Department of Computer Science and Engineering  
National Institute of Technology, Hamirpur  
*Curriculum for Dual Degree Programme (B.Tech. and M.Tech.)*  
(July 2014 Onwards)

## FIRST YEAR

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*UG Courses

"PG Courses

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Hrs = 33

### Summary

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PG Electives

CS-700  Artificial Intelligence
CS-701  Formal Languages and Automata Theory
CS-702  Computer Vision and Image Processing
CS-703  Topics in Cloud Computing
CS-704  Cryptography and Computer Security
CS-705  CAD of Digital Systems
CS-706  Combinatorial Optimization
CS-707  Software Project & Quality Management
CS-708  Software Testing
CS-709  Graph Theory and Network Algorithms
CS-710  Real Time System Design
CS-711  Intrusion Detection System
CS-712  Information Theory and Coding
CS-713  Game Theory
CS-714  Bioinformatics
CS-715  Biometric Security
CS-716  Soft Computing
CS-717  Cluster and Grid Computing
CS-718  Embedded Systems
CS-719  Fault Tolerant Computing
CS-720  Parallel Algorithms
CS-721  Performance Evaluation of Computer System
CS-722  Speech and NLP
CS-723  Advances in Compiler Construction
CS-724  Formal Methods in Secure Computing
CS-730  Mobile Databases
CS-731  Multimedia Computing
CS-732  Data Mining
CS-733  Security in Wireless & Mobile System
CS-734  Distributed and Mobile Architecture
CS-735  Programming Mobile Devices
Matrices
Matrices, Related matrices, Complex matrices (Hermitian and skew-Hermitian matrices, Unitary matrix), Solution of linear system of equations, Rank of a matrix, Gauss-Jordan method, Normal form of a matrix, Vectors, Linear dependence, Consistency of a linear system of equations, Rouche’s theorem, System of linear homogeneous equations, Linear and orthogonal transformations, Characteristic equation, Eigen values, Eigen vectors, Properties of eigen values, Cayley-Hamilton theorem, Reduction to diagonal form, Quadratic form and their reduction to canonical form.

Infinite Series
Convergence and divergence of infinite series, Geometric series test, Positive term series, p-series test, [Comparison test, D’Alembert’s ratio test, Cauchy’s root test (Radical test), Integral test, Raabe’s test, Logarithmic test, Gauss’s test] (without proofs), Alternating series and Leibnitz’s rule, Power series, Radius and interval of convergence.

Differential Calculus
Indeterminate forms, Partial Differentiation and its geometrical interpretation, Homogeneous functions, Euler’s theorem and its extension, Total differentials, Composite function, Jacobian, Taylor’s and Maclaurin’s infinite series, Errors and increments, Introduction to limits and Indeterminate forms, Maxima and minima of functions of two variables, Method of undetermined multipliers. Curve tracing.

Integral Calculus
Quadrature, Rectification, Surface and Volume of revolution for simple curves, Double integrals and their applications, Change of order of integration, Change of variables, Triple integrals and their applications, Change of variables.

Vector Calculus
Differentiation of vectors, Curves in space, Velocity and acceleration, Relative velocity and acceleration, Scalar and vector point functions, Vector operator del, gradient, divergence and curl with their physical interpretations, Formulae involving gradient, divergence and curl. Line, surface and volume integrals, Theorems of Green, Stokes and Gauss (without proofs) and their verifications and applications, Irrotational and Solenoidal fields.

Text Books

Reference Books
Dielectric Solids

Polarization, polarizability, susceptibility, polar and nonpolar dielectrics, dispersion and absorption, electronic, ionic and orientational polarizabilities. Magnetism, para, dia and ferromagnetic solids, exchange interactions and antiferromagnetism, magnetic ordering, spin waves, applications in computer science.

Semiconductor Device Physics

Energy bands in solids, the E-k diagram, Density of states, Occupation probability, Fermi level and quasi Fermi levels, p-n junctions, Schottky junction and Ohmic contacts. Semiconductor optoelectronic materials, Bandgap modification, Heterostructures and Quantum Wells.

Lasers and fiber Optics

Concepts of maser and laser, spontaneous and stimulated emission, characteristics of laser light, three and four level laser system, coherence.; Ruby, He-Ne, CO2 and semiconductor lasers, applications of lasers in computer science.

Optical Fiber, physical structure and basic theory, modes in optical fibers, step index and graded index fibers, losses in optical fibers, applications of optical fibers.

Electrostatics and Electrodynamics

Gauss’s law in dielectric medium, Equation of continuity, displacement current, Maxwell’s equations, wave equation for electromagnetic radiation, electromagnetic wave propagation in free space and isotropic dielectric medium, Poynting theorem & Poynting vector.

Superconductivity

Introduction and discovery of superconductivity, superconducting materials, Meissner effect, critical magnetic field and critical current, type -I and type-II superconductors, Isotope effect, BCS theory of superconductivity, flux quantization, SQUIDS, applications of superconductivity

Text / References books:

2. Introduction to Solid State Physics, C. Kittel.
5. Modern Engineering Physics; A.s. Vasudeva, S. Chand & Co. Ltd.
7. Introduction to electrodynamics; David J Griffiths, Prentice Hall of India, New Delhi
Programming fundamentals

Introduction to computer, block diagram and organization of computer, number system and binary arithmetic, processing data, hardware, software, firmware, types of programming language-Machine language, Assembly level language, higher level language, source file, object file, translators-assembler, compiler, interpreter, translation of source code into object code, library files, linking, loading process and executable code, testing and debugging, software maintenance, hardware maintenance.

Programming Techniques

Steps in program development, algorithm, flowchart, pseudo code, evolution and classification of programming languages.

‘C’ as Structured programming language

‘C’ character set, literals, keywords, identifiers, data types and size, variable declaration, expression, labels, statements, formatted input output statements, types of operators, data type conversion, mixed mode arithmetic’s, control structures. ‘C’ functions, library functions, parameter passing, recursion, storage classes, scope rules and visibility, arrays: declaration, initialization and usage, pointers, dynamic storage allocation, structures and unions, self-referential structures. ‘C’ files, function for file handling, ‘C’ pre-processors and command line arguments, macros and conditional compiler directives.

Text and Reference Books

3. Herbert Schildt, “The complete Reference C”, TMH
CSD-114 COMPUTER WORKSHOP

Objectives:

PC Hardware: Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, Linux and the device drivers. Troubleshooting Hardware and software - some tips and tricks.

Internet & World Wide Web: Different ways of hooking the PC on to the internet from home and workplace and effectively usage of the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene (protecting the personal computer from getting infected with the viruses), worms and other cyber attacks.

Productivity tools: Crafting professional word documents; excel spreadsheets, power point presentations and personal web sites using the Microsoft suite of office tools and LaTeX.

PC Hardware

Identification of peripherals of a computer. To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. A practice on disassemble the components of a PC and assembling them to working condition. Installation of MS windows and LINUX on PC. Exposure to Basic commands and system administration in Linux including: Basic Linux commands in bash, Create hard and symbolic links.

Hardware Troubleshooting (Demonstration):

Students have to be given a PC which does not boot due to improper assembly or defective peripherals. Identifying problem and fixing it for getting to working condition.

Software Troubleshooting (Demonstration): Students have to be given a malfunctioning CPU due to system software problems.

Internet & World Wide Web

Orientation & Connectivity Boot Camp and surfing the Web using Web Browsers: Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email. Students customize their web browsers using bookmarks, search toolbars and pop up blockers.

Search Engines & Netiquette: Students should know what search engines are and how to use the search engines.

Cyber Hygiene (Demonstration): Awareness of various threats on the internet. To install an antivirus software and to configure their personal firewall and windows update on their computers.

Using LaTeX and Word to create project certificate. Features to be covered: Formatting Fonts in word, Drop Cap in word, Applying Text effects, Using Character Spacing, Borders and Colors, Inserting Header and Footer, Using Date and Time option in both LaTeX and Word.

References/Text Book:

1. HTML Programming, Freeman and Robson, Oreilly publications
2. Computer peripherals and interfacing, Jyotisnehi, Firewall Media
CSD-115 BASIC ELECTRONICS ENGINEERING

Semiconductors

Insulators, semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors, Charge Densities in Semiconductors, Mass action Law, Current Components in Semiconductors, The Continuity Equation, Injected minority Charge Carrier, Hall effect.

PN Junction Diode

Characteristic and analysis, Types of diodes – Zener diodes, Photodiodes, Light emitting diodes (LED’s), Varactor diodes and tunnel diodes. Rectifiers and filter circuit: Half wave, full wave and Bridge rectifier circuits and their analysis, L, C and Pi filters, Basic regulator supply using zener diode, Clipping and clamping circuits.

Transistors


Field Effect Transistor

Construction and characteristics of JFET, JFET biasing circuit, JFET amplifier, MOSFET construction and characteristics.

Amplifiers And Oscillators

Classification of amplifiers, concept of feedback, general characteristics of feedback amplifiers, Single stage RC coupled amplifier. Oscillators – Criterion for Oscillation, type of oscillators: Hartley oscillator, Colpitt Oscillator, RC Phase shift oscillator, Crystal oscillator.

Operational Amplifiers:

Introduction to Op-amp, Inverting and non-inverting configuration, Applications – adder, subtractor, integrator, differentiator.

Text Books
1. Integrated devices & Circuits by Millman & Halkias.
2. Electronics Devices and Circuit Theory by R. Boylestad.

Reference Books
2. Electronics Devices and Circuit by G.K. Mithal.
CSH-116 ENGINEERING ECONOMICS AND MANAGEMENT

Basic Economics Concept

Stock and flow, static and dynamic economics. Micro economics and macro economics, National Income concept.

Market Demand

Demand, meaning and types, law of demands, exception to the law of demand, Elasticity of demand, Method of measuring elasticity of demand, marginal utility analysis.

Production Analysis

Production function, law of returns, least cost combinations, cost and cost curves. Choice of plant size in the long run, law of supply, elasticity of supply.

Cost Concepts and Estimation

Cost element, economics vs accounting concept of cost and revenues, standard cost, Actual cost, overhead cost, cost control, Break-Even Analysis.

Economic Appraisal Techniques

Long range and Short range budgeting, Industrial securities, criteria for project appraisal, social benefit-cost analysis, Deputation concept and techniques.

Monetary System

Money and its function, function of the commercial bank and central bank, monetary policy.

Inflation and Business Cycles

Causes, Effects and method of control Inflation. Concept of business cycles.

Introduction To International Economics

Classification theory and modern theory of international trade, meaning of foreign exchange, equilibrium rate of exchange, purchasing power parity theory, impact of globalization of Indian Economy.

Text Books/References:

2. Modern Economic Theory: by Sampat Mukherjee, New Age International Publisher
Fourier Series

Euler’s formula, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of
interval, Odd and even periodic functions, Expansion of odd and even periodic functions, Half-range series,
Typical wave-forms, Parseval’s formula, Practical harmonic analysis.

Ordinary Differential Equations

Brief review of first order ordinary differential equations, Exact equations, Equations reducible to exact
equations, Equations of the first order and higher degree, Clairaut’s equation, Applications of differential
equations of first order (Orthogonal trajectories). Linear differential equations with constant co-efficients,
Complimentary functions and particular integral, Method of variation of parameters, Equations reducible to linear
equations with constant co-efficients (Cauchy’s and Legendre’s linear equations), Simultaneous linear equations
with constant co-efficients, Applications of linear differential equations in engineering.

Complex Numbers

Applications of De Moivre’s theorem, Exponential, Circular, Hyperbolic and Logarithmic functions of a
complex variable, Inverse Hyperbolic functions, Real and imaginary parts of Circular and Hyperbolic functions,
Summation of the series-‘C+iS’ method.

Functions Of Complex Variable

Limit and derivative of complex functions, Cauchy-Riemann equations, Analytic functions and its
applications, Geometrical representation of complex function, Conformal mapping and standard transformations,
Complex integration, Cauchy’s theorem, Cauchy’s integral formula, Series of complex terms, Taylor’s and
Laurent’s series, Cauchy’s residue theorem and its application for the evaluation of real definite integrals.

Integral Transforms

Laplace Transforms of standard functions and their properties, Inverse Laplace Transforms, General
Properties of inverse Laplace transforms and Convolution Theorem, Laplace Transforms of periodic functions,
Bessel functions, Error function, Dirac-delta Function, Heaviside’s Unit Function, Applications to linear
simultaneous differential equations.

Text Books


Reference Books

Polymers
Introduction, classification, tacticity, types of polymerization, coordination polymerization, mechanisms of polymerization, synthesis and applications of some important polymers Effect of polymer structure on properties, Moulding of plastics into articles, Conducting polymers: preparation, types, properties and applications.

Science of Composite Materials
Introduction, Classification, constituents of composites, Fiber reinforced composites, unidirectional fibre reinforced composites, short fibre reinforced composites, particle reinforced composites, important types and failures of fiber reinforced composites, Advantages and applications of composites.

Characterization Techniques
Introduction to spectroscopy; UV-Visible spectroscopy- Absorption laws, Instrumentation, formation of absorption bands, Theory of electronic spectroscopy, Chromophore and auxochrome concept, fluorescence & phosphorescence, application of UV-Visible spectroscopy ; IR spectroscopy- Principle, theory of molecular vibrations, selection rules, spectral features of some classes of compounds, important features of IR spectroscopy and applications; NMR- Principle, relaxation processes, Instrumentation, shielding-desheilding effects, spin-spin coupling, coupling constant, applications of NMR; MS spectroscopy- Basic principle, Instrumentation, determination of molecular formulae, important features of mass spectroscopy; Chromatography- Introduction, types, gas chromatography ; thermal method- instrumentation, fundamental principles and applications of TGA, DTA and DSC.

Nanochemistry
Introduction to nanochemistry, synthesis, characteristics and applications of carbon nanostructures fullerenes, carbon nano tubes and graphene.

Fuels and Non-Conventional Energy Sources
Introduction, classification, solid, liquid and gas fuel; Nuclear energy- Breeder reactor and light water nuclear reactor for power generation (Block diagram only),solar energy conservation and solar cells; Fuel Cells-Introduction, types and their characteristics, alternate fuels.

Corrosion and Its Control
Introduction, Types of corrosion – chemical and electrochemical, Mechanisms of corrosion, factors affecting corrosion and different protection techniques for corrosion control.

Lubricants
Introduction, Mechanisms of lubrication, Types and selection of lubricants, synthetic lubricants, properties and different methods for testing of lubricating oils and greases. Books recommended.

Text Books:
2. Engineering Chemistry: by P C Jain & Monika Jain
3. A Text Book of Engineering Chemistry: by Shashi Chawla

Reference Books:
1. Fundamental of organic spectroscopy by Y. R. Sharma
2. Introduction to spectroscopy by Pavia, Lampman, Kriz.
4. Introduction to nanotechnology by C. P. Poole Jr. and F.J. Owens
5. Principles of polymerization by George Odian
The Process Of Communication
Introduction. What is communication? Barriers to communication. Different types of communication. Written vs. oral communication. Different types of face-to-face interactions, characteristics and conventions of conversation, conversational problems of second foreign language users, difference between conversation and other speech events.

Telephone Techniques
Speaking and listening, commonly used phrases in telephone conversations, reading: conference calls, vocabulary, writing and listening, leaving a message, grammar and usage: the perfect tense, pronunciation: contracted forms.

Job Applications And Interviews
Reading, vocabulary, apply for a job, curriculum vitae, language focus: some useful words, study skills: preparing for an interview, listening, speaking, writing.

Group Discussions:
Reading, writing skills, listening: how to be successful in a group discussion, study skills, language facts, vocabulary, speaking, grammar: connectives, pronunciation

Managing Organisational Structure
Warm up, value to influence and lead, reading: the role of a manager, vocabulary: leadership. Speaking and listening, language focus, degree of probability Grammar: modals, writing, reports, pronunciation.

Meetings
Reading: a successful meeting, speaking: one to one meetings, language focus: opening, middle and close, study skills, editing, listening, criteria for successful meetings, vocabulary, grammar: reporting verbs, writing: memos, pronunciation: stress according to part of speech.

Taking Notes And Preparing Minutes
Taking notes, the note-taking skill: the essential components, the note-taking skill: an example preparing minutes, format of minutes, language and style of minutes, grammar: using the passive voice.

Presentation Skills
Reading, presentation skills, grammar: verbs often required in presentations, language focus, listening: importance of body language in presentations, speaking: preparing an outline of a presentation, pronunciation.

Presentation Skills-II
Reading: structure of presentation, study skills: visual aids, ending the presentation, language focus: taking about increase and decrease grammar: prepositions. Listening: podium panic, speaking, pronunciation: emphasizing the important words in context.

Negotiation Skills
Language focus, idiomatic expressions, study skills: process of negotiations, grammar: phrasal verbs, listening: effective negotiations, speaking, writing.

Reference books:
2. Developing communication skills by krishna mohan Pub: Mac Millan India Limited (2009)
5. The skills of communicating by bill scott. Pub: jaico publishing house, mumbai (2009)
CSD-124 BASIC ELECTRICAL ENGINEERING

Electric Circuits

Introduction to linear and non linear circuits, circuit elements, various sources and source transformation, star delta transformation, solution of D.C. circuits using Kirchoff's laws, signal wave forms and passive elements specifications, basic theorems, generation of A.C. sinusoidal voltage and currents, average and r.m.s. values, Form factor and peak factor, phasor representation, phasor in polar, rectangular and exponential forms, terminal relationship for pure passive elements and their combination in series and parallel.


Electromagnetic and Transformer

Magnetic circuit concept, B-H curves characteristics of magnetic materials, practical magnetic circuits, magnetic circuits with D.C. and A.C. excitation, hysteresis and eddy current losses.

Magnetic force, self and mutual inductances, Faraday’s laws, Lenz’s Law, statically and dynamically induced EMFs, energy stored in magnetic fields. Principle of Transformer operation, construction & equivalent circuit of transformer.

Measuring Instruments

Introduction to galvanometer (Moving coil and moving iron), ammeter, voltmeter, wattmeter, energy meter, use of shunt and multiplier.

Electrical Machines

Fundamentals of D.C. and A.C. machines.

Books/References:

CSD-127 ENGINEERING GRAPHICS

Basic Concepts

Sheet layout, Border Lines, Title Block, Introduction to drawing instruments and use of instruments, Types of line and their uses, Technical lettering as per BIS codes.

Basic Elements

Significance and scope of drawing, Methods of Dimensioning, Different types of projections and their uses. Basic definition of geometrical objects: solids, lines, points and planes.

Projections of Points

Projections of points in different quadrant, Projection of point on auxiliary planes.

Projections of Lines

Projections of lines in different quadrant, Parallel to both H P and V P, Parallel to one and inclined to other, and inclined to both, contained in profile plane, Shortest distance, intersecting lines.

Projection of Planes

Types of planes (perpendicular to both the reference planes, perpendicular to one plane and parallel to other plane, perpendicular to one plane and inclined to the other plane), Projection of planes parallel to one of the reference of plane (when the plane is parallel to H.P, when the plane is parallel to V.P), projection of plane inclined to one reference plane and perpendicular to other.

Orthographic Projections

Review of principle of Orthographic Projection, Sketch/drawing of blocks, and of simple machine parts.

Books/References:

5. Engineering Drawing by Basant aggarwal and B.C Rana
CSS-210 PROBABILITY AND QUEUING MODEL

Probability and Random Variable


Standard Distributions

Binomial, poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties- Function of a random variable. Probability density function and its properties

Two Dimensional Random Variables

Joint distributions – Marginal and conditional distribution – Covariance – Correlation and regression – Transformation of random variables- Central limit theorem.

Random Processes And Markov Chains


Queueing Theory

Markovian models – M /M/1, M/M/C, finite and infinite capacity- M/M/8 queues – Finite source model – M/G/1 queue (steady state solution only) – Pollaczek – Khintchine formula- Special cases.

Text Books


References

CSD-211 DISCRETE STRUCTURE

Introduction to Preliminaries and Predicate Calculus

Basic concepts of discrete mathematics and related problems, propositions and predicates, disjunction and conjunction, tautologies and contradiction, laws of equivalence, rules of substitution and transitivity, normal forms.

Set Theory and Functions

Basic concepts, Venn Diagrams, set operations, power set, methods of proof for sets, Relations and ordering. Types of relations, Graph and matrix of a relation, properties of a relation, Functions: definitions and notation, one to one, onto, one to one and onto, composition, identity and inverse, related results.

Graph Theory

Basic concepts of graph theory, multigraphs and weighted graphs, walk path and circuits, Warshall’s algorithm: shortest path, Eulerian paths and circuits, Hamiltonian paths and circuits, factors of a graph and planar graphs, Graph colorings.

Binary Trees

Introduction, complete and extended binary tree, traversing binary tree, binary search tree, Heaps, Huffman’s algorithm.

Basics of Structures

Mathematical induction, Algebraic structures properties, Semi group, Monoid, Group and Sub group - examples and standard results, generators and evaluation of powers, cosets and Langranges's theorem, rings, integral domains, fields.

Logic and Recursion

Propositional calculus - propositions, logical operators, truth tables, Lattice, propositions generated by a set of recurrence relations – partial and total recursion - problems.

Text and Reference Books
4. Roman, Steven. An Introduction to Discrete Mathematics, Saunders, NY.
7. Dossey, John A. et al, Discrete Mathematics, Addison-Wesley,
CSD-212 OBJECT ORIENTED PARADIGM

Concepts of Object-Oriented Programming
Oriented Programming Paradigm, Basic concepts of OOP’s, Benefits of OOPS, Introduction to object oriented design and development, Design steps, Design example, Object oriented languages, Comparison of structured and object-oriented programming languages.

Arrays, Pointers and Functions
Arrays, Storage of arrays in memory, Initializing Arrays, Multi-Dimensional Arrays, Pointers, accessing array elements through pointers, Passing pointers as function arguments, Arrays of pointers, Pointers to pointers, Functions, Arguments, Inline functions, Function Overloading Polymorphism.

Classes and Objects
Data types, operators, expressions, control structures, arrays, strings, Classes and objects, access specifiers, constructors, destructors, operator overloading, type conversion.

Storage classes
Fixed vs Automatic declaration, Scope, Global variables, register specifier, Dynamic memory allocation.

Inheritance
Inheritance, single Inheritance, Multiple Inheritance, Multi level inheritance, hierarchical inheritance, hybrid inheritance, Virtual functions.

Streams and Files
Opening and closing a file, File pointers and their manipulations, Sequential Input and output operations, multi-file programs, Random Access, command line argument, string class, Date class, Array class, List class, Queue class, User defined class, Generic Class.

Exception Handling and Graphics
List of exceptions, catching exception, handling exception. Text Mode, Graphics mode functions, Rectangles, and Lines, Polygons & Inheritance, Sound & Motion, Text in Graphics Mode.

Standard Template Library

Text and Reference Books
3. Bjarne Strustrup, “The C++ programming Language”, Addison Wesley,
CSD-213 COMPUTER GRAPHICS

Introduction to Computer Graphics


Raster Scan Graphics


Two-Dimensional Geometric Transformation & Viewing

Basic Transformation, Translation, Rotation, Scaling, Other Transformation Reflection, Shear, Transformation functions, Window to viewport co-ordinate transformation, Clipping Operations, Point Clipping, Line Clipping, Polygon Clipping.

Three-Dimensional Concepts & Object Representations

Three Dimensional Display Methods, Parallel Projection, Perspective Projection, Translation, Rotation, Scaling, Composite Transformation, Three dimensional Transformation function, Polygon Surfaces, Curved Lines and surfaces, Bezier Curves and surfaces, B-Spline Curves and surfaces.

Graphics hardware

Display technology, random scan, raster scan display processing, input devices for interaction.

Visible Lines and Visible Surfaces

Visual Realism, Hidden line and hidden surface removal: depth buffer algorithm, geometric computations, scan line coherence algorithms, area coherence algorithms, priority algorithm, shading and color models, Modeling methods.

Rendering


Text and Reference Books

CSD-214 MICROPROCESSOR AND INTERFACING

Introduction to Microprocessor

History and Evolution, types of microprocessors, 8085 Microprocessor, Architecture, Bus Organization, Registers, ALU, Control section, Instruction set of 8085, Instruction format, Addressing modes, Types of Instructions.

Assembly Language Programming and Timing Diagram

Assembly language programming in 8085, Macros, Labels and Directives, Microprocessor timings, Microinstructions, Instruction cycle, Machine cycles, T states, State transition diagrams, Timing diagram for different machine cycles.

Serial I/O, Interrupts and Comparison of Contemporary Microprocessors

Serial I/O using SID, SOD. Interrupts in 8085, RST instructions, Issues in implementing interrupts, Multiple interrupts and priorities, Daisy chaining, Interrupt handling in 8085, Enabling, disabling and masking of interrupts. Brief comparison of contemporary 8-bit microprocessors like Z-80, M68000 with 8085.

Data Transfer techniques

Data transfer techniques, Programmed data transfer, Parallel data transfer using 8155. Programmable parallel ports and handshake input/output, Asynchronous and Synchronous data transfer using 8251A. Programmable interrupt controller 8259A. DMA transfer, cycle stealing and burst mode of DMA, 8257 DMA controller.

Microprocessor Interfacing Techniques

Interfacing memory and I/O devices, Addressing memory, interfacing static RAMs, Interfacing and refreshing dynamic RAMs, Interfacing a keyboard, Interfacing LED and seven segment displays, interfacing a printer, Interfacing A/D converters, D/A converters.

Architecture of 8086

Memory Address space and data organization, segment registers and memory segmentation, Generating memory addresses, IO address space, addressing modes, Comparison of 8086 and 8088, minimum mode maximum mode, system timing, introduction to Pentium and further series of microprocessors.

Text and Reference Books
2. R.S. Gaonkar, “Microprocessor Architecture, Programming and applications with the 8085/8080A”, Wiley Eastern Ltd.
CSD-215 DIGITAL ELECTRONICS & LOGIC DESIGN

Number System & Codes

Binary, Octal, Hexadecimal number systems and their inter-conversion, Binary Arithmetic (Addition, Subtraction, Multiplication and Division), Diminished radix and radix compliments, BCD codes, 8421 code, Excess-3 code, Gray code, error detection and correction, Hamming code.

Logic Gates, Boolean Algebra & Logic Families

Axiomatic definition of Boolean Algebra, Basic Theorems and properties of Boolean Algebra, Boolean Functions, Canonical and Standard forms, Digital Logic Gates. Various Logic Families like TTL and ECL etc., working and their characteristics, MOS and CMOS devices.

Combinational Logic Design


MsiAndPld Components

Binary adder and subtractor, Multiplexers, Decoders / Demultiplexers, Read Only Memory, Programmable Logic Arrays, Programmable Array Logic. Implementation of Combinatorial Logic using these devices.

Introduction to Sequential Logic

Introduction, S-R Flip-flops, JK flip-flop, D flip-flop, T flip-flop, master slave flip-flop. Flip-flop excitation table, Classification of sequential circuits, Registers and A to D and D to A converter circuits, design & analysis of synchronous and asynchronous sequential circuits: Counters, Sequence Detector and Sequence Generator.

Semiconductor Memories

Introduction, Memory organisation, Classification and characteristics of memories, Sequential memories, ROMs, R/W memories. Content addressable memories, Programmable logic arrays, Charged-Coupled device memory.

Books Suggested:

2. Thomas Downs and Mark F Schulz, Logic Design with Pascal, Van Nostrand Reinhold.
3. Digital principle and applications Malvino and Leach- (TMH)
4. Modern digital systems design Cheung (WPC)
CSD-221 COMPUTER ORGANIZATION

General System Architecture

Stored Program control concept (Von-Newman architecture principle), Flynn's Classification of computers (SIMD, MISP, MIMD), Structure organization (CPU, Caches, Main memory, Secondary memory unit & I/O), Register Transfer Operation, Micro-operation, Instruction Set Architecture (Instruction set based classification of processor i.e. RISC, CISC, RISC vs CISC Comparison), Addressing Modes, Operation instruction set (Arithmetic & logical, Data transfer, Control flow), Instruction set format.

Processor Design

Arithmetic & logic unit, Stack organization, CPU Architecture types, Accumulator Based- Register, Stack-Memory, Register, Detailed data path of a typical register based CPU, Fetch, Decode, and Execute Cycle.

Computer Arithmetic

Addition & Subtraction, Multiplication Algorithms (Booth’s Multiplication Algorithm), Division Algorithm, Floating point arithmetic operations.

Control Design

Microprogrammed & Hard-wired control options, Hard-wired design methods, State table method, Multiplier control, CPU control unit. Microprogrammed, Basic concepts, control Memory, Address Sequencing.

I/O Organization & Memory Hierarchy

Programmed, Interrupt driven & Direct Memory Access, Synchronous & synchronous data transfer, The need for Memory Hierarchy, locality of reference principle, Memory Hierarchy, cache, main & secondary, Memory parameters, access cycle time, cost per unit.

Introduction to Parallelism

Goals of parallelism, Instruction level parallelism, pipelining, superscaling, Processor level parallelism, Multiprocessor system overview.

Text and Reference Books

CSD-222 OPERATING SYSTEM

Evolution of operating systems

Evolution of operating systems, Types of operating systems. The process concept, system programmer's view of processes, operating system's views of processes, operating system services for process management.

CPU Scheduling

Scheduling concepts, scheduling algorithms, algorithm evaluation, multiple processor scheduling, real time scheduling.

Concurrent programming and Deadlocks


Memory management

Memory Management, Contiguous allocation, static-swapping, overlays, dynamic partitioned memory allocation, demand paging, page replacement, segmentation, Non-contiguous allocation, paging, Hardware support, Virtual Memory.

File systems

A Simple file system, General model of a file system, Symbolic file system, Access control verification, Logical file system, Physical file system, Allocation strategy module, Device strategy module, I/O initiators, Device handlers, Disk scheduling.

Networks, Security and Design Principles

Network operating system, distributed operating system, external security, operational security, password protection, access control, security kernels, hardware security, layered approach, design principle.

Text and Reference Books

5. A.S. Tanenbaum, “Modern Operating system”, PHI
CSD-23 DATA STRUCTURE

Introduction

Data types, data structures, abstract data types, the running time of a program, the running time and storage cost of algorithms, complexity, asymptotic complexity, big O notation, obtaining the complexity of an algorithm.

Development of Algorithms

Notations and Analysis, Storage structures for arrays - sparse matrices - structures and arrays of structures, Stacks and Queues: Representations, implementations and applications.

Linked Lists

Singly linked lists, Linked stacks and queues, operations on Polynomials, Doubly Linked Lists, Circularly Linked Lists, Operations on linked lists- Insertion, deletion and traversal, dynamic storage management – Garbage collection and compaction.

Trees

Basic terminology, General Trees, Binary Trees, Tree Traversing: in-order, pre-order and post-order traversal, building a binary search tree, Operations on Binary Trees - Expression Manipulations - Symbol Table construction, Height Balanced Trees(AVL), B-trees, B+ -trees.

Graphs

Basic definitions, representations of directed and undirected graphs, the single-source shortest path problem, the all-pair shortest path problem, traversals of directed and undirected graphs, directed acyclic graphs, strong components, minimum cost spanning tress, articulation points and biconnected components, graph matching.

Sorting and Searching Techniques

Bubble sorting, Insertion sort, Selection sort, Shell sort, Merge sort, Heap and Heap sort, Quick sort, Radix sort and Bucket sort, Address calculation, Sequential searching, Binary Searching, Index searching, Hash table methods.

Text and Reference Books

CSD-224 SYSTEM SOFTWARE

System Software


Machine Language and Microprocessor

Defining and Usage of Macro Expression, Macro Definition Language: Macro generation, Positional Parameters and Keyword parameters, Conditional Macro expansion, Macro Calls within Macros and its implementation, Macro Instructions Defining Macros, One-Pass Macro Processor.

Assembler


Loaders


System Software Tools

Elements of System software Tools, Text Editor: Line and Stream Editor, Screen Editor, Structure Editor, Word Processor, Editor Structure, Debug Monitor, Programming Environment, DOS functions, Keyboard Management, Screen Management, Window or Display management, Text or Graphics, Overlayed or Tiled, Transcription and Image Buffer process per Window, Multi Tasking Window System, Machine and Assembly language Programming Interface. Device Driver Programming

Virus
Classification of Virus, Virus Detection and Control System, Virus in other environment, case studies.

Text and Reference Books
CSD-225 THEORY OF COMPUTATION

Machines

Basic machine, FSM, Transition graph, Transition matrix, Deterministic and non-deterministic FSM'S, Equivalence of DFA and NDFA, Mealy & Moore machines, minimization of finite automata, Two-way finite automata.

Regular Sets and Regular Grammars

Alphabet, words, Operations, Regular sets, Finite automata and regular expression, Pumping lemma and regular sets, Application of pumping lemma, closure properties of regular sets.

Formal Grammars & Languages

Basic definitions and examples of languages, Chomsky hierarchy, Regular grammars, context free & context sensitive grammars, context free languages, non-context free languages, Chomsky normal forms, binary operations on languages.

Turing Machines & Pushdown Automata

TM model, representation and languages acceptability of TM Design of TM, Universal TM & Other modification, composite & iterated TM, Pushdown automata, Acceptance by PDA.

Computability

Basic concepts, primitive & partial recursive function, Recursive function, Decidability, Kleen’s theorem.

Undecidibility

Properties of recursive & recursively enumerable languages, Universal Turing machine and undecidable problem, Rice’s theorem & some more undecidable problems.

Computational Complexity Theory

Definition, linear speed-up, tape compression & reduction in number of tapes, Hierarchy Theorem, Relation among complexity measures, Transition lemmas & non deterministic hierarchies, properties of general complexity measures, the gap, speed-up, union theorem, Automatic complexity theorem.

Text and Reference Books

Environmental Management, Resources and Legislation

Environmental disturbances, quantification of environmental issues, soil resources and their classification, equitable use of resources, natural resource management, food chain and trophic levels, environmental impacts of energy development, legislation.

Global Atmospheric Change

The atmosphere of earth, global temperature, greenhouse effect, radiative forcing of climate change, global warming potential, carbon cycle, carbon emissions from fossil fuels, regional impacts of temperature change, global initiatives

Physical, Chemical and Biological Processes

Particle dispersion, methods of expressing particle concentrations, stoichiometry, chemical equilibria, solubility of gases in water, carbonate system, organic chemistry, nuclear chemistry, nuclear fission and fusion, basic atmospheric properties, fundamentals of microbiology.

Population and Economic Growth

The nature of human population growth, population parameters, industrialisation, urbanisation, sustainable development, sustainable consumption, resettlement and rehabilitation issues, health and the environmental impacts.

Solid and Hazardous Waste Management


Pollution and Monitoring

Water resources, characteristics of water, water pollutants, oxygen demanding wastes, surface water quality, groundwater quality, water and wastewater treatment systems. Air quality standards, emission standards, criteria pollutants, air pollution and meteorology, atmospheric dispersion, emission controls. Effect of noise on people, rating systems, community noise sources and criteria, traffic noise prediction, noise control.

References:
CSD-311 MODELING AND SIMULATION

Fundamentals

Definition and reasons for simulation, Continuous (time-oriented) and discrete (event) systems, Modeling/programming simple deterministic systems, Rates and system dynamics.

Concepts in Simulation

Stochastic variables; discrete vs continuous probability, Monte Carlo Simulations; Monte Carlo methods, Normally distributed random numbers, Monte Carlo V/S Stochastic Simulations.

Queuing Models

Single server queuing system, introduction to arrival and departure time, flowcharts for arrival and departure routine. Event graphs of queuing model. Determining the events and variables, Event graphs for inventory model.


Discrete Event System Simulation

Discrete events; representation of time; queues and servers; generation of arrival patterns; resource seizing; departures simulation of a telephone system and computer networks; simulating components of an operating system; delayed calls; modeling policies; priority queues; tasks; gathering statistics; counters and summary statistics; measuring utilization and occupancy; recording distributions and transit times.

Introduction to a Simulation Languages

Simulation in C++, GPSS/ MATLAB/Network Simulators.

Text and Reference Books

CSD-312 ANALYSIS & DESIGN OF ALGORITHMS

Algorithms Introduction

Algorithm Design paradigms- motivation, concept of algorithmic efficiency, run time analysis of algorithms, Asymptotic Notations.

Divide and Conquer approach

Structure of divide-and-conquer algorithms: sets and disjoint sets: Union and Find algorithms, quick sort, Finding the maximum and minimum, Quick Sort, Merge sort, Heap and heap sort.

Greedy Algorithms

Optimal storage on tapes, Knapsack problem, Job sequencing with deadlines, Minimum Spanning trees: Prim’s algorithm & Kruskal’s algorithm, Huffman codes.

Graph Algorithms

Representation of graphs, BFS, DFS, Topological sort, strongly connected components; single source shortest paths: Bellman-Ford algorithm, Dijkstra’s algorithm; All pairs shortest path: The Warshall’s algorithm.

Dynamic programming

Overview, difference between dynamic programming and divide and conquer, Matrix chain multiplication, Traveling salesman Problem, longest Common sequence, 0/1 knapsack.

Backtracking

8-Queen Problem, Sum of subsets, graph coloring, Hamiltonian cycles.

Branch and bound

LC searching Bounding, FIFO branch and bound, LC branch and bound application: 0/1 Knapsack problem, Traveling Salesman Problem.

Computational Complexity

Complexity measures, Polynomial Vs nonpolynomial time complexity; NP-hard and NP-complete classes, examples.

Text and Reference Books

Basic Concepts

Introduction to File and Database systems- Database system structure – concepts and architecture, date models, schemas & instances, DBMS architecture & data independence, database languages & interfaces, Data Model, ER model.

Relational Models

SQL – Data definition- Queries in SQL-relational model concepts, relational model constraints, relational algebra, SQL- a relational database language: date definition in SQL, view and queries in SQL, specifying constraints and indexes in SQL; relational database management systems-Updates, Views, Integrity and Security, Relational Database design, Functional dependences and Normalization for Relational Databases, normal forms based on primary keys, (1NF, 2NF, 3NF & BCNF), lossless join and dependency preserving decomposition, converting ER-diagrams into relations.

Data Storage and query Processing

Record storage and Primary file organization- Secondary storage Devices, Operations on Files, Heap File, Sorted Files, Hashing Techniques, Index Structure for files, Different types of Indexes- B-Tree - B+Tree, Query Processing.

Transaction Management

Transaction Processing, Need for Concurrency control, Desirable properties of Transaction, Schedule and Recoverability, Serializability and Schedules; Concurrency Control, Types of Locks, Two Phases locking, Deadlock, Time stamp based concurrency control , Recovery Techniques, Concepts- Immediate Update- Deferred Update, Shadow Paging.

Current Trends

Introduction to Distributed and parallel databases, Deductive Databases, Multimedia Databases, Real-Time Databases.

Text and Reference Books

Introduction to Compilers

Compiler and translators need of translators, structure of a compiler, lexical analysis, syntax Analysis.

Basic Parsing Techniques

Parsers, shift-reduce parsing, predictive parsing.

Automatic Construction of Efficient Parsers

LR parsers, canonical collection of LR(0) items, construction canonical LR parsing tables, construction LALR and SLR parsing tables using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables, construction LALR sets of items.

Syntax-Directed Translation

Syntax directed translation schemes, implementation of syntax directed translation, intermediate code, postfix notation parse trees and syntax trees, three address code, quadruples and triples, translation of assignment statements, postfix translation with top down parser.

Symbol Tables

Contents of a table, data structures for symbol tables, representing scope information.

Error detection and recovery

Errors, lexical-phase errors, syntax-phase errors, semantic errors.

Introduction to Code optimization

The principal source of optimization, loop optimization, DAG representation of basic blocks, value numbers and algebraic laws, global data flow analysis.

Code Generation

Object programs, problems in code generation, machine model, simple code generator, register allocation and assignment, code generation from DAG’s, peephole optimization.

Text and Reference Books

2. Allen I. Holub “Compiler Design in C”, Prentice Hall of India
3. C. N. Fischer and R. J. LeBlanc, “Crafting a compiler with C”, Benjamin Cummings
5. Henk Alblas and Albert Nymeyer, “Practice and Principles of Compiler Building with C”, PHI
Introduction to Communications Systems

Communication process, sources of information, communication channels, base band and pass band signals, representation of signals and systems, switched communication systems.

Continuous-wave Modulation

Amplitude modulation (AM), frequency spectrum of the AM wave, representation of AM, power relations in the AM wave, AM detector, vestigial side-band modulation.

Angle Modulation

Frequency spectrum of Frequency Modulation (FM) and Phase Modulation, generation of FM (direct and indirect method), demodulation of FM signal.

Radio receiver

Tuned Radio-Frequency (TRF) receiver, Super heterodyne receiver.

Pulse Modulation

Sampling process, Pulse Amplitude Modulation (PAM), Time Division Multiplexing (TDM), Frequency Division Multiplexing (FDM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM).

Digital Modulation Techniques

Quantization process, Pulse Code Modulation (PCM), Differential Pulse Code Modulation (DPCM), Delta Modulation (DM), Adaptive Delta Modulation, Amplitude – Shift Keying (ASK), Frequency-Shift Keying (FSK), Phase-Shift Keying (PSK), QPSK.

Advanced Communication

Satellite communications, Earth station, CDMA.

Text and Reference Books
1. Electronic Communication Systems: George Kennedy
2. Communication Systems: Simon Haykin
3. An Introduction to Analog and Digital Communications: Haykin
5. Principles of Communication Engineering: Anokh Singh
CSD-320 COMPUTER NETWORKS

Introductory Concepts


Physical Layer

Fourier Analysis, Maximum data rate of a channel, Transmission media, Wireless transmission, Narrowband ISDN, Broadband ISDN and ATM, Virtual circuits, Circuit switching, Communication satellite.

Data Link Layer

Data link layer design issues, services provided to network layers, Framing, Error control, Flow control, Error detection and correction, Elementary data link protocols, An unrestricted Simplex protocol, A Simplex Stop-and-Wait protocol, Simplex Protocol for a noisy channel, Sliding Window protocols, A one-bit Sliding protocol, A protocol using go-back-N, A protocol using selective repeat, Protocol specification and verification, Example data link protocol-HDLC, PPP and SLIP.

Medium Access Sublayer

Channel Allocations, Static and dynamic allocation in LAN and MAN, Multiple Access protocols, ALOHA, Carrier Sense multiple access protocols, WDMA protocols, Wireless protocols, Collision free protocols, Limited contention protocols, IEEE standard 802.3 and Ethernet, IEEE standard 802.4, Token bus IEEE standard 802.5, Token Ring, Distributed Queue Dual bus, Logical link control, bridges, High speed LAN, Satellite networks.

Network Layer


Transport Layer

Transport services, Design issues, elements of transport protocols, simple transport protocols, Connection management, TCP, UDP.

Session, Presentation and Application Layer


Text and Reference Books

Introduction
   Problem domain, software engineering challenges, software engineering approach.

Software Processes
   Software process, characteristics of software process, software development process models, other processes.

Software Requirements analysis and specification
   Software requirements, problem analysis, requirements specification, functional specification with use cases, validation, matrices.

Software Architecture
   Role of software architect, architecture views, component and connector view, architecture style for C & C view, discussion and evaluating architectures.

Planning a software project
   Effort estimation, project scheduling and staffing, software configuration management plan, quality assurance plan, risk management, project monitoring plan.

Function oriented design
   Design principles, module level concepts, design notation and specification, structured design methodology, verification, metrics.

Object oriented design
   OO concepts, design concept, Unified Modeling Language, design methodology, metrics.

Detailed Design, Software Measurements, metrics and Models
   Detailed design and PDL, verification, Metrics and their scope, Qualities of a good Software metrics, classification of metrics, Cost estimation models COCOMO, Quality attributes, SQA, Quality Standards, ISO 9000 and CMM.

Coding
   Programming principles and guidelines, coding process, refactoring, verification, metrics.

Testing
   Testing fundamentals, black-box testing, white-box testing, testing process, defect analysis and prevention, metrics - reliability estimation.

CASE Tools
   Types of CASE tools, advantages and components of CASE tools, Unified Modeling Language (UML)

Text and Reference Books
Overview of database management
Traditional database models, relational model, relational languages, SQL and Embedded SQL.

Conceptual database design
Conceptual database design process, ER model, generalization, specialization and aggregation, conventions, ternary and higher order relationships and concept of cardinalities in such relationships.

Logical database design
Relational Database design and update anomalies, structures, guidelines for relational schema, normalization, dependencies, transformation of entity relationship model into relational schema.

Physical database design
Database performance, tables using operating system files, multi-table files and table fragmentation clustered table organization, page organization, indexing, B-Tree, B+ Tree, B-tree organizations, ISAM organization, clustered and non-clustered indexes, hashing, static and dynamic hashing, buffer management, physical design features.

Query processing
Query processing stages, query Interpretation, query resource utilization, query execution, estimation of query processing cost, table scans, simple index access, fill factor, multiple index access, methods for join tables, (nested loop, merge join, hybrid join, multiple table join); structure of query optimizer, examples from one or two actual contemporary database management software.

Transaction Processing
Types of Failures of applications, transaction, properties, schedules and recoverability, serializability of schedules, levels of transaction, consistency, deadlocks, transaction performance, bench marking, transaction in contemporary database management systems.

Crash Recovery
Failure classification, recovery concepts based on deferred update, recovery concepts based on intermediate update, shadow paging, check points, on-line backup during database updates, case study from contemporary database management software.

Concurrency Control
Techniques based on time stamp ordering, multi-version techniques, optimistic techniques, multiple granularity, case studies Distributed Databases, distributed database concepts, architecture and design of distributed database, query processing, recovery, federated databases, asynchronous replication concepts, distributed database features in contemporary database management systems.

Client/Server Databases
Client/Server concepts, approach, Client/Server environments, characterization of Client/Server computing, application partitioning, the two-layer, and the Three layer architecture, Client/Server communication, APIs in Client/Server computing, middleware technology, application developments, design concepts, Client application development tools, and database servers.

Integrity, Security and Repositories
Needs for database integrity, integrity constraints, non-procedural integrity constraints, integrity constraints specifications in SQL, introduction to database security mechanism, security specification in SQL, system catalogues.

Emerging Database Trends
Object-Oriented databases, active databases, deductive databases, concept of next generation databases, data warehouses and executive information system, data mining, parallel query processing: multi-media databases.

Text Books

Reference Books
CSD-323 DIGITAL IMAGE PROCESSING

Introduction

Digital image representation, Fundamental steps in image processing, Elements of Digital Image processing systems, Elements of visual perception, Image model, Sampling and quantization, Relationship between pixels, Imaging geometry.

Image Enhancement

Enhancement by point processing, Sample intensity transformation, Histogram processing, Image subtraction, Image averaging, Spatial filtering, Smoothing filters, Sharpening filters, Frequency domain: Low-Pass, High-Pass, Homomorphic filtering.

Image Compression

Coding redundancy, Inter-pixel redundancy, fidelity criteria, Image compression models, Error-free compression, Variable length coding, Bit-plane coding, Loss-less predicative coding, Lossy compression, Image compression standards, Fractal Compression, Real-Time image transmission, JPEG and MPEG.

Image Segmentation

Detection of discontinuities, Edge linking and boundary detection, Thresholding, Region oriented segmentation, Use of motion in segmentation, Spatial techniques, Frequency domain techniques.

Spatial Operations and Transformations

Spatially dependent transform template and convolution, Window operations, 2-Dimensional geometric transformations.

Pattern Recognition

Classification and description, Structure of a pattern recognition system, feature extraction, Classifiers, Decision regions and boundaries, discriminate functions, Supervised and Unsupervised learning, PR-Approaches statistics, syntactic and neural.

Statistical Pattern Recognition

Statistical PR, Classifier Gaussian Model, Classifier performance, Risk and error, Maximum likelihood estimation, Bayesian parameter estimation approach, clustering for unsupervised learning and classifiers.

Text and Reference Books

CSD-325 COMPUTATIONAL TOOLS AND TECHNIQUES

Study of Network simulation and analysis tools: NS2, NS3, OMNET++ and QUALNET. Study of Data mining tools: WEKA and CLUTO. Study of Image Processing tools: MATLAB and SCILAB.

References

1. www.cse.wustl.edu/~jain/cse567-08/ftp/simtools/index.html
2. www.cs.waikato.ac.nz/ml/weka/
3. glaros.dtc.umn.edu/gkhome/cluto/cluto/overview
4. www.mathworks.in/products/matlab/
5. www.scilab.org/
CSD-410 INFORMATION SECURITY

Introduction

Number Theory and Prime numbers
Groups, Rings, and Fields, Modular Arithmetic, Euclid’s Algorithm, Finite Fields of the Form GF(p), Polynomial Arithmetic, Finite Fields of the Form GF(2^n), Generation of large prime numbers, Prime factorization, Euler Totient Function ø(n), Euler's Theorem, Primality Test- Fermat's Little Theorem, Baillie-PSW, Solovay-Strassen, Miller-Rabin Algorithm, AKS Algorithm, Cyclotomicprimality test, Elliptic Curve Primality Test, Prime Distribution, Chinese Remainder Theorem, Primitive Roots, Discrete Logarithms

Cryptographic Techniques
Perfect security, Feistel Cipher Structure, Block Cipher- DES, differential and Linear Cryptanalysis, Avalanche Effect, Double-DES, Triple-DES, Electronic Codebook Book (ECB), Cipher Block Chaining (CBC), Message Padding, Cipher Text Stealing (CTS), AES, International Data Encryption Algorithm (IDEA), Blowfish Algorithm, RC-x Algorithms, CAST-x Algorithms; Stream Cipher- Stream Modes of Operation-Cipher Feedback (CFB), Output Feedback (OFB), Counter (CTR), Storage Encryption, XTS-AES Mode, RC4; Pseudo number generation- Linear-Congruential Generators, Blum BlumShub Generator, Nonlinear Generators, RNGs used in Common Software Packages, Block Ciphers as PRNGs, ANSI X9.17 PRG, Hardware Random number generator, Attacks, Entropy Gathering Daemon (EGD), Intel Digital Random Number Generator (DRNG), RNG in Linux, Windows and iOS7.

Public-Key Cryptography and Message Authentication

Security Protocols
Secure User Authentication, Mail security, PGP, database security, File system security, Program security, Memory security, Session security, SSH, Web security, Replay Attacks, Needham Schroeder Protocol, Denning’s Modification, Corrected Protocol, One-Way Authentication for Email, IPSec, SSL, IEEE 802.11, Wired Equivalent Privacy (WEP)

Intrusion detection

Text and Reference Books
6. NIST standards
Introduction to System C
Introduction, Modules and Hierarchy, Processes, Ports and Signals, Data Types, Simulation and Debugging using SystemC.

Assessing and understanding Performance

Instruction Set Principles and Examples (example of MIPS)
Introduction, Classifying Instruction Set Architectures, Memory Addressing, Type and Size of Operands, Operations in the Instruction Set, Instructions for Control Flow, Encoding an Instruction Set, Role of Compilers, MIPS Instruction Set Architecture.

The Processor: Datapath and Control
Introduction, Building a Datapath for Supporting the ISA, Single Cycle Implementation, Multi Cycle Implementation, Exceptions, Micro-programming, Hard-wired Control

Enhancing Performance with Pipelining
An Overview of Pipelining, Pipelined Datapath, Pipelined Control, Data Hazards and Forwarding, Data Hazards and Stalls, Control Hazards, Exception Handling.

Instruction Level Parallelism and its Exploitation
Instruction Level Parallelism: Concepts and Challenges, Basic Compiler Techniques for Exposing ILP, Reducing Branch Cost with Speculation, Overcoming Data Hazards with Dynamic Scheduling, Exploiting ILP Using Multiple Issue and Scheduling, Advanced Techniques for Instruction Delivery and Speculation.

Caches and Memory Hierarchy Design
Introduction, the Basics of Caches, Measuring and Improving Cache Performance, Basic Cache Optimizations, Virtual Memory, Memory Hierarchies, Scratch pad Memories.

Multiprocessors and Clusters

Vector Processors
Basic Vector Architecture, Vector Length and Stride, Enhancing Vector Performance, Effectiveness of Compiler Vectorization.

Hardware and Software for VLIW and EPIC
Introduction, Statically Exploiting ILP, detecting and Enhancing Loop Level Parallelism, Scheduling and Structuring Code, Predicated Instructions, Compiler Speculation.

Storage Systems
Advanced Topics in Disk Storage, Real Faults and Failures, I/O Performance, Reliability, Measures and Benchmarks.

Text and Reference Books
Overview of Advanced Operating Systems
Introduction, Functions of OS, Design approaches, Types of advance OS.

Architecture of Distributed OS
Introduction, Motivations, System Architecture Types, Distributed OS, Issues in distributed OS, Communication Networks and Primitives.

Interprocess Communication
APIs for Internet Protocols, External Data Representations, Client-Server Communication, Group Communication, Distributed Objects

Distributed File Systems

Time and Global State
Physical and Logical Time, Internal and External Synchronization protocols like Cristian’s Algorithm, Berkeley Algorithm, Network Time Protocol, Lamport’s Logical Clocks, Vector Clocks, Casual Ordering of Message, Global State, Cuts of a Distributed Computation, Termination Detection.

Distributed Mutual Exclusion and Election
Simple and Multicast based Mutual Exclusion Algorithms: Centralized, Ring based, Ricart Agrawala’s Algorithm, Maekawa’s Algorithm, Election Algorithms: Ring based, Bully’s Algorithm, Multicast Communication.

Text Book

Reference Book
CSD-421 DATA WAREHOUSING AND DATA MINING

Introduction
Data warehousing Definition, usage and trends. DBMS vs data warehouse, Data marts, Metadata, Multidimensional data mode, Data cubes, Schemas for Multidimensional Database: stars, snowflakes and fact constellations.

Architecture
Data warehouse process & architecture, OLTP vs OLAP, ROLAP vs MOLAP, types of OLAP, servers, 3-Tier data warehouse architecture, distributed and virtual data warehouses, data warehouse manager.

Implementation
Data warehouse implementation, computation of data cubes, modeling OLAP data, OLAP queries manager, data warehouse back end tools, complex aggregation at multiple granularities, tuning and testing of data warehouse.

Data mining & tools
Data mining definition & task, KDD versus data mining, data mining techniques, tools and applications. Data mining query languages, data specification, specifying knowledge, hierarchy specification, pattern presentation & visualization specification, data mining languages and standardization of data mining. KDD Dataset.

Data mining techniques
Association rules, Clustering techniques, Decision tree knowledge discovery through Neural Networks & Genetic Algorithm, Rough Sets, Support Victor Machines and Fuzzy techniques.

Mining complex data objects
Spatial databases, Multimedia databases, Time series and Sequence data; mining Text Databases and mining Word Wide Web.

Text and Reference Books
2. Jiawei Han & Micheline Kamber, “Data Mining-Concepts & Techniques”, Morgan Kaufmann.
3. Arun Pujari, “Data Mining Techniques”.
5. Alex Berson, “Data Warehousing, Data Mining and OLTP”, McGraw Hill.
Introduction
Challenges in mobile computing, coping with uncertainties, resource poorness, bandwidth, etc. Cellular architecture, co-channel interference, frequency reuse, capacity increase by cell splitting.

Medium Access Control
Motivation for a specialized MAC: Hidden and Exposed terminals. Near and Far terminals; SDMA, FDMA, TDMA: Fixed TDM, Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDM, Multiple access with collision avoidance, Polling, Inhibit sense multiple access; CDMA: Spread Aloha multiple access.

Telecommunication Systems

Wireless LAN
Infrared vs. Radio transmission, Infrastructure and Ad hoc Networks, IEEE 802.11: System architecture, Protocol architecture, Physical layer, Medium access control layer, MAC management, Future development.

HIPERLAN
Protocol architecture, Physical layer, Channel access control. Sublayer, Medium access control Sublayer, Information bases And Networking.

Bluetooth
User scenarios, Physical layer, MAC layer, Networking. Security, Link management.

Mobile Network Layer
Mobile IP: Goals, assumptions and requirements, Entities and Terminology, IP packet delivery, Agent advertisement and discovery, Registration, Tunneling and Encapsulation, Optimizations, Reverse tunneling, Ipv6; Dynamic host configuration protocol, Ad hoc networks: Routing.

Mobile Transport Layer
Traditional TCP: Congestion control, Slow start, Fast retransmit/fast recovery, Implications on mobility; Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission/timeout freezing, Selective retransmission, Transaction oriented TCP.

Data Dissemination and Management
Challenges, Data dissemination, Mobile data replication, Mobile data caching, Mobile cache maintenance, mobile web caching, caching in ad hoc networks.

Context Aware Computing
Ubiquitous computing, concept of context, context aware computing and applications, middleware support.

Mobile Middleware
Service discovery, adaptation, mobile agents.

Wireless security
Traditional security issues, mobile and wireless security issues, Problems in ad hoc networks.

Text and Reference Books
5. J. Schiller, “Mobile Communications”, Addison Wesley.
Project Evaluation and Planning


Monitoring and Control

Collecting Data, Visualizing Progress, Cost Monitoring, review techniques, project termination review, Earned Value analysis, Change Control, Software Configuration Management (SCM), Managing Contracts, Types of Contracts, Stages In Contract Placement, Typical Terms of A Contract, Contract Management and Acceptance.

Quality Management and People Management


Text Book


References:

PG Courses
CSE-600 Topics in Computer Networks  L-T-P-C: 3-0-0-3

Overview and motivation, Resource sharing, Design issues for the network layers
Networking devices
Principles of internetworking, Tunneling, Fragmentation, Naming and addressing concepts, Hierarchical naming, Domain name system, Name resolution process, IP address classes and concept of subnetting, Classless Inter-domain routing (CIDR) and DHCP concepts. The internet protocols: IP, ICMP, ARP, RARP
The design issues for the transport layer, addressing, establishing connection, flow control and multiplexing.
The internet protocols: TCP and UDP.
Multicast routing
Mobility in networks, Mobile IP
Emerging trends in networking

Books and References
1. B.A. Forouzan, Data Communications and Networking, McGraw Hill.
2. A.S. Tanenbaum, Computer Networks, PHI.

CSE-610 Distributed Computing  L-T-P-C: 3-0-0-3

Introduction
Distributed systems, processes and models, remote invocation

Time Synchronization and Coordination
Clocks, events and process states, physical time and clocks, logical time and clocks, global states, distributed debugging, Coordination and Agreement
Distributed mutual exclusion, Elections, coordination agreement, consensus

Transactions and Concurrency Control
Failure model for transactions; Concurrency control; Recoverability from aborts; Nested transactions Deadlocks;
Increasing concurrency in locking schemes; Optimistic concurrency control, Timestamp ordering, Comparison of methods for concurrency control, Distributed Transactions

Replication
System model and group communication, Fault-tolerant services, Transactions with replicated data

Distributed Shared Memory
Structure; Synchronization model; Consistency model; Update options; Granularity; Thrashing

Books and References
2. Tanenbaum, Distributed Systems: Principles and Paradigms, PHI.

CSE-614 Wireless Sensor Networks  L-T-P-C: 3-0-0-3

Introduction to sensor networks and its applications: Architecture and factors influencing the sensor network design.
Routing protocols- data centric routing protocols, hierarchical routing protocols, location based routing, energy efficient routing etc; Node Scheduling and coverage issues, topology control. Querying, data collection and processing, Collaborative information processing and group connectivity. Target tracking and identity management using sensor networks. Localization . Application & future research Challenges.
Books and References

CSE-700 Artificial Intelligence L-T-P-C: 3-0-0-3

Introduction: Introduction to AI, AI techniques, level of model, criteria for success.
Function and Recursion, Tuples, patterns, Lists, concrete data types, Inductive definitions, Induction on concrete data, Formal syntax, Operational semantics, operational reasoning, references, The environmental model, exceptions, polymorphism, typing subtyping, inference. AI application development using SML.
The major methods of representing knowledge in AI: Rule based representations, declarative or logical formalisms, Prolog programming, frames or objects oriented systems, network based approaches, semantic network, and finally mixed representations.
For each of them the emphasis will be along three dimensions: The building of tools in which all knowledge is to be represented. The use of these tools to actually represent knowledge, and the use of this represented knowledge to solve problems (i.e., essentially control issues).
Case study of one or more examples from natural language processing, question answering, speech, expert systems, etc.

Books and References
2. The SML Basis Library, including information on useful common functions included with most implementations of SML.
3. A Gentle Introduction to ML, by Andrew Cumming.
5. Art of Prolog, Ehud Shapiro
6. Artificial Intelligence, Ritche & Knight

CSE-701 Formal Languages and Automata Theory L-T-P-C: 3-0-0-3

Propositional calculus and Predicate Calculus, Satisfiability and validity, Notions of soundness and completeness
Chomsky Hierarchy of Grammars and the corresponding acceptors, Turing Machines, Recursive and Recursively Enumerable Languages; Operations on Languages, closures with respect to the operations.
Church-Turing Thesis, Decision Problems, Decidability and Undecidability, Halting Problem of Turing Machines;
Problem reduction (Turing and mapping reduction).
Time Complexity, Space Complexity

Books and References
1. John E. Hopcroft, Rajeev Motwani, Jeffery Ullman, Introduction to Automata theory, Languages & computation, Pearson Education.

CSE-702 Computer Vision and Image Processing L-T-P-C: 3-0-0-3

Digital Image Fundamentals; Image Enhancement in Spatial Domain; Gray Level Transformation, Histogram Processing, Spatial Filters; Image Transforms; Fourier Transform and their properties, Fast Fourier Transform, Other Transforms; Image Enhancement in Frequency Domain; Colour Image Processing; Image warping and restoration; Image Compression; Image Segmentation; edge detection, Hough transform, region based segmentation; Morphological operators; Representation and Description; Features based matching and Bayes classification; Introduction to some
computer vision techniques; Imaging geometry, shape from shading, optical flow; Laboratory exercises will emphasize development and evaluation of image processing methods.

Books and References
2. ANDRIAN LOW, Introductory Computer Vision and Image Processing, McGraw Hill CO.

CSE-703 Topics in Cloud Computing     L-T-P-C: 3-0-0-3

Unit 1: Introduction to Cloud Computing
Roots of Cloud Computing, Layers and Types of Clouds, Features of a Cloud, Cloud Infrastructure Management, Infrastructure as a Service Providers, Platform as a Service Providers, and Challenges and Opportunities.

Unit 2: Virtualization and Resource Provisioning in Clouds
Introduction and Inspiration, Virtual Machines (VM), VM Provisioning and Manageability, VM Migration Services, VM Provisioning in the Cloud Context, and Future Research Directions.

Unit 3: Cloud Computing Architecture
Cloud Benefits and Challenges, Market-Oriented Cloud Architecture, SLA-oriented Resource Allocation, Global Cloud Exchange; Emerging Cloud Platforms, Federation of Clouds

Unit 4: Programming Enterprise Clouds using Aneka

Unit 5: Advanced Topics and Cloud Applications:
Integration of Private and Public Clouds, Cloud Best Practices, GrepTheWeb on Amazon Cloud, ECG Data Analysis on Cloud using Aneka, Hosting Massively Multiplayer Games on Cloud, and Content Delivery Networks Using Clouds, and Hosting Twitter and Facebook on Cloud.

Books and References

CSE-704 Cryptography and Computer Security     L-T-P-C: 3-0-0-3

Introduction: need and basic goals for computer security, security threats etc.
Cryptography : Elementary number theory, Finite fields, Arithmetic and algebraic algorithms, Secret key and public key cryptography, Pseudo random bit generators, Block and stream ciphers, Hash functions and message digests, Public key encryption, Probabilistic encryption, Authentication, Digital signatures, Zero knowledge interactive protocols, Elliptic curve cryptosystems, Formal verification, Cryptanalysis, Hard problems
Network Security: problems in network security; kinds of attacks, PKI, key exchange protocols, example protocols such as PGP, Kerberos, IPSEC/VPN, SSL, S/MIME etc. Protocol vulnerabilities: examples of protocol vulnerabilities such as in TCP/IP, denial of service attacks etc. Tools for network security such as firewalls and intrusion detection systems.

Books and References
1. Cryptography, Theory and Practice, Douglas R. Stinson, CRC Press,
3. Applied cryptography, B. Schneier, John Wiley & Sons
CSE-705 CAD of Digital Systems  L-T-P-C: 3-0-0-3

Basic concepts of verification. Physical design automation. Review of MOS/CMOS fabrication technology. VLSI design styles: full-custom, standard-cell, gate-array and FPGA. Physical design automation algorithms: floor-planning, placement, routing, compaction, design rule check, power and delay estimation, clock and power routing, etc. Special considerations for analog and mixed-signal designs.

Books and References

CSE-706 Combinatorial Optimization  L-T-P-C: 3-0-0-3

Optimization Problem: Global and Local optima; Convex sets and functions; Convex programing problem; Simplex algorithm: Forms of linear programming problem; Geometry of linear program; Duality: Dual of a linear program in general form; shortest path problem and its dual; Dual simplex algorithm; Primal dual algorithm: Shortest path problem, max flow; Algorithms and complexity: Computability; time bound; analysis of algorithm; polynomial time algorithm; Algorithm for matching; weighted matching. Special topics in Combinatorial Optimization

Books and References

CSE-707 Software Project & Quality Management  L-T-P-C: 3-0-0-3


Books and References

CSE-708 Software Testing  L-T-P-C: 3-0-0-3
Introduction, Basic concepts, discrete mathematics for testers, Graph theory for testers, Black box testing: Boundary value testing, Equivalence class testing, White box testing: statement coverage, Branch coverage, condition coverage, path coverage, Mc Cabe’s cyclomatic complexity; Decision Table based testing, Data flow based testing, Integration testing, System testing, Interaction testing, Performance testing, Mutation testing, Regression testing, error seeding, object oriented testing: issues in object oriented testing, Test case design by object oriented software, Fault based testing, test cases and class hierarchy, Scenario based Test design, Testing surface structure and deep structure, Class 11 testing: Random testing for object oriented classes, Partition testing at the class level; Inter class test case design: multiple class testing, tests derived from behavior models, Test case generation using UML diagrams, GUI testing, object oriented system testing. Special topics in software testing.

Books and References
2. R. Gopalswamy, Software testing, Pearson.
5. R. Mall, Fundamentals of Software Engineering, Prentice Hall of India

CSE-709 Graph Theory and Network Algorithm L-T-P-C: 3-0-0-3

Books and References
2. N. Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India.

CSE-710 Real Time System Design L-T-P-C: 3-0-0-3
Introduction to Real Time systems, applications of Real Time systems, basic model of Real Time systems, characteristics of Real Time systems, types of Real Time systems: hard, firm, soft, timing constraints, modeling timing constraints, Real Time task scheduling: basic concepts, clock driven scheduling, table driven scheduling, cyclic, schedulers, hybrid schedulers, event driven scheduling, EDF Scheduling, RMA, DMA, resource sharing among RT tasks, Priority inversion, Priority Inheritance Protocol, Highest Locker Protocol, Priority Ceiling Protocol, Scheduling Real Time tasks in multiprocessor and distributed systems, Fault tolerant scheduling of tasks, clocks in distributed Real Time systems, Commercial Real Time Operating Systems, timers, UNIX and Windows as RT OS, POSIX, PSOS, VRTX, QNX, RT Linux, Lynx, other RT OS, benchmarking RT OS, RT communications, QoS framework, models, Real Time Communication in a LAN,
IEEE 802.4, RETHER, Communication over Packet Switched Networks, Routing algorithms, RSVP, rate control, RT databases, Applications, characteristics of temporal data, Concurrency control, Commercial RT databases. Special topics in real time systems.

**Books and References**
1. J. W. S. Liu, Real time Systems, Pearson Education.

**CSE-711 Intrusion Detection System**  
**L-T-P-C: 3-0-0-3**  
Introduction to data and methodologies of computer intrusion detection, statistical & machine approaches to detection of attacks on computers, techniques for studying the Internet & estimating the number & severity of attacks, network based attacks such as probes & denial of service attacks, host based attacks such as buffer overflows and race conditions, malicious codes such as virus and worms, statistical pattern recognition for detection & classification of attacks, techniques for visualizing networked data etc. Special topics in intrusion detection systems.

**Books and References**
3. S. McClure, J. Scambray, G. Kurtz, Hacking Exposed, TMH.

**CSE-712 Information Theory and Coding**  
**L-T-P-C: 3-0-0-3**  
Introduction to information Theory, Information and entropy, properties of entropy of a binary memory less source, Measure of Information, Source Coding, Shannon Fano coding, Huffman coding, Lempel Ziv coding , channel coding, Channel capacity, noisy channel coding theorem for DMC. Linear block codes, generator matrices, parity check matrices, encoder syndrome and error detection minimum distance, error correction and error detection capabilities, cyclic codes, coding and decoding. Coding convolutional codes, encoder, generator matrix, transform domain representation state diagram, distance properties, maximum likelihood decoding, Viterbi decoding, sequential decoding, interleaved convolutional codes. Special topics in information theory and coding.

**Books and References**
3. S. Roman, Coding and Information Theory, Springer.
5. T. M. Cover, J. A. Thomas, Elements of Information Theory, Wiley.

**CSE-713 Game Theory**  
**L-T-P-C: 3-0-0-3**  

**Books and References**
4. K. Binmore, Fun and Games: A text on Game theory, AIBS publisher.

CSE-714 Bioinformatics L-T-P-C: 3-0-0-3
Introduction
; Databases mapping, sequence, structure, non redundant; Sequence alignment pair wise and multiple; phylogenetics; Structure prediction methods homology, threading, abinitio; Sequence analysis class and secondary structure prediction; motifs PROSITE; detecting functional sites in DNA; OR Finder; Computer science perspective pattern recognition, hidden Markov models; Data Mining using Soft computing Techniques. Special topics in bioinformatics.

Books and References

CSE-715 Biometric Security L-T-P-C: 3-0-0-3
Security via biometrics, space domain based biometrics and recognition techniques. Correlation based biometric filters, Basic theory of correlation filters, Design of advanced correlation filters that offer tolerance to expected impairments, methods to implement digital correlation, applications of correlation filters. Special topics in biometric security.

Books and References

CSE-716 Soft Computing L-T-P-C: 3-0-0-3

Books and References
1. V. Kecman, Learning and Soft Computing, Pearson.
3. B. Kosko, Neural Network and fuzzy systems, Prentice Hall of India.

CSE-717 Cluster and Grid Computing L-T-P-C: 3-0-0-3
Introduction
balancing, Scheduling of parallel processes, Enforcing policies, GUI, Introduction to programming tools such as PVM, MPI, Cluster Operating Systems Examples: Linux, MOSIX, CONDOR, Characteristics of Grid, Computational services, Computational Grids, Data grids/Storage grids, management and applications, Different components of Grid Grid fabric, Grid middleware, Grid applications and portal, Globus toolkit Ver.2.4, web services, MDS,GRAM, Grid Security – Cryptography, Authentication, Integrity, Digital Signature, Digital Certificates, Certificate Authority, MD 5, RSA, GSI, GSSAPI, Directory Service, LDAP, GRID
FTP, GASS Fault Tolerance: Fault detection and diagnosis of Clusters and Grids. Recent advances in cluster and grid computing.

Books and References

CSE-718 Embedded Systems  
L-T-P-C: 3-0-0-3  
Introduction:  Embedded system, Processor, hardware units, software embedding, SOC, NOC, VLSI circuit; Device and Device drivers, I/O devices, timer and counting devices, serial communication using IC, LAN and advanced I/O buses between the networked multiple devices, Host system, parallel communication using ISA, PCI, PCI X, and advanced buses, device drivers, parallel port device drivers in a system, serial port device drivers. Interrupt service handling mechanism; Software and programming concepts: processor and memory selection for embedded system, embedded programming in C++, Java and UML, multiple processes and applications, problem of sharing data by multiple tasks and routines, interprocess communication; Real time OS: OS services, I/O subsystem, Network OS, Real time Embedded system, Need of well tested and debugged RTOS, Introduction to C/OS II. 
Case Studies of programming with RTOS: Smart card embedded system, Hardware and Software co design: specification and design of an embedded system, use of software tools for development of an embedded system. Recent advances in embedded applications.

Books and References

CSE-719 Fault Tolerant Computing  
L-T-P-C: 3-0-0-3  
Books and References

CSE-720 Parallel Algorithms
- L-T-P-C: 3-0-0-3

Books and References
2. M. J. Quinn, Parallel Programming in C with MPI and OpenMP, Tata McGraw Hill.
5. G. V. Wilson & G. Wilson, Practical Parallel Programming, MIT Press.

CSE-721 Performance Evaluation of Computer System
- L-T-P-C: 3-0-0-3
- Introduction to Probability Refresher: Bayes theorem, Conditional probability, Total probability, Discrete and Continuous Random variables, Common distributions, Probability Generating Functions(PGF) and Laplace Transforms(LST), Numerous examples from computer networking, Stochastic processes, Discrete time Markov chains (DTMC), Continuous time Markov chains (CTMC), Queueing systems (M/M/1, M/M/c/k, M/G/1), Queueing networks, Statistical analysis of simulations, Specific topics: Introduction to performance measures, basic probability review, Markov chains, basic queueing models, introduction to simulation modeling, some advanced queueing models, basic queueing networks, examples from recent research papers.

Books and References
1. Kishor Trivedi , Probability and Statistics with Reliability, Queueing and Computer Science Applications, PHI.
5. A gentle introduction to some basic queuing concepts, by William Stallings, PHI.

CSE-722 Speech and NLP
- L-T-P-C: 3-0-0-3
- Brief Review of Regular Expressions and Automata; Finite State Transducers; Word level Morphology and Computational Phonology; Basic Text to Speech; Introduction to HMMs and Speech Recognition. Indian language case studies; Part of Speech Tagging; Parsing with CFGs; Probabilistic Parsing. Representation of Meaning; Semantic Analysis; Lexical Semantics; Word Sense; Disambiguation; Discourse understanding; Natural Language Generation; Techniques of Machine Translation; Indian Language case studies.

Books and References
1. Daniel Jurafsky and James H.Martin, Speech and Language Processing, Prentice Hall
CSE-723 Advances in Compiler Construction  L-T-P-C: 3-0-0-3

Review of compiler fundamentals - lexical analysis, parsing, semantic analysis, error recovery and intermediate code generation; Runtime storage management; Code generation; Code improvement - peephole optimization, dependence analysis and redundancy elimination, loop optimization, procedural and inter-procedural optimization, instruction scheduling, optimization for memory hierarchy; Compilation for high performance architecture; Portability and retargetability; Selected topics from compilers for imperative, object-oriented and mark-up languages, parallel and distributed programming and concurrency.

Books and References

CSE-724 Formal Methods in Secure Computing  L-T-P-C: 3-0-0-3

Decidability of security, Access control, take grant model, SPM, Expressive power of models, typed access control models Authentication and key establishment, Freshness, general design principles, common attacks, forward secrecy, multiparty authentication, Anonymity Protocol Verification and Correctness, Logic based Models, BAN Logic, Spi calculus Strand space based analysis, Applicability to group protocols.

Books and References
1. Willis H Ware, Charles P Pfleeger, Shari Lawrence Pfleeger, Security in Computing , Prentice Hall.
2. Theo Dimitrakos, Fabio Martinelli, Formal Aspects In Security And Trust: Springer.
4. W. Mao, Modern Cryptography: Theory & Practice, Pearson Education.

CSE-730 Mobile Databases  L-T-P-C: 3-0-0-3

Introduction to conventional databases, distributed databases
Mobile Data Access Systems: Mobility issues, On-demand services, Broadcast services, Transaction Processing, Security Moving Object Databases: Basic concepts and challenges, Accessing methods of moving object databases, Current Information Oriented Indexing, Historical Information Oriented Indexing, Mixed-type indexing, Indexing Moving Objects with Special Characteristics
Moving Object Queries: Basic Queries (nearest neighbor query, range query), Advanced Queries (density query, continuous query)
Trends and Open Issue

Books and References
2. Research Publication
3. Technical Documents.

CSE-731 Multimedia Computing  L-T-P-C: 3-0-0-3

An overview of multimedia system and media streams; Source representation and compression techniques text, speech and audio, still image and video; Graphics and animation; Multi-modal communication; Multimedia communication,
video conferencing, video-on-demand broadcasting issues, traffic shaping and networking support; Transcoding; Multimedia OS and middleware; Synchronization and QoS; Multimedia servers, databases and content management; Multimedia information system and applications.

**Books and References**

**CSE-732 Data Mining**


**Books and References**
1. Jiawei Han and Michielien Kamber, Data Mining Concepts and Techniques, Morgan Kaufmann.
2. Alex Berson and Stephen Smith, Data Warehousing, Data mining and OLAP, McGraw Hill.

**CSE-733 Security in Wireless & Mobile System**


**Books and References**

**CSE-734 Distributed and Mobile Architecture**


**Books and References**
1. Research Publications
2. Technical documents

**CSE-735 Programming Mobile Devices**


**Books and References**
1. Research Publications
2. Technical documents
Motivation and Programming Strategies

Memory Management - Design Patterns for Limited Memory, Memory Management in Mobile Java, Memory Management in example OS

Applications - Workflow for Application Development, Techniques for Composing Applications, Application Models in Mobile Java, Case study: Symbian OS Application Infrastructure


Concurrency - Infrastructure for Concurrent Programming, MIDP Java and Concurrency, Case study: Symbian OS and Concurrency

Resource Management - Resource-Related Concerns in Mobile Devices, MIDP Java.

Networking - MIDP Java and Web Services, Bluetooth Facilities with an example OS


Books and References