory of product pricing

- Revenue concepts
- Equilibrium of the firm & industry under perfect

Competition, monopoly, monopolistic competition

Oligopoly & duopoly

Theory of Factory pricing

- Marginal productivity theory of distribution and

Modern theory

- Theories of rent, wages, interest & profit.

- Risk and uncertainly
- The economy
 - National income
- Concepts
 - Public finance
 - Public revenue, public expenditure and public debt
 - Deficit financing
- Savings - investments
- Applications of Harrod - Domar Model
- Open economy model
- International trade and balance of payments
- The financial system
- Money: Definition and uses, Demand and supply of money
- Commercial banking systems
- Money and capital markets, Development financial institutions, RBI and its monetary policy

References:

1. "Economics": Samuelson
2. "Micro Economic Theory: A Mathematical Approach": Henderson, Quandt
3. "Financial Institutions and Market - Structure, Growth and Innovation": Bhole

2405. Computer Oriented Quantitative Techniques

Statistical Methods:

Frequency distribution, measures of central tendency, measures of dispersion, linear correlation and regression, forecasting, Elementary probability theory, Bayes theorem, Some standard discrete and continuous distributions, Testing of statistical hypotheses and tests of significance, sampling distributions, non-parametric methods, Analysis of variance and covariance, Use of some relevant statistical packages

Optimization models :

Introduction to optimisation models, Assignment problem, transportation problems, Linear programming, Simplex method, sensitivity analysis, Use of relevant packages' Network analysis
PERT/CPM, resource and scheduling, network compression and cost consideration, use of relevant packages

Inventory model

The classical economic order quantity, Sensitivity analysis, Non-zero lead-time

Queuing model

General characteristics, Performance measure, Markovian queuing model, Non-Markovian queuing model

Simulation

Development and implementation of simulation modeling, Design of simulation model, some examples. Applications in financial management, NPV, IRR, hertz model

References:

1. "PERT and CPM Principles and Application": Srinath
2. "Operations Research": Kantiswaroop, Gupta
3. "Operations Research Methods and Problems": Sasieni, Yaspan Friedman
4. "Mathematical Methods in Operations Research": Wagner
5. "Operations Research": Sharma
6. "Operations Research": Taha
7. "Probability and statistical Inference": R.V.Hogg & E.A.Tanis, Macmillan, 1983

8. “Introductory Mathematical Statistics”: E.Kreyszig Wiley, 1970

SEMESTER V

2501. Information Technology Management

IT and the global business environment
Frameworks for thinking about business and IT
Delivering the information
IT for competitive advantage
Managing the development of an IT strategy
Analysing IT investment
The impact of IT on the organization
Implementing an IT strategy
The business manager’s role in development
Major trends in the management of business IT
Management concerns for the future

References:

1. “Information Technology The Management Challenge”: N. Caroline Daniels

2502. Distributed Computing

Concepts of distributed processing, networkable architectures, inter process and processor communication algorithms, process migration and porting techniques etc. Communication, Processes, Naming, Synchronization, Consistency and replication, Fault tolerance, Security, File systems.

References:

1. “Distributed Systems”: Andrew Tanenbaum

2503. Software Engineering and Project Management

Introduction to software engineering, Definition, need, software engineering methods, Tools, and procedures
Issues in software engineering: automation issues, technology change, costing of software projects, scheduling of software projects, programming team organisation, programmer productivity quality assurance
Software evolution, Concepts of product life cycle, development life cycle models: waterfall, spiral, iterative enhancement and phased development
Computer system engineering
Overview, various phases, analysis, design, development and implementation.
Software project planning, Overview, objectives, scope, resources, Cost Estimation Techniques
Metrics for software productivity and quality
Productivity metrics: direct and indirect methods, size and function oriented metrics
Decomposition techniques: LOC and FP estimation,
Effort Estimation: Overview, COCOMO, putnam, esterling models, automated Estimation tools
Software Project Scheduling
Task definition and parallelism, effort distribution, scheduling

Methods: PERT and CPM
 Software project plan outline
 Software prototyping, Overview, steps, methods, tools, specification, guidelines
 Requirement analysis methods: introduction, methods
 Object oriented, data flow and data structure oriented, comparisons, application results, automated tools
 Software design
 Methods: iterative, top-down, bottom-up
 Design representations: flow charts, pseudo code, HIPO and techniques
 Modular design: overview, module coupling and cohesion, various types of coupling, merits and demerits, other approaches to programming, PDF
 Software implementation: issues, concept of programming support environment
 Software testing Overview Various tests and methods: top-down, bottom-up, mixed regression
 Debugging: definition, techniques and strategies, exhaustive testing, classification, cyclomatic complexity
 Software reliability: reliability theory and maths: definition
 Software availability and repair: definition,
 Models of cumulative errors and error rate
 Reliability models: bug proportional (macro), MTTF, V-M, estimation of macro model constants
 S-W Models
 System integration: Overview, integration of hardware and software components
 Strategies software configuration management
 Management activity, planning, monitoring
 Controlling, resource management
 Product assurance: overview, quality assurance
 Software quality assurance, ISO 9002, CMM, 6 Sigma etc.
 Definition and techniques, criteria definitions for software quality, various types, trade-offs
 Configuration management: identification, control, auditing, status accounting, verification and validation, overview, definition, V and V life cycle, re-usability

References:

1. "Software Engineering Design, Reliability and Management": Shooman
2. "Software Engineering A Practitioner's Approach": Pressman
3. "Software Engineering Concepts": Fairley
4. "Software Metrics": Fenton
5. "Software Engineering - Risk Analysis and Management": Charette
6. "An integrated Approach to Software Engineering": Pankaj Jalote
7. "A Software Engineering Approach": Peter A. Darnell, Philip E. Margolis

2504. Elective I

2505. Elective II

The following are the proposed Electives

- Multimedia
- Component Technologies
- ERP
- Network Security
- Distributed Databases
- Artificial Intelligence and Expert Systems
- Introduction to Coding Theory and Cryptography
- Advanced Internet Programming

SEMESTER VI

2601. Seminar

Objectives:

To obtain expertise in a topic of interest to the students in Computer Science and Application, that must not have been a part of the curriculum.

To encourage independent study as well as to develop competence in giving lectures on specified topics.

2602. Project

Objective:

To give the first-hand experience of analysis, design, implementation and documentation of relevant projects.

Analysis of the existing system

Investigating alternatives

Design of a computer-based system

Documentation

User training