First Year First Semester

Hum/T/A HUMANITIES-A

English - 2 Pds/week - 50 Marks
Sociology - 2 Pds/week - 50 Marks

HUMANITIES

1.Basic writing skills
2.Report, Covering Letter & Curriculum-Vitae writing
3.Reading and Comprehension
4.Selected Short Stories

Text Book: ENGLISH FOR ALL

SOCIOLOGY

1.Sociology: Nature and scope of Sociology - Sociology and other Social Sciences - Sociological Perspectives and explanation of Social issues
2. Society and Technology: Impact of Technology on the Society - A case study
3. Social Stratification: Systems of Social Stratification - determinants of Social Stratification - Functionalist, Conflict and Elitist perspectives on Social Stratification
4.Work: Meaning and experience of work: Postindustrial society- Post-Fordism and the Flexible Firm
5.Development - Conceptions of and approaches to development - The Roles of State and the Market in the Development
6. Globalization: The concept of globalization - globalization and the nation state - Development and globalization in post colonial times.
7. Industrial Policy and Technological change in India - The nature and Role of the State in India
8. Technology Transfer: The Concept and Types of Technology Transfer-Dynamics of Technology Transfer
9. Technology Assessment: The Concept - Steps involved in Technology Assessment
10. Environment: Sociological Perspectives on Environment - Environmental Tradition and values in ancient India
11.The Development of Management: Scientific Management - Organic Organization - Net Work organization - Post modern Organization - Debureaucratization - Transformation of Management
12. Technological Problems and the Modern Society: Selected Case Studies - Electric Power Crisis, Industrial and/or Environmental Disaster, or Nuclear Accident.

CSE/T/112 CIRCUIT AND NETWORK THEORY

Passive circuit parameters and their equilibrium conditions – Kirchoff's law. Differential equation representation of passive circuits. Solution of circuit differential equations for simple circuits, concept of impedance and reactance. Steady state response. Frequency

domain analysis of RLC circuits. Amplitude and phase. Vector representation, resonance, circle diagram. Network equation, Y-DELTA transforms, network theorems – superposition, reciprocity, Thevenin, Norton, Maximum power transfer theorems, Fourier series and Fourier transform, Laplace transform. Solution of circuit differential equations using Laplace transform, transient and steady state responses. Transformer function – concept of poles and zeros – frequency response. Filters – low-pass, High-pass, band-pass and band elimination. Basic ideas of characteristic impedance, matching, attenuation and phase distortion in transmission lines.

CSE/Math/T/113 MATHEMATICS – ID

Sets: Algebra of sets, Cartesian product of sets, Binary relations, Partially ordered sets, Lattice, Equivalence relations and induced partitions, Functions and their properties. Countable and uncountable sets and their properties. Reordered sets. Least upper bound property. Statement of real number system as an ordered field with least upper bound property. Rational numbers. Algebraic and transcendental numbers. Infinite decimal expansion of real numbers. Cantor's diagonalisation method for uncountability of real numbers.
Permutations, their parity and cycle structure. General definition of the decimal.

CSE/Math/T/114 MATHEMATICS – IID

Sequence and infinite series, their convergence and divergence, Cauchy's general principle of convergence (statement only), Comparison test, D'Alembert's ratio test and Cauchy's root test, Rearrangement of terms of a series, Power series, Radius of convergence.
Successive differentiation, Rolle's theorem, Mean value theorem, Taylor's theorem and Maclaurian's series, Expansion of elementary function: e, log(1+x), (1+x)m, Sin(x), Cos(x),etc., Indeterminate forms, Maxima and Minima, Riemann integration, Definition and properties, Fundamental theorem of integral calculus, Improper integrals, Gamma and Beta functions, Partial differentiation.
Applications: Curvature and asymptotes, Rectification, Quadrature, Volume and surface areas of solids of revolution. First Year Second Semester.

AM/ME/T/1A ENGINEERING MECHANICS

Statics:
Introduction, Idealizations of Mechanics, Fundamentals of Vector Algebra, Application of Vectors in Mechanics, Equiv System, Equilibrium, FBD Concept, Fundamentals of Friction, Properties of surface, Centroid, Moment of Inertia
Dynamics:
Intro to vector calculus, Definition of vectors in Dynamics, Rectilinear Motion, Curvilinear motion of particle and description of different coordinate systems, Kinetics,

Newton's Law and D' Alembert's principle and application to rectilinear and curvilinear motion, constrained motion, Energy and Momentum methods.

Ph/T/1A PHYSICS – IA

1. Use of vectors in particle mechanics, Unit vectors in spherical and cylindrical polar coordinates, Conservative vector fields and their potential functions - gravitational and electrostatic examples, Gradient of a scalar field, Equipotentials, States of equilibrium, Work and Energy, Conservation of energy, Motion in a central field and conservation of angular momentum.
2. Angular momentum of a system of particles, Torque, Moment of inertia , Parallel and Perpendicular axes theorem, Calculation of moment of inertia for (i) thin rod, (ii) disc, (iii) cylinder and (iv) sphere. Rotational dynamics of rigid body (simple cases).
3. Motion of fluids, Bernoulli's equation and its applications, motion of viscous fluids - Poiseuille's equation.
4. Simple harmonic motion, Composition of simple harmonic motion, Forced vibration and resonance, Wave equation in one dimension and travelling wave solution, Standing waves, Wave velocity and group velocity.
5. Assumption for the kinetic theory of gases, Expression for pressure, Significance of temperature, Deduction of gas laws, Qualitative idea of (i) Maxwell's velocity distribution. (ii) degrees of freedom and equipartition of energy, Specific heat of gases at constant volume and constant pressure.
6. Equation of state of a gas, Andrew's experiment, Qualitative discussion on van der Waal's equation of state, Critical constants, Law of corresponding states.
7. Macroscopic and microscopic description, Thermal equilibrium, Zeroth law of thermodynamics, Concept of international practical temperture scale, Heat and Work, First law of thermodymamics and some applications, Reversible and irreversible processes, Carnot cycle, Second law of thermodymamics, Concept of entropy, Thermodynamic relations.

Ph/S/1 PHYSICS LABORATORY

(Selected Experiments from the following)

1. Determination of Galvanometer resistance by half - deflection method.
2. Determination of Galvanometer resistance by Thomson's method.
3. To find high resistance by Galvanometer deflection method.
4. To measure mechanical equivalent of heat, J by electrical method (Joule's) using copper calorimeter (radiation correction to be done).
5. To compare to low resistance by drop of potential method.
6. To determine resistance per unit length of wire by using Carey Foster bridge.
7. To estimate strength of a current by using copper voltmeter.
8. a) To compare the EMF's of two cells by using a potentiometer
b) To measure current by using a potentiometer
9. To measure the horizontal components of earth's magnetic field intensity using

deflection and vibrating magnetometers.
10. Determination of co efficient of linear expansion by optical lever method.
11. Determination thermal conductivity of metal by Searle's method.
12. To determine co-efficient of viscosity by Capillary flow method.
13. Determination of Young's modulus by Flexure method.
14. To draw mutual and anode characteristics of triode and hence too fine Rp, μ, and gm
15. To draw the transistor characteristics (NPN/PNP) in the given configuration and hence to find hi, hf
16. Determination of refractive index of the material of the glass prism by prism spectrometer (for at least two ?s)
17. Study of collisions in one dimension using a linear air track
18. Use of an air track for obtaining potential energy curves for magnetic interactions.
19. Study of oscillations under potential wells of various shapes using an air track.
20. Experiments on diffraction in single slit, double slit and plane grating using He- Ne laser
a) To find the wavelength of a monochromatic light by single slit.
b) To find slit separation of a double slit.
c) To find number of rulings per cm of a plane grating
21. To find the wavelength of a monochromatic light by Newton rings.
22. Fabry-Perot interferometry: To find out separation of wavelength of sodium D1 & D2 lines.

CSE/Prod/S/112 TECHNICAL ARTS

Introduction to different materials in engineering practices with respect to their workability, formability and machinability with hand-tools and power tools; Specification, identification and use of hand-tools and sensitive machines; datum selection, location layout and marking problems for wood, plastics and metals; cutting shearing chipping, sizing and finishing of woods, plastics and metals; making temporary and permanent joints between materials by process of mechanical fasteners chemical bonding and revetting.
All exercise will be oven around a group of carefully designed product features involving material selection, technology decisions, choice of tooling and fixtures, layout marketing and measurements.
Processing of plastic products, injection moulding and blow moulding.

BED/ME/S/1 BASIC ENGINEERING DRAWING

Drawing primitives: instruments, letters, lines, title block, geometric curves & shapes, scale and dimension.
Projection: orthographic and isometric, sectional views.

WS/ME/S/12A WORKSHOP PRACTICE-XII (Machine Shop)

Introduction to machine tools - lathes, drilling machines, shaping machines, planning machines, slotting machines, milling machines, grinding machines; machine shop work

involving different operations by using the above mentioned machines through making of jobs.
Experiments on: Study of the speed structure of a lathe, study of apron mechanism and calibration of feeds in a lathe.
Study and grinding of various cutting tools.

First Year Second Semester

CSE/T/121 INTRODUCTION TO COMPUTER PROGRAMMING

Background: History of computing, overview of computers, basic organization of the von Neumann machine; instruction fetch, decode, and execution; Programming languages and the compilation process • Fundamental programming constructs: Syntax and semantics of a higher-level language like C; variables, types, expressions, and assignment; simple I/O; conditional and iterative control structures; functions and parameter passing; structured decomposition • Algorithms and problem-solving: Problem-solving strategies; the concept of an algorithm; properties of algorithms; implementation strategies; concept of recursion; sequential and binary search algorithms; quadratic sorting algorithms (selection, insertion) • Fundamental data structures: Primitive types; arrays; records; strings and string processing; pointers and references; runtime storage management • Machine level representation of data: Bits, bytes, and words; binary representation of integers; representation of character data; representation of records and arrays Brief overview on the following topics: • Basic computability theory: Tractable and intractable problems; the existence of noncomputable functions • Graphics: Using a graphics API • Principles of encapsulation: Encapsulation and information-hiding; separation of behavior and implementation • Software development methodology: Fundamental design concepts and principles; structured design; testing and debugging strategies; test-case design; programming environments; testing and debugging tools.

CSE/T/122 DIGITAL LOGIC

Various number systems and codes - algorithms for conversion between different number systems and between different codes, representation of signed binary number in fixed and floating points. Boolean algebra – postulates and fundamental theorems, Boolean function and their representation using Venn diagrams, truth tables, Duality and complementation, canonical terms, fundamental Boolean operation --- AND, OR, NOT, NAND, NOR, XOR Minimization of Boolean functions through fundamental theorems, KV-map, and Quine_McClusky’s tabular method, sum of products, product of sums forms, elimination of static hazards. Some common combinational circuits: Encode/decode, code converters, magnitude comparator, bit adder/subtractor, multiplexer/demultiplexers, parity generators and checkers. Elementary sequential circuits, various types of F/Fs, R-S, clocked R-S, D, master slave J-K, T etc. Registers shift registers and counter. Synthesis of sequential circuits: clocked operations, state diagram; state table and assignment of memory states; characteristic and excitation tables of various memory elements (F/Fs); reading of individual and universal transition maps, analysis of asynchronous sequential circuits. Common application of sequential circuits:

design of binary, decade and modulo-N counters, ripple and synchronous counter, ring counters, universal shift registers etc.

Books:

1. Switching Circuits for Engineers, M.P. Marcus.
2. Digital Logic and Computer Design, M. Morris Mano.
3. Switching and Finite Automata, Z. Kohavi.

CSE/ET/T/123 ELECTRONICS-I

Elementary physics of semiconductor materials, P-N junction diodes. Zener diodes, bipolar junction transistors, JFET and MOSFET. Equivalent circuits of diode, bipolar transistor and FET, switching characteristics of diodes and transistors. Elementary physics and characteristics of Schottky diodes, P-N-P-N structures, thyristors, diacs, triacs and VJTs. Elementary physics of display devices- cold cathode displays, LEDs, LCDs, opto-isolators, photo-electric and photo-voltaic devices. Application of diodes in rectification, clipping, clamping etc. regulated D. C., power supplies.

CSE/Math/T/124 MATHEMATICS-IIID

Geometry of three dimension and vector algebra: Cartesian Co-ordinates in three dimension, Position vectors, Addition of vectors, Multiplication of a vector by a scalar, Division of a line segment in a given ratio, Rectangular resolution of vectors, Direction cosines, Scalar and vector product of two vectors, Equations of planes and straight lines, Shortest distance between two skew lines, Product of three vectors, Volume of a tetrahedron, Equation of sphere, cylinder and cone, Application of mechanics.
Functions of several variables: Limit and continuity, Partial derivatives, Differentials, Partial derivatives of a composite function, Euler's theorem on homogeneous functions, Implicit function, Jacobian function, Taylor's theorem, Maxima & minima and Lagrange's method.

CSE/Math/T/125 MATHEMATICS-IVD

Abstract algebra: Definition of Groups, Subgroups and Cyclic groups, Lagrange's theorem, Homomorphism, Theorem of group, Permutation group, Rings and subrings, Ideals, Prime ideals, Maximal ideals, Fields, Polynomial rings, Algebraic exension of field, Existance and construction of finite fields, Galois fields.
Linear algebra: Vector space, Linear dependence and independence of vectors, Basis and dimension, Definition of matrix, Algebra of matrices, Row and column operations, Row and column space, Rank of a matrix, Inverse of a matrix, Solution of a system of linear equations by matrix method, Eigen values and eigen vector of a matrix, Caley Hamilton theorem, Jordan canonical form.

Ph/T/2A PHYSICS-IIA

1. Electric potential and intensity, Flux of electric field, Gauss's law and its application to problems with spherical and cylindrical symmetry, Capacitance- parallel plate and spherical condensers, Energy of a capacitor, Energy density of an electric field, Potential and field due to a dipole, Dielectric polarisation, Electric displacement vector, dielectric susceptibility.
2. Biot-Savart law and Ampere's law in magnetostatics, Calculation of magnetic field in simple situations like (i) straight wire (ii) circular wire (at a point on the symmetry axis) and (iii) Solenoid.
3. Time-varying fields, Faraday's law of electromagnetic induction, Self and mutual inductance, Resonance and oscillation in electrical circuits.
4. Nature of light waves, Interference of light waves, Young's experiment, Spatial and temporal coherence, Fresnel bi-prism, Interference in thin film, Newton's rings, Measurement of film thickness and wavelength, Diffraction of light waves, Huygen's construction, Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction due to single slit and plane diffraction grating, Approximate rectilinear propagation of light, Zone plate, Polarisation of light waves, Polarisation by reflection, Brewster's law, Double refraction- ordinary extraordinary rays, Polaroid, Optical activity.
5. Energy levels of the hydrogen atom and the Bohr atom model, X-ray spectra, X-ray diffraction, Bragg's law, Compton effect. De-Broglie waves, Particle diffraction, Uncertainty principle and its application.

CSE/S/121 PROGRAMMING PRACTICE-I

Lab experiments will be related to topics covered in the corresponding theory paper "Introduction to Computer Programming".

CSE/S/122 DIGITAL LOGIC LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Digital Logic".

CSE/ET/S/123 ELECTRONICS LABORATORY-I

Lab experiments will be related to topics covered in the corresponding theory paper "Electronics-I".

AED/ME/S/1 ADVANCED ENGINEERING DRAWING

True length, development of surface of simple objects. Threaded joint & riveted joints, cotter/knuckle joint. Pulley, shaft coupling.

Second Year First Semester

CSE/Math/T/211 MATHEMATICS-VD

Power series: uniform convergence, validity of term by term operation and product operation Fourier series, Euler formulae, Dirichlet's conditions, even and odd functions, half-range sine and cosine series
Ordinary differential equations – 2nd and higher order, Euler – Cauchy equations, variation of parameters, ordinary point and regular singular solution of 2nd order linear equations – series solution, Legendre and Chebycheff's polynomials
Complex analysis: differentiation of complex functions, analytic functions, Cauchy – Reimann equations, line – integral, Cauchy's integral formulae, Laurant's series, singularity, Residue theorem, contour integration.

CSE/T/212 DATA STRUCTURE AND ALGORITHMS

• Review of elementary programming concepts, conception of types as a set of values together with a set of operations, Abstract Data Type; • Fundamental data structures: Linked lists: Pointer and Cursor based implementations, Applications of linked lists, Doubly linked lists, Circular Lists, Generalized lists. Stacks: array and linked list implementations, Expression handling and other Applications of Stacks. Queues: array and linked list based implementations, Application of Queues in Simulation, Double-ended Queues; Hash tables: Hashing Functions, Collision Resolution Strategies, Hash applications; Trees: Pointer-based implementation, General Trees, Binary Trees, Binary Search Trees, Balanced Trees, B-Trees, Insertion, Deletion and Search Operations in Trees, Heaps, Applications of Trees and Heaps. Graphs: Implementation of Graph Structures, Graph Traversals, Spanning Tree Algorithms, Shortest Path Algorithms, Transitive Closure Matrix, Graph Applications. • Fundamental computing algorithms: O(N log N) sorting algorithms; hash tables, including collision-avoidance strategies; binary search trees; representations of graphs; depth- and breadth-first traversals • Recursion: The concept of recursion; recursive mathematical functions; simple recursive procedures; divide-and-conquer strategies; recursive backtracking; implementation of recursion • Basic algorithmic analysis: Asymptotic analysis of upper and average complexity bounds; identifying differences among best, average, and worst case behaviors; big "O," little "o," omega, and theta notation; standard complexity classes; empirical measurements of performance; time and space tradeoffs in algorithms; using recurrence relations to analyze recursive algorithms • Strategies for choosing the right data structure; Event-oriented Programming: Event Handling, Event Propagation, Exception Handling; Data Structures as Classes. Introduction to Algorithm Design strategies: Brute-force algorithms; greedy algorithms; divide-and-conquer; backtracking; branch-and-bound;

CSE/T/213 COMPUTER ORGANIZATION

Introduction to basic concepts Instructions—Op code and operands, Representation of Instructions, Different classes of instructions, Hardware support for procedure calls, Non numeric computation, Hardware-Software interface. Arithmetic operations-- construction of ALU, different implementation techniques for Adders, Subtractors. Multiplication and division -- different algorithms and their implementation. Implementation of floating

point arithmetic. Hardware Description Language—Concepts and Principles Datapath and control unit—construction of data paths, Single and multi-cycle implementation, Hardwired and Microprogrammed control units. Bit slice processor design Memory Hierarchy-- Cache and its Performance I/O interfacing—types and characteristics of I/O devices. Buses. Interfacing I/O devices to memory and processor, Design of I/O system

Books:

1. Computer Architecture & Organization, J.P. Hayes.
2. Computer Organization, Hamacher et. Al.
3. Digital Computer Design, Morris Mano.

CSE/T/214 DIGITAL CIRCUITS

Different logic families- DTL, TTL, ECL, MOS & CMOS – their operations, Characteristics and specifications. Open collector & Tristate gates, wired-AND and bus operations. Timing circuits- 555 timer & its use as monostable and astable multivibrators, VCO and PLL-their operational principles and applications. Memory devices: semiconductor main memory RAM, ROM, EPROM, EAPROM etc. Secondary storage device principles. Analog digital interfacing: Different A/D and D/A conversion techniques, sample-hold units and analog multiplexers in multichannel data acquisition.

Books:

1. Millman & Halkias- Integrated Electronics
2. Taub & Schilling- Digital Integrated Electronics

CSE/T/215 OBJECT ORIENTED PROGRAMMING WITH JAVA AND C++

• Review of programming concepts • Algorithms and problem-solving: Implementation strategies for algorithms; • Object-oriented programming: Object-oriented design; encapsulation and information hiding; separation of behavior and implementation; classes, subclasses, and inheritance; polymorphism; class hierarchies; collection classes and iteration protocols; fundamental design patterns • Event-driven and concurrent programming: Event-handling methods; event propagation; managing concurrency in event handling; exception handling • Using APIs: API programming; class browsers and related tools; programming by example; debugging in the API environment • Virtual machines: The concept of a virtual machine; hierarchy of virtual machines; intermediate languages; security issues arising from running code on an alien machine • Concept about the issues related to the translation of the object oriented programming languages. • Fundamental techniques in graphics: Hierarchy of graphics software; using a graphics API • Introduction to object-oriented design: software architecture; structured design; object-oriented analysis and design; component-level design; design for reuse • Software tools and environments: Programming environments for object-oriented programming; testing tools.

CSE/ET/T/216 ELECTRONICS-II

R-C coupled amplifiers, power amplifiers, Darlington amplifiers, multistage amplifiers, FET amplifiers. Feedback theory, negative feedback in single stage and multistage amplifiers, operational amplifiers and some of its common applications, positive feedback and R-C oscillators. Regulated power supplies- shunt, series and switching regulator. Inverter using bipolar transistor and FET, bistable, monostable and astable multivibrators, Schmidt triggers. Sweep circuits- bootstrapping principle.

CSE/S/211 DATA STRUCTURE & ALGORITHMS LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Data Structure and Algorithms".

CSE/S/212 DIGITAL CIRCUITS LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Digital Circuits".

CSE/S/213 OBJECT ORIENTED PROGRAMMING LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Object Oriented Programming with JAVA and C++".

CSE/ET/S/214 ELECTRONICS LABORATORY-II

Lab experiments will be related to topics covered in the corresponding theory paper "Electronics-II".

Second Year Second Semester

ETech/EE/T/B ELECTRICAL TECHNOLOGY-B

DC Circuits: Kirchhoff's Laws. Maxwell's Loop Current Methods of Analysis. Star-Delta Conversion. Superposition Theorem. Thevenin's Theorem. Maximum Power Transfer.
Magnetic Circuit: MMF, Flux ,Reluctance. B-H Loop. Hysteresis and Eddy current loss. Magnetic circuit analysis with air gap.
AC 1 -phase: Periodic Waves and Sinusoids. Average and RMS Values, Form Factor, Peak. Factor. Phasor concept of Sinusoids. Impedance and Admittance. Power, Power Factor, V A, V AR. Series R-L-C Circuit ,Parallel R-L-C circuit. Resonance.
Balanced 3-phase: 3-phase AC balanced circuits. Phase-sequence. Star and Delta connections. Power, V A, V AR, Power Factor _or balanced 3-phase circuits.
Power Measurement: Wattmeter circuit connection. Power Measurment by two wattmeter methods in 3phase system.
DC Machines: Construction and general priciple of operation. Generator EMF Equation. Field connection ,shunt series and compound. Generator characteristics.

Motor-equation and general operation. starting and speed control, torque -speed curve.
1-PhaseTransformer: Construction. EMF equation. Phasor diagram. Equivalent circuits. Losses and Efficiency. Open circuit and Short circuit test.
3-Phase Induction Machine: Types of induction machines. Rotating magnetic field, slip ,torque equation, torquespeed curve.DOL starting and reduced voltage starting.
3-Phase Synchronous Machines: Alternator, constructional features, EMF equation, synchronous reactance, power -angle characteristics.
Concept of synchronous motor.
Meters: DC and AC Ammeters and Voltmeters. Megger.Multiplier.

Books :
1. Electrical Science by Prof. S. Chowdhury, Prof. R. Chakraborty & Prof. P. K. Chatterjee.
2. Electrical Machines by Prof. P.K. Mukherjee & Prof. S. Chakravorti.

CSE/Math/T/222 MATHEMATICS-VID

Mathematical Theory of Probability:
Basic concepts, Classical and axiomatic approaches, Sample space and events, Properties of probability functions, Conditional probability and independent events, Concept of random variable, Discrete and continuous probability density, mass and distribution functions, Expectations and moments, Moment generating and characteristic functions, U niform, binomial, poisson, exponential and normal distributions, Multi – dimensional random variables and random vectors, Joint, marginal and conditional probability distributions, Functions of random variable and random vector, Linear transformation of random variable and random vector,
Independent random variables, Mean square estimation, Correlation and regression, Central limit theorem. Introduction to random processes: Markov, stationary and ergodic processes, Correlation function and power spectral density.

CSE/T/223 MICROPROCESSORS

Introduction to microprocessors- basic features of hardware of 8085 microprocessor, instruction set. 8085 microprocessor architecture– as an 8-bit representative. Memory interfacing– address decoding, address aliasing, memory read and write operations, timing diagrams, I/O Devices, I/O interfacing – Memory mapped I/O and I/O mapped I/O, synchronous and asynchronous data transfer and some I/O programming examples, overview of 8085 assembly language programming. Interrupt driven I/O, Interrupts– Polled interrupts and vector interrupts, priority and masking, interrupt driven data transfer. Direct memory access- concept and interface. Introduction to 16-bit microprocessor and its architecture– 8086 as an example, min-max mode, co-processor and its interfacing. Familiarization with peripheral devices – 8255 programmable peripheral interface, 8254 programmable counter, 8251– UART programmable communication interface, 8257 DMA Controller. Introduction to interrupt controller (8259), keyboard & display interface (8279). Signal converter and their interfacing

techniques- ADC/DAC/HUO/Amask/Reconstruction filter. Introduction to micro-controller – 8051 as an example. Micro-controller architecture, microcontroller families, bi-directional data ports, internal ROM and RAM, counters/timer s, oscillator and clock, serial communication. 8051-register set, memory organization – internal & external, program memory & data memory, bit addressable memory, and special function registers, stack, ports, interrupts, counters/timers and serial I/O. Introduction to instruction set of 8051 and assembly language programming- Data movement, logical, arithmetic, jump and call instruction with programming examples, interrupt programming examples. Microcontroller application case studies. Important features of higher processor in the Intel 80X86 family including Pentium.

Books:

1. J. Uffenberk, “Microcomputers and microprocessors”, 3rd Ed., Pearson Education, Asia (LPE), 2002.
2. R. Gaonkar, “Microprocessor Architecture, Programming and Applications”, 5th Ed., Pearson International, 2001.
3. C. Gilmore, “Microprocessors Principles and Applications”, 2nd Ed., McGraw-Hill International, 1995.
4. D. Hall, “Microprocessors and Interfacing”, 2nd Ed., Tata-McGraw-Hill, 1999.
5. Liu and Gibson, “Microcomputer Systems: The 8086/8088 Family”, 2nd Ed., Prentice-Hall India (EEE), 1986.
6. Treibel and Singh, “The 8088 and 8086 Microprocessors”, 4th Ed., Prentice-Hall India (EEE), 1991.
7. K. Ayala, “The 8051 Microcontroller – Architecture, Programming and Applications”, 2nd Ed., Pearson International,1996.
8. Mazidi, “The 8051 Microcontrollers & Embedded Systems”, Pearson Education Asia (LPE). M. Predco, “Programming and Customizing the 8051 Microcontroller”, Tata McGraw-Hill EA., 1999.

CSE/T/224 NUMERICAL METHODS

Approximation in numerical computation. Truncation and rounding errors. Numerical solution of algebraic and transcendental equation. Methods for complex roots of a polynomial. Numerical treatment of a system of a linear equation, matrix inversion, iterative methods for linear systems. Eigen value and Eigen vectors; Power method. Interpolation: Lagrange formula. Newton and Gauss formula. Spline functions. Curve fitting. Numerical differentiation and integration. Trapezoidal, Simpson’s and Romberg integration. Gauss quadrature. Numerical solution of ordinary differential equations. Runge-Kutta method, Predictor corrector method. Numerical solution of Partial differential Equation.

Books:

1. Numerical Algorithms: E.V. Krishnamurthy & S.K. Sen
2. Applied Numerical methods for the microcomputer: T.E. Shoup (Prentice-Hall Inc.)

3. Introduction to Numerical Analysis: C. Froberg (Addison Wesley).
4. Numerical Methods for Scientific & Engineering Computation: M. K. Jain, S. R. K. Iyengar, R. K. Jain
5. Numerical Methods for Scientists and Engineers: H.M. Antia Introductory Methods of Numerical Analysis: S. S. Sastry

CSE/T/225 SOFTWARE ENGINEERING

Introduction to the notion of software as a product – characteristics of good software products. Introduction to the engineering aspects of software products – necessity of automation. Job responsibilities of programmers and software engineers as software developers. Software development process models – code and fix model, waterfall model, incremental model, rapid prototyping model, spiral model. Program design techniques – structured programming, modularity, abstraction, information hiding, coupling and cohesion, abstraction, automated programming, defensive programming, redundant programming, aesthetics. Software cost estimation – underlying factors of critical concern. Metrics for estimating complexity of software products – function points. Techniques for software cost estimation – expert judgment, Delphi cost estimation, work breakdown structure and process breakdown structure, COCOMO and COCOMO-II. Testing and verification of software products – black-box testing and white-box testing, static analysis, symbolic execution, control flow graphs – cyclomatic complexity, introduction to the techniques for testing real time systems. Software project management – management functions. Project planning and project control. Organization and intra-team communication. Risk management. Formal methods in software engineering – Z notation, Hoare's notation. Formalization for functional specifications – introduction to SPEC. Formalization of design specifications – introduction to PSDL. Support environment for development of software products. Representative tools – editors, linkers, interpreters, code generators, debuggers. Configuration control tools. Decision support and synthesis tools. Project management tools. Engineering databases. Software modeling tools – Data Flow Diagrams, UML, XML. Modeling distributed software system – petrinets.

References:

1. Fundamentals of software engineering – Carlo Ghezzi, Mehdi Jazayeri, and Dino Mandrioli – Prentice Hall.
2. Software engineering with abstraction – Berzins and Luqi, Addison -Wesley.
3. Software engineering – Ian Sommerville – Addison-Wesley.
4. Software engineering – design, reliability and management – Schuman Mar. Software engineering – Pressman.

CSE/T/226 DATA COMMUNICATION SYSTEMS

Introduction: Goals, nature and methodology of communication, communication entities, multimedia messages. Signals for communication: Time-domain and frequency-domain representation of signals. Analog/digital/sampled, periodic/aperiodic,

deterministic/random signals. Fourier series, frequency spectrum, filtering and bandwidth. Message transducers and signal converters. Communication channel: Important characteristics of a communication channel. Available communication channels (media) and their properties. Baseband data communication: Basic concepts of analog and digital communication in the baseband. Various encoding formats for data. Attenuation and distortion problems and remedies. Maximum data rate of a channel. Modulation techniques: Analog modulation- AM/FM/PM: Digital modulation- ASK/FSK/PSK, Binary and M-ary data modulation, continuous phase modulation- binary and M-ary CPFSK, MSK, partial response CPM. Pulse modulation and pulse coded modulation schemes- PAM/PWM/PPM, PCM/DPCM/ADPCM/DM etc. Demodulation techniques: Principle of demodulating various kinds of modulated signals. Coherent and incoherent receivers. Matched filters. PLL/DPLL and applications. Clock recovery. Reliable and efficient asynchronous and synchronous data communication: block error handling and channel coding. Bit and character oriented framing. Transparent data communication. Error detection and correction in a frame- LRC/VRC/Checksum/CRC and Hamming code. Protocols for data communication- Stop and Wait protocol and its efficiency, sliding window protocols- go-back-n and selective repeat. Modem technologies: QAM/MSK/CPFSK/ADSL/Cable Modem Wireless communication: Data communication over radio/microwave/satellite/infrared links. Principles of Spread spectrum communication- DSSS, FHSS Optical communication technology: Basic principles and components for point-to-point communication. Multimedia communication and data compression.

Books:

1. S. Haykin, “Communication Systems”, 3rd edition, John Wiley, 1994
2. H. Taub and D. Schilling, “Principles of Communication Systems”, 3rd edition, Tata Mcgraw Hill
3. W. Stallings, “Data And Computer Communications”, 6th edition, Pearson education Asia (IPE), 2000
4. F. Halshall, “Data Communications, Computer networks and Open Systems”, 4th edition, Pearson Education Asia (IPE), 1996
5. B.A. Forouzan, “Data Communications and Networking”, 3rd edition, Tata Mcgraw Hill, 2003
6. D. Bertrekas and R. Gallagar, Data Networks, 2nd edition, Prentice Hall (EEE), 1992
7. J.Proakis and M.Salehi, “Communication System Engineering”, Prentice Hall, 1995
Schiller, “Mobile Communications”, Pearson Education Asia, 2000

CSE/EE/S/221 ELECTRICAL TECHNOLOGY LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Electrical Technology-B".

CSE/S/222 MICROPROCESSOR LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Microprocessors".

CSE/S/223 NUMERICAL METHODS LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Numerical Methods".

CSE/S/224 SOFTWARE ENGINEERING LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Software Engineering".

Third Year First Semester

CSE/T/311 COMPUTER GRAPHICS

Introduction: display devices, line and simple curve drawing algorithms, geometric transformations for two dimensional graphics, polygon filling, display files, essentials of animation, windowing and clipping, three dimensional graphics, geometric transformations: projections, hidden line/surface removal, curves and surfaces, interactive graphical techniques, graphical input devices, input device handling algorithms, graphics processor, graphical user-interface design, multimedia techniques.

Books:

1. Procedural Elements for Computer Graphics by D.F. Rogers.
2. Computer Graphics-A programming approach by S. Harrington.
3. Mathematical Elements of Computer Graphics – D.F. Rogers.
4. Computer Graphics- D. Hearn and M. P. Baker Computer Graphics – Principles and Practice- Foley, van Dam, Feiner, Hughes

CSE/T/312 DATA BASE MANAGEMENT SYSTEMS

1. Introduction to Database Management Systems – Database, Database Management Systems, Database System Applications, Database Systems versus File Systems, View of Data, Data Models, Database Languages, Database Users and Administrators, Transaction Management, Decision Support Systems, Components of a Database Management System, Distributed Processing and Client-Server Architecture 2. The Entity Relationship Model – Database Development Process, Tools of Database Development, Basic Concepts, Constraints, Keys, Design Issues, Entity-Relationship Diagrams, Extended E-R Features, Design of an E-R Database Schema, The Unified Modeling Language (UML), Class Diagrams, Higher Level Views through Packages 3. Relational Model - Structures of Relational Databases, Integrity Constraints, Logical Database Design – ER to Relational, Converting a Class Diagram to Tables, Views, Data Dictionary, Relational Algebra, Extended Relational Algebra Operations, Modification of

the Database, Tuple Relational Calculus, Domain Relational Calculus, 4. SQL Features of SQL:1999 standard – Basic Structures, Set Operations, Aggregate Functions, Null Values, Nested Subqueries, Views, Complex Query (Derived Relations, WITH clause), Modification to the Database, Joined Relations, Data-Definition Language, Embedded SQL, Open Database Connectivity (ODBC), Java Database Connectivity (JDBC), Triggers and Active Databases, Security and Authorization, Authorization in SQL, Other SQL features 5. Other Query Languages – Query-by-Example (QBE), QBE in Microsoft Access, User Interfaces and Tools – Forms and Graphical User interfaces, Report Generators. 6. Relational Database Design – Functional Dependencies, Multivalued Dependencies, Normal Forms, Decompositions into Normalized Relations 7. Issues in Physical Database Design – Physical Data Storage, RAID Disk Organization Technique, Buffer Manager, Overview of Physical Database Design, File Structures – Sequential File Organization, Clustering File Organization, Ordered Indices, B+-tree Index files, Static Hashing, Dynamic Hashing, Bitmap Indices, Performance Tuning – Tuning of Hardware, Tuning the Conceptual Schema, Tuning of Indices, Performance Benchmarks 8. Object – Relational Databases - Nested Relations, Complex Data types, Inheritance, Object oriented Data Relationships, Reference Types, Object Relational features in SQL:1999. 9. Internet Databases – World Wide Web, Client-Side Scripting and Applets, Web Servers and Sessions, Servlets, Server-Side Scripting, XML – Structure of XML data, XML document schema, XQuery, Storage of XML data, XML Applications, E-commerce 10. Query Evaluation – Introduction to Query Processing, Join Operations, Set Operations, Aggregate Operations, Evaluation of Expressions, Overview of Relational Query Optimization, System Catalog in a Relational RDBMS, Materialized Views. 11. Fundamental concepts of : Transaction Management, Concurrency Control, Recovery Systems, Decision Support Systems, Data Analysis and OLAP, Data Mining, Data Farming, Data Warehousing, Information – Retrieval Systems, Spatial and Geographic Data, Multimedia Databases, Mobility and Personal Databases.

References:

1. Database Systems Concepts (4th Edition) – Korth et. al. – MH International Edition
2. Database Management Systems (2nd Edition) – Ramakrishnan et. al. – MH International Edition
3. An Introduction to Database Design – Date – Narosa
4. Fundamentals of Database Systems – Elmasri and Navathe – Addison Wesley
5. Database Management Systems – Post – TMH
6. Database Application Development & Design – Mannino – MH International Edition
7. Relational Database Design – Harrington – Harcourt India
8. Object – Oriented Database Design – Harrington – Harcourt India
9. Database Management and Design – Hansen & Hansen – PHI
10. Database Management Systems – Majumdar & Bhattacharyay – TMH

CSE/T/313 SYSTEMS PROGRAMMING

Assembly Language (at least for a specific system): Why assembly language, description of functional characteristics, addressing modes, data types, instruction structure, registers,

indexing, instruction set description, macros, recursive macros, sub-routines, stacks, procedures, exception handling. Assemblers- Overview of assembly process, processing of imperative, declarative and assembler directive statements, relocation, linking and loading concepts; one and two pass assembler; symbol table organization, program sections, output forms. Macro-assembler- Macro definitions and parameters, macro call expansion, macro definition within a macro and macro call within a macro, conditional assembly macro processor. Loaders- Review of loading, linking and relocation, absolute, dynamic and direct loading schemes, program linking schemes and resolution of external references, optional features in loaders and linkage editors, overlay structures and dynamic loading. Concept of Editor and text editor, Interpreters, Simulator, Cross-assembler Debug monitor and compiler

CSE/T/314 VLSI DESIGN

Introduction, IC technology: Diffusion, Photolithography, wafer fabrication, etching of different layers, oxidation, epitaxial formation etc, Different circuit configurations, design and fabrication aspects of MOS, CMOS, BiCMOS, GaAS devices used in VLSI circuits Representations of layers of MOS and CMOS devices by stick and mask diagrams, Design rules for MOS and CMOS IC devices. Examples of stick and mask layout representations of MOS and CMOS circuits and subsystems. Introduction to VHDL Structured designs of integrated circuits systems with ROM, Multiplexers and PLAs. Different VLSI design styles, Introduction to different CAD tools for design and simulation of VLSIs. Introductory concepts about testing and testability of VLSI circuits.

CSE/T/315 COMPUTER ARCHITECTURE

1. The Concept of Computer Architecture – Architecture at Micromachine (for Microprogrammed processors), processor, and computer system levels – Abstract (or logical) and concrete (or physical) architectures – Formal description languages for architecture: VHDL, AADL etc. 2. Instruction-level parallel (IPL) processors – Dependencies between instructions – Pipelined processors, VLIW (Very Long Instruction Word) and Superscalar processors. 2.1 Pipelined processors – Basic principles of pipelining – Performance Measures – Traditional 4-stage RISC pipeline – Traditional 6-stage CISC pipeline – Forbidden latencies and collision prevention. 2.2 VLIW Architecture – Difference between VLIW and Superscalar Architectures – Case study. 2.3 Superscalar processors: The Pentium – Separate Code and Data caches– Instruction Pairing rules – The Instruction Pipeline: D1, D2, Execution, and Write-back stages – Branch Prediction and History bits – Floating Point Pipeline. 3. Data-Parallel Architectures – The concept of Data-parallel computation – Connectivity: Near-neighbor, Tree, Pyramid, and Hypercube networks – Classes of Data-Parallel Architectures: SIMD, Systolic, Vector, Neural, and Associative and Data-parallel Pipeline Architectures. 3.1 SIMD Architectures: Unger's machine and its features: two-dimensional array, parallel execution, local memory, fast propagation of data – Case Study – Algorithms for Matrix Inversion/ Matrix Multiplication. 3.2 Systolic Architectures – Basic features – Spatial Convolution – the WARP Processor. 3.3 Vector Architectures – Principle of Vectorization – Vector Instructions– Case study: CRAY-1. 4. MIMD Architectures –

Distributed Memory and Shared-memory systems – Lack of scalability of shared-memory systems – Concept of multi-threaded Architectures. 4.1 Dataflow architectures – The dataflow program – Graphical notation for dataflow programs – Static dataflow architecture – Tagged-Token Dataflow architecture – Explicit Token-Store architecture. 4.2 Shared-Memory MIMD Architectures – Single shared-bus and arbitration – Multiple shared buses – Switching Network: Crossbar and Multistage Networks – Cache coherence – Memory Update Policy: write-through and write-back – Cache coherence policy: write-invalidate and write-update – Snoopy Cache protocols for shared-bus multiprocessors – Directory-level Cache Coherence – Synchronization mechanisms: spin-locks – Case study : Sun Enterprise 6000. 5. RISC – Characteristics of CISC Processors – The RISC concept – Hardwired control - Pipeline Interlocks – Horizontal Machine Code format – Register files – Jumps and Delay slots. 6. Contemporary Architectures – Hand-held devices – Embedded systems – current trends.

Books

1. Kai Hwang, Advanced Computer Architecture: Parallelism, Scalability and Programmability, McGraw-Hill 1993, pp. 770, ISBN 0-07-113342-9.
2. David A. Patterson and John L. Hennessy, Computer Architecture: A Quantitative Approach, Harcourt Asia PTE Ltd. 2000, pp. 760, ISBN 981-4033-227.
3. Daniel Tabak, Advance Microprocessors, McGraw-Hill 1995, pp. 523, $18.50, ISBN 0-07-113715-7. 4. James L. Antonakos, The Pentium Microprocessor, Prentice-Hall Inc. 1997, pp. 539, ISBN 0-02-303614-1.

CSE/T/316 GRAPH THEORY & COMBINATORICS

Graphs--- paths, cycles, walk; Trees and their characterization, diameter, center, degree sequences and realizability, Eulerian trails, Hamiltonian cycles---sufficient conditions, connectivity—cut points, bridges, block, Whitney’s theorem, Planarity, colourability, Coverings and independence, digraphs, tournaments, orientability, Matrix representation of graphs, External problems. Permutation, Combination of multisets, Pegionhole principle, Formal power series, and recurrence relation, Stirling numbers, Mobius inversion, Posets, Sperner’s lemma, Dilworth’s theorem, Systems of distinct representatives, Principle of inclusion-exclusion.

CSE/S/311 COMPUTER GRAPHICS LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Computer Graphics".

CSE/S/312 DATA BASE MANAGEMENT SYSTEMS LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Data Base Management Systems".

CSE/S/313 SYSTEMS PROGRAMMING LABORATORY (including Assembly Language)

Lab experiments will be related to topics covered in the corresponding theory paper "Systems Programming".

CSE/S/314 DESIGN LABORATORY-I

Involves design, implementation and debugging of small but complete functional digital/analog systems or subsystems.

Third Year Second Semester

CSE/T/321 COMPILER DESIGN

Outline of compilation, Lexical analyzer, Parsing – top-down parsing, LL(1) grammars, Recursive descent method, Bottom-up parsing, Shift-reduce technique, Operator precedence grammar, LR(0) and SLR(1) grammars, Syntax directed translation, Error processing and recovery, Storage allocation, Static and dynamic allocations, Code generation, Introduction to optimization in compilers.

Books:

1. Aho and Ullman, Principles of Compiler Design, Addison Wesely
2. Tremblay and Sorenson, Theory and Practice of Compiler Writing, McGraw Hill. Aho, Sethi and Ullman, Compilers Principles, techniques and tools, Addison Wesley

CSE/T/322 OPERATING SYSTEMS

Introduction: Concept of batch-processing, multi-programming, time sharing, real time operations, resource manager view, process view and hierarchical view of an OS File Management: File concept, file organization and access, file allocation, directory structures & file sharing, file protection Memory management: Partitioning, paging, virtual memory, demand paging, page replacement algorithms, thrashing, segmentation and demand paging segmentation, cache or buffered memory management Processor management: CPU scheduling, non-preemptive and preemptive scheduling algorithms, performance analysis of multiprogramming, multiprocessing and interactive systems, multiqueue scheduling Process synchronization: Concurrent processes, precedence graphs, critical section problem – software and hardware solutions for n processes, semaphores, classical process coordination problems Inter process communication, conditional critical region, monitor constructs, concurrent languages Deadlock: Characterization, prevention, avoidance, detection and recovery Device Management: Scheduling algorithms, Spooling Protection: Policies and mechanisms, domain of protection, access matrix and its implementation, dynamic protection, security Introductory concepts on distributed systems: event ordering, synchronization, deadlock

handling, reaching agreement and election algorithm Case studies: Windows/ Linux/ Unix/ Solaris

CSE/T/323 DESIGN & ANALYSIS OF ALGORITHMS

• Review of proof techniques • Basic algorithmic analysis: Asymptotic analysis of upper and average complexity bounds; best, average, and worst case behaviors; big-O, little-o, ?, and Ø notation; standard complexity classes; empirical measurements of performance; time and space tradeoffs in algorithms; using recurrence relations to analyze recursive algorithms • Fundamental algorithmic strategies: Brute-force; greedy; divide-and-conquer; backtracking; branch-and-bound; heuristics; pattern matching and string/text algorithms; numerical approximation • Graph and tree algorithms: Depth- and breadth-first traversals; shortest-path algorithms (Dijkstra's and Floyd's algorithms); transitive closure (Floyd's algorithm); minimum spanning tree (Prim's and Kruskal's algorithms); topological sort • Tractable and intractable problems, Uncomputable functions, The halting problem, Implications of uncomputability The complexity classes P and NP: Definition of the classes P and NP, NP-completeness (Cook's theorem), Standard NP-complete problems, Reduction techniques Advanced algorithmic analysis: Amortized analysis, Online and offline algorithms, Randomized algorithms, Dynamic programming, Combinatorial optimization

CSE/T/324 COMPUTER NETWORKS

1. INTRODUCTION: Definition, goals, applications and classification of computer networks. Some well-known networks and networks standardization bodies.
2. NETWORK STRUCTURE: Direct and indirect interconnection, need for addressing and routing. Concept of subnet-structure and topology of subnet. Need-based dynamic channel allocation techniques – polling and concentration. Efficient message transport across the subnet – circuit, message and packet switching.
3. NETWORK ARCHITECTURE: Layered architecture and protocol hierarchy. OSI Reference Model. Services and important functions of each layer.
4. QUEUEING THEORY: Queuing as an applied stochastic process. Markov and Birth-Death (B-D) processes. Differential difference equation of a B-D process. M/M/m/k/M queuing systems. Little's Theorem. Pollackzek–Khinchin (P-K) Formula for a M/G/1 system. Application of queuing theory in computer networks.
5. BRIEF REVIEW OF PHYSICAL AND DATA LINK LAYERS
6. NETWORK LAYER: Connection–oriented and connectionless services and corresponding subnet structures, Routing techniques – shortest path, static multipath, flooding, distance vector, link state, hierarchical and broadcast/multicast routing. Congestion control algorithms.
7. LOCAL AREA NETWORKS: IEEE 802.X – introduction, architecture, protocol and management of Ethernet and token ring LANs.
8. METROPOLITAN AREA NETWORKS: FDDI, DQDB.

9. WIRELESS AND MOBILE NETWORKING: ALOHA and Reservation ALOHA-based satellite networks, IEEE 802.11, IEEE 802.16, BLUETOOTH and IEE 802.15. Ad-hoc networks. Cellular networks – GSM, CDMA and PCS systems.
10. ISDN, B-ISDN, FRAME RELAY AND ATM NETWORKS: Concept of ISDN and B-ISDN. Review of the digitization status of the telephone network. X.25, Frame Relay and ATM-evolution, ATM layers, sublayers and their functions, ATM switch architecture.
11. TRANSPORT LAYER: Transport service and service primitives. Sockets. Transport addressing – process server and name (directory) server. Connection establishment and release Flow control, buffering, multiplexing and crash recovery
12. NETWORK SECURITY: Security need for message communication and storage. Concept of traditional and modern cryptography. Digital implementation of secret key (symmetric key) algorithms – P/S/PRODUCT Boxes, DES/Triple DES/ AES, cipher modes. Public key encryption – authentication, digital signature, message digest. Management of public keys.
13. OPTICAL NETWORKS: An overview of optical networks.

Books:

1. A.Tanenbaum, “Computer Networks”, 4th Ed., Pearson Education Asia (LPE), 2003.
2. L.L. Peterson and B.S. Davie, “Computer Networks: A Systems Approach”, 2nd Ed., Morgan Kaufman, Harcourt Asia, 2000.
3. W. Stallings, “Data and Computer Communications”, 6th Ed., Pearson Education Asia (LPE), 2000.
4. F. Halsall, “Data Communications, Computer Networks and Open Systems”, 4th Ed., Pearson Education Asia (LPE), 1996.
5. L. Garcia and I. Widjaja, “Communication Networks: Fundamental Concepts and Key architectures”, Tata-McGraw-Hill Ed., 2000.
6. J.F. Kurose and K.W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education Asia (LPE), 2001.
7. L. Kleinrock, “Queueing Systems, Vol. 1: Theory”, John Wiley, 1975.
8. Bertsekas and R. Gallagar, “Data Networks”, 2nd Ed., PHI (EEE), 1988.
9. W. Stallings, “ISDN and Broadband ISDN with Frame Relay and ATM”, 4th Ed.

CSE/T/325 MATHEMATICAL LOGIC AND FUNCTIONAL PROGRAMMING

• Evolution of logic programming • Propositional Logic Syntax, Semantics, Logical Consequences • First Order Predicate Logic Syntax, Semantics, Logical Consequences, Clausal Form, Resolution • Herbrand’s Theorem Skolemization, Semantic Tree, H-Universe, H-Theorem, Implementation of H-Theorem. • Concepts of Logic Programming With Prolog • Functional Programming Concepts • Functional Programming Techniques Functions, recursion, macros, user defined control constructs, higher order constructs, types, data abstraction, polymorphism, semantics, implementation issues • Introduction to functional programming languages Concepts of lambda calculus • Functional programming With Haskell/ML//Gofer/Scheme

BOOKS AND REFERENCES

• D.A.Watt. Programming Languages and Paradigms, Prentice Hall 1990
• J. Lloyd. Foundations of Logic Programming, Springer Verlag, 1984
• M.Hennessey. The semantics of Programming Languages, John Willey, 1990
• Luca Cardelli and P.Wegner On Understanding Types, Data Abstraction and Polymorphism, Computing Surveys, 17(4), pp 471, 1985 C.Reade. Elements of Functional Programming, Addison Wesley, 1989

CSE/T/326 ELECTIVE-I

1. ADVANCED MICROPROCESSORS
2. ADVANCED VLSI SYSTEM DESIGN
3. BIOINFORMATICS
4. ENERGY MANAGEMENT
5. ENVIRONMENTAL ENGINEERING

CSE/T/326A ADVANCED MICROPROCESSORS

Review of 8086 microprocessor – register organization, architecture, physical memory organization min mode, max mode, instruction set, assembly language programming with 8086, special architectural features of 8086 and related programming. Basic peripherals and their interfacing with 8086, special purpose programmable peripheral devices. Introduction to 32 bit microprocessors – 80386 and 80486 as examples, Salient features, architecture, register organization, addressing modes, real address mode, protected mode, enhanced instruction set of 80386, the co-processor 80387. Recent advances in microprocessor architecture, few relevant concepts – instruction level parallelism – pipelining revisited, data hazards, dynamic scheduling, Branch prediction: static, dynamic and zero-cycle branches, Compiling for superscaler implementations, Hardware support for instruction level parallelism, Memory hierarchy – Cache revisited: block organixation, cache lookup, replacement and write-through policy, write buffering, classifying misses: cold/ capacity/ conflict misses, Reducing misses: line size, associativity, victim cache, prefetching, compiler optimizations, Reducing miss penalty: reordering memory cycles, sub-block placement, early restart, lock-up free operation, multilevel caches, Reducing hit time, Main memory and its performance. Enhanced instruction set of Pentium, MMX architecture, MMX data types, wraparound and saturation arithmetic, MMX instruction set, salient points about multimedia application programming. Pentium Pro – superscalar RISC implementation of a CISC instruction set, DEC ALPHA – the ‘clean sheet’ superscalar RISC architecture, PowerPC – a pragmatic combination of features, Embedded processor: the DEC StrongARM, Familiarity with Pentium II, III and IV. Future technology limitations, requirement for mobile code, JAVA implementation techniques, JIT compilation, dynamic optimization.

CSE/T/326B ADVANCED VLSI SYSTEM DESIGN

Review of VLSI Technology, Layout Rules and Circuit Abstraction. Subsystem Design Principles: Pipelining, Data paths; and examples: ALUs, multipliers, Memory Units, FPGA etc. Floor Planning: Floor Planning Methods and off–chip connections. Architecture Design: Modeling with HDL's (VHDL,Verilog); RT Design technique, high level synthesis, architecture for low-power ICs, System-on–chips and embedded CPUs. Chip design methodologies with examples. CAD systems and algorithms: switch–level simulation, layout synthesis (placement, global and detailed routing), layout analysis, timing analysis and optimization, logic synthesis, test generation. concepts of hardware and software Co-Design.

Reference:

1. Wayue Wolf: Modern VLSI Design- Pearson Education.
2 M. Sarrafzadeh and C. K. Wong, "An Introduction to VLSI Physical Design, Mcgraw-Hill Internationals.

CSE/T/326C BIOINFORMATICS

1. Introduction to genomics
2. Sequence alignment: Global and local alignment, gapping (constant, general, affine)
3. Sequence Alignment using Hidden Markov Models, Global alignment via HMMs
4. Gene finding: Markov models, Hidden Markov models, Gene finding via HMMs
5. Protein Sequences and Substitution matrices: Suffix tree construction and applications
6. Multiple Sequence Alignments: High dimensional dynamic programming, tree alignment, scoring
7. Introduction to Gene Expression: Microarrays and their uses and some idea about normalization
8. Classification and Class Discovery: Predicting phenotype from gene expression data
9. Single Necleotide Polymorphisms (SNPs): The Haplotype problem
10. Introduction to Gene Regulation: Gene regulation, binding sites, transcriptional networks, gene's circuitry
11. Signals in Sequences: Weight matrices, higher order MC dependencies, transcription factor binding sites
12. Network of Interactions: Regulatory networks, REVEAL
13. Introduction to Proteomics: Protein structure, interactions, biotechnologies
14. Peptide Sequencing problem: sequencing peptides with mass spectrometry data
15. Protein Structure Prediction: Attempts to predict secondary an tertiary structure of amino acid sequences

References:

1. Gusfield D. Algorithms on Strings, Trees, and Sequences, Cambridge University Press, 1997
2. Durbin, Eddy, Krogh, Michinson, Biological Sequence Analysis, Cambridge, 1998
3. Holmes Molecular Evolution: A phylogenetic Approach, Blackwell Sciences Inc 1999

4. Campbell A.M and Heyer, L. J. Discovering genomics, proteomics and bioinformatics, Benjamin Cummings, 2002
5. Pevzner, P. Computational Molecular Biology, MIT press, 2000
6. Baxevanis. A. Oullette , F. A Practical Guide to Gene Analysis, 1998

CSE/T/326D ENERGY MANAGEMENT

Fundamentals of Energy conversion systems Energy Resources: Energy & Development, Units & Measurements Optimization of Energy use. Conventional and non conventional sources of energy Direct & indirect way of energy conversion Energy storage technologies Basic of solar thermal conversion Management & Audit, Basics of Energy demand & supply, Energy conversion and management in power plant, Tools for energy auditing, Case studies for energy management opportunities in small industries and commercial houses.

CSE/T/326E ENVIRONMENTAL ENGINEERING

Fundamentals of air pollution control, Design of air pollution control equipment, Collection efficiency, Advantages & disadvantages of various control devices viz., Gravitational settling chambers, Cyclone separators, Fabric filters, Electrostatic precipitators, Scrubbers etc. Fundamentals of water pollution control, Primary, Secondary and Tertiary methods of treatment, Design principles of various treatment processes, Choice of treatment processes. Fundamentals of noise pollution, Impact of noise pollution, Measurement and control of noise pollution. Definition of hazardous wastes, Classification & sources of hazardous waste generation, Hazardous waste treatment and disposal techniques.

CSE/S/321 COMPILER DESIGN LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Compiler Design".

CSE/S/322 OPERATING SYSTEMS LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Operating Systems".

CSE/S/323 VLSI LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "VLSI Design".

CSE/S/324 DESIGN LABORATORY-II

Involves design, implementation and debugging of small but nontrivial systems based on microprocessors. Students will have to deal with all aspects of microprocessor based system design and finally demonstrate a fully functional prototype system.

Fourth Year First Semester

CSE/T/411 INTERNET TECHNOLOGIES

The Internet: Brief history. Organization and architecture. Routing in the Internet Transport Layer in the Internet Quality of Service (QOS): QOS requirements Internet security: IP-Sec, Firewall. Internet Application Layer: DNS, e-mail, SMTP, POP 3, World Wide Web & HTML Web design basic Client side programming Server side programming Web-enabled databases Web services.

CSE/T/412 EMBEDDED SYSTEMS

INTRODUCTION: Embedded systems overview, Design metrics System implementation and performance.
GENERAL PURPOSE PROCESSORS: Review of microprocessors and microcontrollers - recent developments in memory and interfacing technologies.
DIGITAL SIGNAL PROCESSING: Fundamental concepts, Simple filtering algorithms, FIR and IIR filters, DSPS and DSP based implementation of filters
FPGA AND CPLD TECHNOLOGIES: Principles of FPGA operation FPGA design software - compilation and design verification Behavior modeling with VHDL, Xilinx Logic Cell Array architecture. CLB interconnection and I/O. LCA design software
IC TECHNOLOGIES: VLSI, ASIC, Gate Array and Standard Cell. IC design methodologies - automation, verification and reuse. Hardware-software codesign and cosimulaton
CONTROL SYSTEM FUNDAMENTALS: Open loop and closed loop control systems. PID controllers - Design of PID controllers
EMBEDDED SYSTEM CASE STUDIES

BOOKS

1. F Vahid and T. Givargis, Embedded System Design - A Unified Hardware/Software Introduction, John Willey & Sons (Asia) Pvt Ltd, 2002
2. J.H. Jenkins, Designing with FPGAs and CPLDs, PTR Prentice Hall, 1994 Mazidi, 8051 Microcontrollers and Embedded systems, Pearson Education Asia (LPE), 2001

CSE/T/413 FORMAL LANGUAGE & AUTOMATA THEORY

Strings and their operators, Regular expressions - algebraic properties, Finite Automata, closure properties, Kleen's theorem, Subset construction, Minimization, Pumping lemma, CFLs - closure properties, grammatical transforms, Normal Forms, Ogden's lemma, Push Down Automata, Equivalence of different modes of acceptance, relationship with CFL,

Ambiguity and deterministic language, decision problems, introduction to Turing Machines and Undecidability, hierarchies of languages.

CSE/T/414 PATTERN RECOGNITION & IMAGE PROCESSING

Part I: Pattern Recognition • Introduction • Classification- Bayes' classifier, Maximum Likelihood classifier, Minimum Distance Classifier, Nearest Neighbor classifier • Clustering- Basic Sequential Algorithm, Partition based clustering (e.g. k-means, maximin), Hierarchical Clustering • Feature Selection and Extraction • Learning- Supervised and Unsupervised • Trainable Pattern classifier- Connectionist and Statistical Approaches Part II: Image Processing • Fundamentals of digital image processing • Low Level image processing - Segmentation, Edge Detection etc • Image Transformations • Image Enhancement • Image Restorations • Image Registration • Image Data Compression

Books:

1. Pattern Recognition Principles: Tou, Gonzalez, Addison-Wesley
2. Pattern Classification: Duda, Hart, Stork, John Wiley & Sons, 2001
3. Digital Image Processing: Gonzalez, Woods, Pearson Education 2003
4. Digital Image Processing and Analysis: B. Chanda and D. Dutta Majumdar
5. Digital Image Processing: E. Hall Pattern Recognition and Image Analysis: E.Gose, R. Johnsonbough, S. Jost, Prentice Hall of India Pvt Ltd., 2002)

CSE/T/415 ARTIFICIAL INTELLIGENCE

• Introduction • Search - Uninformed, Informed/Heuristic, Some advanced intelligent search techniques (like Hill Climbing, Simulated Annealing, Genetic Algorithm, Tabu Search) • Adversary search - Game Playing • Knowledge and Reasoning - Predicate calculus In Artificial intelligence, Resolution Refutation Systems • Structured knowledge Representation Techniques • Reasoning under Uncertainty – Non Monotonic Reasoning Systems, Assumption based Truth Maintenance System, Probabilistic Reasoning, Fuzzy Reasoning. • Machine Learning - Decision Trees, Artificial Neural Networks • Planning • Some Applications of Artificial Intelligence.

Books:

1. Artificial Intelligence: N. J. Nilsson, Harcourt Asia Pte Ltd, 2000
2. Artificial Intelligence and Modern Approach: S. Russel, P. Norvig, Pearson Education, 2003
3. Principles of Artificial Intelligence: N. J. Nilsson, Narosa Publishing House, 1993
4. Artificial Intelligence: G. F. Lugar, Pearson Education, 2001
5. Essentials of Artificial Intelligence: M. Ginsberg, Morgan Kaufman Publishers
Artificial Intelligence: Rich

CSE/T/416 GENERAL VIVA – VOCE

Based on all the theoretical and sessional subjects of BCSE course.

CSE/S/411 PROJECT-I

Topics for Project I are to be chosen from the areas covered in the third and fourth year of the BCSE programme

CSE/S/412 SEMINAR-I

Topics for Seminar I are to be chosen from the areas covered in the third and fourth year of the BCSE programme.

CSE/S/413 INTERNET TECHNOLOGIES LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Internet Technologies".

CSE/S/414 COMPUTER NETWORKS LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Computer Networks".

Fourth Year Second Semester

CSE/T/421 DISTRIBUTED COMPUTING

Distributed system characterization and models, Networking and internetworking, Interprocess communication, Remote Method Invocation, Distributed objects, Synchronisation and message passing, Deadlock and Livelock, Non-determinism, Safety and liveness properties, Client/server computing, Sockets for client/server communication, ORBs, CORBA and Java IDL, Transaction Processing, EJB, Message Passing (MQ and JMS, Security, Name services, Replication, Distributed multimedia, Operating system support, Distributed file systems, Introduction to grid computing, Advanced topics.

CSE/T/422 PROGRAMMING ENVIRONMENT & USER INTERFACE DESIGN

Importance of User Interfaces (UI) in Computer Applications. UI Design as an Engineering problem. I/O Devices for User Interface. Ergonomic aspects of UI Cognitive and Cultural aspects of UI Principles of UID – Ease of Learning. Ease of Use – Consistency -Terseness. Usage of Special Keys and Function Keys. Methodology for Design of Command Names and Structures, Error Messages and Exception Reporting, Dialogues, Menus, Forms, Windows. Windows Programming. Case Studies. Design of Graphical User Interfaces (GUI) – Object Orientation. GUI Tools – case studies. UI

Management Systems Advanced UI's for groupware – 3D and Multimedia UI's – Multilingual UI.

Books:

1. M. Helander (Ed.): Handbook of Human – Computer Interaction, Elsevier Sc. Pub., Amsterdam, 1988.
2. D. A. Norman: The Psychology of Everyday Things, Basic Books, N.Y.,1988.
3. B. Schneiderman: Designing the User Interface, Addison Wesley,1987.
4. R. Rubinstein & H. Hersh : The Human Factor, Digital Press, Bedford, 1984.
5. B. Lausel (Ed.): The Art of Human Computer Interface Design, Addison Wesley, 1990.
6. A. Marcus: Graphic Design for Electronic Documents and User Interface Design, Addison Wesley, 1991.
7. J. Nielson: Usability Engineering, Academic Press, 1992.
8. J. Nielson: Coordinating User Interfaces for Consistency, Academic Press , 1989.
9. Alex Leavens: Designing GUI Applications for Windows, BPB, 1995.
10. Cox & Walker: User Interface Design, P.H., 1993.

CSE/T/423 INDUSTRIAL MANAGEMENT AND OPTIMIZATION TECHNIQUE

Production, Planning and Forecasting – Scheduling and network technique, Inventory control, Quality control and Statistical quality control, Maintenance and replacement policies for machine and equipment, Decision making theories, Break even analysis, Benefit analysis, Fund and cash flow analysis, Budgetary control, Different types of audit, Problem of allocation of limited resources in an optimal way, Formulation of linear programming problem - Graphical methods, Simplex techniques, Transportation and assignment models, Introduction to game theory, Equivalence of matrix game and the problem of linear programming.

Books and References:

1. H.B. Manyard, Handbook of Industrial Engineering
2. Billey E. Gillet, Operations Research: A Computer oriented algorithmic approach; Tata McGraw Hill

CSE/T/424 DATA MINING TECHNIQUES & APPLICATIONS

Concepts of Knowledge Discovery from Database Process and Data Mining; Scalability issues of data mining algorithms Data Warehousing and OLAP Data Preprocessing: Summary Data Structures, Dimensionality Reduction, Data cleaning Association Rule Mining: Apriori Algorithm, FP Tree Algorithm Clustering: Partitional, Hierarchical, Density Based, Grid Based Classification: Decision Trees, Instance Based, Support Vectors Machines, Computational Learning theory Mining Complex types of Data – web, spatial, temporal etc Applications and Trends in Data Mining

Books and References:

1. J. Han & M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann/ Elsevier, India, 2001
2. D. Hand, H. Mannila, & P. Smyth. Principles of Data Mining, MIT Press, 2001.
3. Recent literature from ACM SIGMOD, VLDB, IEEE Trans. Knowledge & Data Engg., Data Mining & Knowledge Discovery, ACM SIGKDD, IEEE ICDM, SIAM, Data Mining, ICML .

CSE/T/425 ELECTIVE-II

1. COMPUTATIONAL GEOMETRY
2. PARALLEL & HIGH PERFORMANCE COMPUTING
3. COMPUTER MODELING & DISCRETE EVENT SIMULATION
4. NATURAL LANGUAGE PROCESSING
5. SOFT COMPUTING
6. INFORMATION & CODING THEORY
7. COMPLEXITY OF COMPUTATION
8. MOBILE COMPUTING
9. GRAPH AND COMBINATORIAL ALGORITHMS
10. MULTIMEDIA TECHNOLOGIES

CSE/T/425A COMPUTATIONAL GEOMETRY

Art gallery theorems, triangulation of polygons, segment intersection, partitioning of polygons, convex hulls in 2-d and 3-d, lower bounds and incremental algorithms, Voronoi diagrams, Delaunay triangulation medial axis, arrangements and their combinatorics, Duality, Search point in polygon and polyhedron, intersection of polygon and segments, extreme points, motion planning: shortest paths, disk movement, translating a convex polygon, ladder and robot arm motion.

CSE/T/425B PARALLEL & HIGH PERFORMANCE COMPUTING

Part 1: Introduction and Motivation Motivation for high performance and parallelism; Application areas and themes Introduction to technologies; Different Applications and Algorithms
Part 2: High Performance Techniques for modern Serial Processors Models for cache performance and memory hierarchy; Cache aware and Cache Oblivious Algorithms Compiler Optimization Issues; Overheads
Part 3: Parallel Programs and Programming Languages Development of two Main Parallel Programming Models: multiple processes [message-passing] & multiple threads; [Data Sharing] - ‘private’ and ‘shared’ variables Requirements for Parallel Programming Languages Case Studies [using simple parallel algorithms] Message-Passing Extensions to High Level Languages; Data Sharing extensions to high level languages
Part 4: Fundamentals of Parallel Hardware Introduction to Parallel Hardware: sequential heritage; shared memory multi-processor, distributed memory multi-computers Overview

of CPU technologies: Commodity versus Proprietary; (super)scalar versus vector Memory organization and Data Layout : 'Real' versus 'virtual' Addressing - UMA, NUMA AND COMA schemes:, Access time hierarchy Interconnections networks State-of-the-art case studies
Part 5: Performance models Workload, load balancing and parallel overheads, Performance, Speed up and Efficiency
Part6: Conclusions Making it all work together: Obtaining High Performance in real systems; Effect of data layout on program performance: Case study (Dense matrix multiplication) Overview of the state-of –the-Art, Research and future development.

Books

1. Foster, I.T., Designing and building parallel programs: concepts and tools for parallel software engineering., (ISBN 0-201-575-949), Addison-Wesley 1995
2. Culler, D.E. and Singh, J.P., with Gupta A., parallel computer Architecture: a hardware/ software approach, (ISBN 1-55860-343-3), Morgan Kaufman 1999.
3. Hockney, R.W.and Jesshope, C.R., Parallel Computers 2, (ISBN 0-862-748-124), Adam Hilger 1988 4. Introduction to Parallel Computing by Vipin Kumar et.al

CSE/T/425C COMPUTER MODELING & DISCRETE EVENT SIMULATION

Discrete Event simulation ? Survey of simulation languages and tools. ? Designing simulation experiments ? Simulation strategies ? Analysis of simulation output ? Variance reduction techniques ? Validation of simulation results. Modeling case studies : ? modeling a distributed client server computer system ? modeling a multimedia information system . Contemporary modeling techniques ? interactive graphical modeling ? finite state modeling

Books: 1. Introduction to Discrete Event Systems: C. G. Cassandras, Kluwer Academic Publishers

CSE/T/425D NATURAL LANGUAGE PROCESSING

Part I: Symbolic Approaches to NLP Symbolic Approaches to Natural Language Processing, Fundamental Concepts and Tools - Tokenisation and Sentence Segmentation, Lexical Analysis, Parsing Techniques, Semantic Analysis, Discourse Structure and Intention Recognition, Natural Language Generation, Typical applications - Intelligent Writing Assistance, Database Interfaces, Information Extraction, The Generation of Reports from Databases, The Generation of Multimedia Presentation, Machine Translation, Dialogue Systems Part II: Empirical Approaches to NLP Empirical Approaches to Natural Language Processing, Corpus Annotation, Part of Speech Tagging, Alignment, Computing Similarity, Collocations, Statistical Parsing, Authorship Identification and Computational Stylometry, Lexical Knowledge Acquisition, Example-Based Machine Translation, Word-Sense Disambiguation Part III: Artificial Neural Network Approaches to NLP NLP Based on Artifical Neural Networks: Introduction, Knowledge Representation, Grammar Inference, Automata Induction, and Language

Acquisition, The Symbolic Approach to ANN-Based Natural Language Processing, The Subsymbolic Approach to ANN-Based Natural Language Processing, The Hybrid Approach to ANN-Based Natural Language Processing, Some Examples of ANN-Based System to NLP

Reference:

1. Speech and Language Processing – Daniel Jurafsky and James H. Martin, Pearson Education
2. Natural Language Understanding – James Allen, Pearson Education.
3. Handbook of Natural Language Processing – Dale, Moisl, Somers (Eds.), Marcel Dekker

CSE/T/425E SOFT COMPUTING

• Introduction • Fuzzy systems- fuzzy operators, fuzzy relations, measures of fuzziness, fuzzy reasoning. • Artificial Neural Networks- single layer and multilayer perceptron, RBF Network, Hopfield's network, Kohonen's network, ART. • Genetic Algorithms- Schema Theorem, various selection procedures, Crossover and mutation operators, constrained optimization, ordered GA , distributive/parallel GA, multi-objective GA. • Rough sets • Application of the above soft computing tools • Hybridization of these tools and their applications.

Books:

1. Genetic Algorithms in Search, Optimization and Machine Learning – D. E. Goldberg, Pearson Education, 2003
2. Fuzzy sets and Fuzzy Logic- G.J. .Klir, B. Yuan, Prentice Hall of India Pvt. Ltd., 1997
3. Neural Networks - S.Haykin, Pearson Education, 2003
4. Rough Sets, Theoretical Aspects of Reasoning about Data – Z. Pawlak, Kluwer Academic, 1991.
5. Neuro fuzzy and Soft Computing, S.R. Jang, T. Sun, Mizutani, Prentice Hall of India Pvt Ltd., 1997

CSE/T/425F INFORMATION & CODING THEORY

Entropy and average mutual information-measures and characterization, Huffman and Shannon Fano coding, Rate distortion function and optimum quantizer, channel- models and capacity, Shannon limit. Properties of finite fields- minimal polynomials, existence of primitive elements, Linear Block codes and syndrome decoding, Perfect codes, Maximum distance separable codes, Cyclic codes, Burot error correction, Fire codes, Golay Codes, CRC Codes, BCH Codes, Reed-Solomon Codes, Shift register sequences & their synthesis, Concatenated Codes, Convolutional codes - Trellis codes, Vitrebi decoding, Turbo codes, Trellis coded modulation, introduction to cryptography, Public key cryptography, RSA,

CSE/T/425G COMPLEXITY OF COMPUTATION

Turing machines- different variants and equivalence, counter machines, multistacks machines, limits on states and symbols, recursively enumerable and recursive sets, universal Turing machines, halting problem, Rice's theorem, PCP & other undecidable problems, Oracles, Space and time complexity, linear speed up & tape compression, space & time hierarchy, gap, speed up & unions theorems, NP-complete problems PSPACE complete problems, provably intractable problems, P ? NP Problem relative to Oracle.

CSE/T/425H MOBILE COMPUTING

• Introduction to wireless networks and mobile computing • Characteristics of mobile computing. Simplified reference model • Fundamentals of wireless transmission • Medium Access Control Protocols FDMA, TDMA, CDMA • Mobile IP IP micro-mobility protocols Mobile Ad-hoc networks • Mobile transport layer Effects of mobility on Reliable Transport Protocols, Mechanisms for improving TCP performances on wireless links • Mobile/ Wireless Locations Managements Location determination Technologies, Power Management • Wireless LAN IEEE 802.11 series Overview of Bluetooth • Wireless application Environments WAP WML, Push Architecture, Push/Pull Services • Mobile Computing Wireless Java (J2ME/BREW) • Mobile Information access Mobile file systems • Mobile Middleware Tool for logical and physical mobility • Overview of Security in mobile environments • Introduction to Ubiquitous computing Introduction to Mobile Adhoc Network

CSE/T/425I GRAPH AND COMBINATORIAL ALGORITHMS

Properties of DFS forests, separability, bi-connectivity, transitive closure, equivalence relations, partial orders, topological sorting, strong components, Boruvka's Algorithm, Euclidean MST, shortest paths with negative weights, network flows: Augmenting path Max-flow algorithms, Preflow- push max flow algorithms, Maxflow reductions, Mincost flows, Network simplex algorithms, Mincost flow reductions, Matching on general graphs, Knapsack problems, bin-packing, job scheduling backtracking- branch and bound, Amortized bounds, coverings, independent sets and colorings, dominating sets Matroids- axiom systems, duality, graphoids, restrictions, contractions and minors, representability, binary matroids, orientable matroids, characterization of greedy algorithms Permutation and combination generation algorithms, ranking, unranking and enumeration, algorithms on subspaces, block designs, codes and Hadamard matrices.

CSE/T/425J MULTIMEDIA TECHNOLOGIES

Motivation, Evolution of Multimedia Structure and Components of multimedia, Application domains, Internet and Multimedia Primary user Interface Hardware, Primary visual Interface Items, Basic Metaphors, Hypertext, Hypermedia, Browsers and Helper Application Overview Psycho acoustics- frequency and amplitude, sensitivity of hearing, music and noise, stereo effects, masking, frequency domain compression of analog sound

signal, Digitization of audio signal- sampling and coding, digital audio signal processing, Architecture of sound card, elementary concepts of music, pitch and voice, stuff notation and scoring, Electronic music and synthesizer, MIDI interface, Protocol and data format. Principles of raster graphics, Digital image representation and formats, graphic drafting tools, Image processing and enhancement color printer principle, image scanner principles, file format, digital still camera and photography. Animation principles, survey of animation tools, special visual effects- Wiping, morphing etc. Analog video- principles, broadcasts standards, CCD Camera, recording formats and standards, digital video- principles, PC video and video conference standards, TV cards, Frame Grabber principles, IDTV and HDTV principles, motion picture to video conversion. Magnetic media principles and storage density achievable, evolution & basic principles of Compact Disks technology- CD-DA and CD-ROM, CD-DA format and details, CD-ROM format & principles, writable compact disk- WROM & magneto optical disk principles, photo-CD, CD-ROM production process, IDE, SCSI & USB interfaces to storages devices. Hypertext, HTML, MHEG & hypermedia, AGML, ODA, quicktime movie file format, open media framework. Temporal dependence in multimedia presentation, inter-object & intra-object synchronization, reference model & specification. Real time requirements of multimedia, distributed multimedia architecture, multimedia conferencing using Internet & ISDN. Application development: overview, life cycle models, human roles & team works, product planning- basic authoring paradigm, story scripts, authoring Metaphors & authoring languages, content analysis, cost quality trade-offs, IPR & Copyright issues. Authoring tools & metaphors. Production processes: visual design fundamentals, media preparations, graphics & image editors, component editing principles & tools- animation edition, sound editing, video editing, Dubbing Subtitling. Media integration principles & tools. CD-ROM preparation.

CSE/S/421 PROJECT-II

Topics for Project-II are to be chosen from the areas covered in the third and fourth year of the BCSE programme.

CSE/S/422 SEMINAR-II

Topics for Seminar-II are to be chosen from the areas covered in the third and fourth year of the BCSE programme.

CSE/S/423 DISTRIBUTED COMPUTING LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Distributed Computing".

CSE/S/424 EMBEDDED SYSTEMS LABORATORY

Lab experiments will be related to topics covered in the corresponding theory paper "Embedded Systems".