CE/CS/EB/EC /EE/EI/IT/ME/MRE/SE 301Engineering Mathematics III

Module I

Fourier series and Fourier integrals: Periodic functions, Euler formulae for Fourier coefficients, functions having arbitrary period, even and odd functions, half range expansions, Fourier integral, Fourier cosine and sine transformations, linearity property, transform of derivatives, convolution theorem (no proof)

Gamma and Beta functions, error functions - definitions and simple properties.

Module II

Special functions: Legendre polynomial, Rodrigue's formula- generation function, recurrence formula for Pn (x), orthogonality. Bessel function, Jn(x)- recurrence formula, general function, orthoganilty.

Module III

Partial differential equations: Solutions of equations of the form F(p, q) = 0, F(x,p,q)=0, F(y,p,q)=0, F(z,p,q)=0, $F_1(x,p) = F_2$ (y,q), Lagrange's form Pp+Qq = R.

Vibrating string: one dimensional wave equation, D'Alembert's solution, solution by the method of separation of variables. One dimensional heat equation, solution of the equation by the method of separation of variables, solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variables.

Module IV

Probability and Statistics: **Probability distributions**: random variables (discrete & continuous), probability density, mathematical expectation, mean and variance of a probability distribution, binomial distribution, Poisson approximation to the binomial distribution, uniform distribution , normal distribution

Curve fitting: method of least squares, correlation and regression, lines of regression.

Module V

Sampling distributions: population and samples, the sampling distribution of the mean (? known), the sampling distribution of the mean (? unknown), the sampling distribution of the variance, point estimation, interval estimation, tests of hypotheses, null hypotheses and significance tests, hypothesis concerning one mean, type I and type II errors, hypotheses concerning two means.

The estimation of variances: Hypotheses concerning one variance - Hypotheses concerning two variances.

Note:- Treatment of the topics under Modules IV, V should be oriented towards application of statistical techniques to problems in real life.

References:

1) Ervin Kreyszig : Advanced Engineering Mathematics, Wiley Eastern
2) Potter, Goldberg : Mathematical Methods, Prentice - Hall
3) Churchill R.V. : Fourier series and Boundary Value Problems - McGraw Hill
4) Irvrin Miller & John E. Freind : Probability and statistics for Engineers , Prentice Hall of India.
5) Bowker and Lieberman : Engineering Statistics Prentice - Hall
6) Kirk - Patrick : Introductory statistics and probability for engineering science and technology , Prentice -Hall
7) Parzen E : Modern Probability Theory and its Applications, Wiley estern.

CS/EB/EC/EI/IT/ME/MRE 302 Electrical Technology

Module I

Transformers: working principles and elementary theory of an ideal transformer, Constructional features of single phase transformer, emf equation, turns ratio, vector diagram , equivalent circuit, impedance transformation, transformer losses, flux leakage, efficiency, open circuit and short circuit test, load test. Auto transformer - working principle and saving copper, basic idea of current transformer and potential transformer, distribution and power transformer, applications, standard rating, IS specifications.

Module II

Basic principles of electrical machines: Concepts of motoring and generating action,

DC machines- Main constructional features, principles of operation, types of generators, emf equation, characteristics, applications, armature reaction and commutation, types of motors, torque, speed, and power, characteristics, applications, starting losses, and efficiency, speed control, testing, load test of dc machines.

Module III

AC Machines: Alternator- rotating field, speed and frequency, effect of distribution of winding, coil span, characteristics, emf equation, losses and efficiency, regulation (emf method only), applications, synchronous motor- principle of operation, over excited and under excited, starting, applications, synchronous capacitor.

Module IV

Induction Motor: Three phase induction motor, principles of operation, constructional features of squirrel cage and slip ring motors, torque-slip characteristics, starting, speed control, losses and efficiency.

Single phase induction motor: Principle of operation, types of single phase induction motors

Module V

Generation, transmission & distribution of electrical energy:

Different methods of power generation- thermal, hydro-electric, nuclear, diesel, gas turbine stations (general idea only), electrical equipments in power stations, concept of bus bar, load dispatching, methods of transmission, transmission lines, overhead lines and insulators, corona and skin effect of DC & AC distribution, substation (elementary idea only)

References:

1) Electrical Machines : By F.S.Bimbra, Khanna publications.
2) Advanced Electrical Technology : By H.Cotton, Wheeler publications.
3) Electrical Machines : Nagarath & Kothari, (TMH)

CS/IT 303 Discrete Mathematical Structures

Module I

Introduction to set theory –sets and subsets – operation on sets – sequences – characteristic functions – Introduction to logic propositions and logic operations – methods of proof – mathematical induction. Counting – permutations and combinations – elements of probability

Module II

Relations and Digraphs – properties of relations – paths in relation and digraphs – Equivalence relations and partitions – operations on relations. Functions – composition of functions – functions for Computer Science.

Module III

Introduction to graph theory – graphs – Eulerian paths and circuits- Hamiltonian Path and circuits - coloring of graphs - trees – minimal spanning trees

Module V

Algebraic Systems – Semi groups and monoids. Groups – subgroups and homomorphism – group codes – error correcting codes.

Module VI

Partially ordered sets- Hasse diagram – isomorphism – extremal elements – lattice- properties of lattices.

References

1) J.P.Tremblay, R. Manohar, “Discrete mathematical Structures with Applications to Computer Science, McGrawHill
2) Bernard Kolman, et.al., “Discrete Mathematical Structures”, 3rd ed., Prentice Hall India, New Delhi, 1999
3) John Truss, "Discrete Mathematical Structures for Computer Science", Addison Wesely,
4) Seymour Lipchutz, Marc Lipson, "Discrete Mathematics", Tata McGraw-Hill

CS /EB/EC/EE /EI304 Digital Electronics

Module I

Number system and codes: Binary, Octal, and Hexa-decimal number systems - Binary arithmetic, Binary code, Excess - 3 code Gray error detection and correction - Boolean algebra - Minimization of Boolean function using Karnaugh Map and Quine - Mclusky methods - Formation of switching functions from word statements, realisation using NAND, NOR & X - OR Gates. Combinational circuits- multiplexer demultiplexer decoder encoder

Module II

Sequential circuits: Flip-flops - RS, JK & T & D flip- flops, shift registers - counters - Asynchronous and synchronous counters, Up-Down counter, Modulo counter, Ring counter, Johnson counter - sequence generators - Analysis of sequential circuits - state table and diagrams

Arithmetic circuits: Half adder, Full adder, Subtractor, Serial and parallel addition - Carry look ahead adder - Binary multiplication and division - Multivibrators - Monostable and astable multivibrators using discrete gates.

Memories - ROM, RAM, EPROM, Programmable logic array, devices - Basic ideas - PLD architecture - PAL and PLA - Programming examples with software tools - Study of PAL 22v10

Logic families: DCTL, RTL, DTL, TTL, ECL, CMOS - Tri-state logic - specification and transfer characteristics of basic TTL interfaces, - Standard logic levels - Current and voltage parameters - fan in and fan out - Propagation delay, integrated circuit modules, noise consideration- interfacing of CMOS to TTL and interfacing of TTL to CMOS

References:

1) Taub & Schilling, “Digital Integrated Electronics”, Mc Graw Hill
2) Samuel C Lee, ”Digital Circuits and Logic Design”, Prentice Hall
3) A P Malvino,”Digital Computer Electronics”, Tata Mc Graw Hill
4) Morris & Miller, “Design with TTL Integrated Circuit”, Mc Graw Hill
5) Peatman , ”Digital Hardware Design”, Mc Graw Hill
6) Ronald J Tocci , “Digital Systems, Principles and Applications “, Prentice Hall
7) Lloyd T L, ”Digital Fundamentals”, Universal, N. Delhi
8) Mercins, ”Switching Circuits”, Prentice Hall
9) MOS-LSI Circuits, Publication of Texas Instruments
10) Douglas V Hall, “Digital Circuits and Systems”, Mc Graw Hill
11) R P Jain, Principles of Digital Electronics

CS 305 Electronic Circuits

Module I

Semiconductor devices PN junction- barrier potential, biasing PN junction, - principle of zener and avalanche diodes - photodiodes -LDR - tunnel diode -PIN diode - varactor diode. Bipolar junction transistors - NPN, PNP types, current components in transistors Transistor configurations - Characteristics - current amplification factors - relations between alpha & beta - comparison - Field effect transistors: JFET - basic structures - principle of operation - basic principles & characteristics of phototransistors - UJT. & MOSFET.

Module II

Small Signal amplifiers –- Biasing techniques - stabilization of operating point - h-parameters - CE RC coupled amplifier - concept of load lines- frequency response of RC coupled amplifier -- frequency analysis of R C coupled amplifier - lower cut-off frequency - upper cut-off frequency - 3 db bandwidth Multistage Amplifiers& Feed-back amplifiers: Negative and positive feedback - Different types Pulse circuits - pulse characteristics - Pulse shaping using RC circuits - Differentiating and integrating circuits - clipping and clamping circuits - Transistor as a switch– Multivibrators.

Module III

Power amplifier -classification - class A, class B, Class AB and class C - Transformer coupled & - Transformerless class AB push-pull Power amplifier - complementary symmetry power amplifier – Harmonic distortion – Heat sinks. Principle of sinusoidal oscillators - Bark Hausen criteria - RC - LC, Crystal oscillators

Module IV

Difference amplifier. Common mode and difference mode operation - CMRR - merits and demerits - use of constant current source, drift and offset problems - Operational amplifier block diagram - Characteristics of ideal op-amps - Linear circuits using op-amp - -inverting amplifier, non-inverting amplifier instrumentation amplifier, adder, substractor, log and antilog amplifier, integrator, differentiator, peak detector, precision rectifier. Nonlinear circuits using op-amp-comparators, multivibrators, function generators - Active filters.

References:

1) Millman & Halkias, ”Electronic Devices & Circuits”
2) Bapat K N, ”Electronic Devices & Circuits”
3) Allan Mottorshed, ” Electronic Devices & Circuits”
4) Millman & Halkias, ”Integrated Electronics”
5) Boylestead & Neshelsky,”Electronic Devices & Circuits
6) Schilling &Belove “Electronic Circuits, Discrete & Integrated” TMH
7) Gayakwad, “ Op-Amp and Integrated Circuit”
8) Clayton,” Operational Amplifiers”
9) Sergio Franco “Design with Op amps & Analog Integrated Circuits” MH International
10) Theodore F.Bogart Electronic Devices & Circuits Universal Book Stall, New Delhi.

CS 306 Electronics Circuits Lab

1. Study of - Multimeter, Signal generators, CRO etc. and measurement of electrical quantities
2. Testing of Passive and Active components - Resistors, Capacitors, inductors, Transformers, diodes, Transistors, etc.
3. Characteristics of Active devices
4. Rectifying circuits
   i) HW rectifier
   ii) FW rectifier
   iii) FW Bridge rectifier
   iv) Filter circuits - Capacitor filter, inductor filter and Pi section filter
   (Measurement of ripple factor, maximum ratings of the devices)
5. Differentiating circuit and integrating circuit.
6. Clipping & Clamping circuits.
7. Amplifying circuits Simple common emitter amplifier configuration - gain and bandwidth.
8. Oscillators –
9. Multivibrators - Astable only.
10. Circuits using OP- Amps

CS /EB/EC /EI 307 Electrical Lab

Compulsory experiments

1. (a) Preliminary study of AC and DC Power supplies in the laboratory.
   (b) Study of instruments and their mode of use
2. Open circuit characteristics of
   (a) Self excited generator
   (b) Separately excited generator.
3. Load characteristic of compound generator
4. Load characteristic of shunt generator
5. Study of face plate starter and starting of DC motors
6. Load characteristics of DC series motor.
7. Swinburn's test
8. Polarity and transformation ratio test on single phase transfer.
9. O.C & SC test on single phase transformer - equivalent circuit
10. Load rest on single phase transformer.
11. Study of starting methods of squirrel cage and slip ring induction motor.
12. Load test on slip ring induction motor and study of characteristics.

Optional Experiments

1. Study of single phase motors.
2. Load test of DC shunt motor.
3. Poly phase connection of single phase transformer.
4. Load test on squirrel cage induction motor
5. Study of alternators.

CEA/CS/EB/EC/EE/EI/IT/ME/SE 401Engineering Mathematics IV

Module I

Complex Analytic functions and conformal mapping: curves and regions in the complex plane, complex functions, limit, derivative, analytic function, Cauchy - Riemann equations, elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions.

Conformal mapping: Linear fractional transformations, mapping by elementary functions like e^z, sin z, cos z, sin hz, and cos hz, Schwarz - Christoffel transformation.

Module II

Complex integration: Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's series, Laurent's series, residue theorem, evaluation of real integrals using integration around unit circle, around the semi circle, integrating contours having poles, on the real axis.

Module III

Numerical Analysis: Errors in numerical computations, sources of errors, significant digits. *Numerical solution of algebraic and transcendental equations*: bisection method, regula falsi method, Newton - Raphson method, method of iteration, rates of convergence of this method,

Solution of linear system of algebraic equations: exact methods, Gauss elimination method, iteration methods, Gauss-Jacobi method.

Polynomial interpolation: Lagrange interpolation polynomial, divided differences, Newton's devided differences interpolation polynomial.

Module IV

Finite differences: Operators ?,?,?, and ?, Newton's forward and backward differences interpolation polynomials, central differences, Stirlings central differences interpolation polynomial.

Numerical differentiation: Formulae for derivatives in the case of equally spaced points.

Numerical integration: Trapezoidal and Simpson's rules, compounded rules, errors of interpolation and integration formulae. Gauss quadrature formulae (No derivation for 2 point and 3 point formulae)

Module V

Numerical solution of ordinary differential equations: Taylor series method, Euler's method, modified Euler's method, Runge-Kutta formulae 4^{th} order formula,

Solution of linear difference equations with constant co-efficients: Numerical solution of boundary value problems, methods of finite differences, finite differences methods for solving Laplace's equation in a rectangular region, finite differences methods for solving the wave equation and heat equation.

Reference:

1) Ervin Kreyszig: Advanced Engineering Mathematics, Wiley Eastern
2) S.S.Sastry: Introductory Method of Numerical Analysis, Prentice -Hall of India
3) Ralph G. Stanton: Numerical Methods for Science and Engg. Prentice - Hall of India
4) S.D.Conte and Carl de Boor: Elementary Numerical Analysis Analograthmic approach McGraw Hill
5) M.K.Jani, S.R.K Iyengar and R.K. Jain : Numerical Methods for scientific and Engineering Computations. Wiley Eastern.
6) P.Kandaswamy K.Thilagavathy : Numerical Mehtods , S.Chand & Co. K.Gunavathy
7) E.V.Krishnamurthy, S.K.Sen: Numerical Algorithms, Affiliated East West.

CS 402 Principles of Programming Languages

Module I

Programming Domains. Language evaluation. Evolution of major programming languages. Describing Syntax and Semantics. Formal methods of Describing Syntax and semantics. Backus Naur Form. Attribute grammars. Describing semantics - Denotational semantics.

Module II

Data types and ariables - Names - variables . Scope and lifetime. Expression and assignment Statements. Control structures. Subprograms - parameter passing - overloading - generic subprograms.

Module III

Data abstraction and Encapsulation. Polymorphism and inheritance. Features of object oriented Languages. Smalltalk, C++ and JAVA. Design and implementation issues. Exception handling. Constructs for concurrency

Module IV

Functional programming languages - Lambda calculus- Introduction to pure LISP. Applications of functional programming languages.

Module V

Logic programming languages- a brief introduction to predicate calculus - Horn clauses - Logic programming. Introduction to prolog. Applications of Logic programming.

References

1) James Gosling “Java Programming Language”, Addison Wesley,
2) “Symbolic Logic and Logic Programming”, Learning Material Series, Indian Society for Tech. Education, 1996
3) Bjarn Stroustrup, “Design and Evolution of C++”, Addison Wesley, 1991
4) Michael J.Gordon, “Programming language Theory and its implementation”, Prentice Hall, 1991
5) Terence W. Pratt, “Programming Languages”, Prentice Hall, Ninth edition 1996
6) Ravi Sethi, “Programming Languages-concepts and constructs”, Addison Wesely, Second Edition, 1996
7) Robert W.Sebesta, "Concepts of Programming Languages",

CS 403 Automata Languages and Computation

Module I

Finite State systems – Non Deterministic Finite Automata and Deterministic Finite Automata. Equivalence of NFA and DFA. Equivalence of NFA with and without epsilon moves.

Module II

Regular expressions – Equivalence of Finite Automata and regular expressions. Finite Automata with output. Moore and Meelay Machines. Equivalence of Moore and Meelay machines. Applications – Lexical Analysers. Properties of regular sets. Pumping Lemma for regular sets. Closure properties. Decision algorithms. Myhill Nerode's theorem and Minimisation of Finite Automata. Minimisation algorithm.

Module III

Context Free Grammars – Derivation of Languages – Derivation trees. Ambiguity. Simplification. Chomsky Normal Form and Greibach Normal Form. Push Down. Automata. Deterministic Push Down Automata. Equivalence of Push Down Automata and Context Free Languages. Pumping Lemma for Context free languages. Closure properties. Decision Algorithms.

Module IV

Turing machines – Computation – languages and functions. Techniques for Turing machine construction – storage in finite control – multiple tracks – checking of symbols, shifting over - subroutines. Non Deterministic Turing machines.

Module V

Undecidability – Recursive and recursively enumerable functions. Universal Turing machine. Halting problem of Turing machine. Chomsky Hierarchy – Equivalence of regular grammar and Finite Automata. Equivalence of Unrestricted grammar and Turing Machine. Context Sensitive Grammars. Equivalence of Context Sensitive languages and Linear Bound Automata (LBA). Relation between classes of Languages.

Text Books

1) J.E. Hopcroft, J.D. Ullman, "Introduction to Automata Theory, Languages and Computation", Addison Wesley, 1990.
2) K.L.P. Misra, N. Chandrasekharan, "Theory of Computation", Prentice Hall, 1998.

References:

1) H.R. Lewis, Shistos H. Papadimitrou, "Elements of Theory of Computation", Prentice Hall India, New Delhi, 1991.
2) John Martin, "introduction to Language and Theory of Computation", Tata McGraw-Hill, New Delhi, 1998.
3) Peter Linz, An Introduction to Formal Languages and Automata, Narosa Publications, 2000
4) Thomas A. Sudkamp, "languages and Machine – An Introduction to Computer Science", Addison Wesley, Reading, MA, 1990

CS 404 Computer Architecture & Organization

Module I

Basic structure of computer hardware and software - Addressing methods and machine program sequencing - Computer arithmetic - logic design for fast adders - multiplication - Booth's algorithm - Fast multiplication - integer division - floating point number representation- floating point arithmetic

Module II

Control unit - instruction execution cycle - sequencing of control signals - hardwired control - PLAs - micro programmed control - control signals - microinstructions- micro program sequencing- Branch address modification- Prefetching of micro instructions- emulation-Bit slices

Module III

Memory organisation-Semiconductor RAM memories- internal organisation-Bipolar and MOS devices - Dynamic memories - multiple memory modules and interleaving - cache memories - mapping functions - replacement algorithms - virtual memory - address translations - page tables memory management units - Secondary memory - disk drives - organisation and operations - different standards

Module IV

Input-output organisations - accessing I/O devices - direct memory access (DMA) - interrupts - interrupt handling - handling multiple devices - device identification - vectored interrupts - interrupt nesting - Daisy chaining - I/O interfaces - serial and parallel standards - buses - scheduling - bus arbitration – bus standards.

Module V

Introduction to parallel organisations – multiple processor orginisation - symmetric multiprocessors - cache coherences – non uniform memory access –vector computation –introduction to CISC & RISC - Architectures –comparison

Text Books:

1) Hamacher C V, "Computer Organisation – 4th Edition" , Mc.Graw Hill., NewYork ,1997
2) Stallings William, "Computer Orginisation and Architecture",6th Edition Pearson Education ,2003

References:

1) Pal Chaudhary P, "Computer Organisation and Design " , Prentice Hall, New Delhi,
2) Hayes J P , "Computer Organisation and Architecture - 2nd Edition ", Mc Graw Hill,
3) Tanenbaum A S , "Structured Computer Organisation - 3rd Edition", Prentice Hall,
4) Kai Hwang & Faye A Briggs "Computer Archtecture and Parallel Processing "Mc.Graw Hill., NewYork –1985
5) D.A Pattersen and J.L Hennesy ,"Computer Orginisation and Design: The hardware/software Interface 2nd Edition", Harcourt Asia private Ltd. (Morgan Kaufman),Singapore 1998

CS/IT 405 Data Structures and Algorithms

Module I

Introduction to data structures. Arrays. Sparse matrices. Strings - representation. Implementation of abstract data type (ADT) string. Linked Lists. Representation of polynomials using linked lists. Doubly linked list. Garbage collection. Buddy systems.

Module II

Stacks, implementation of ADT stack using arrays and lists. Typical problems. Conversion of infix to postfix. Evaluation of postfix expression. Queues and Deques, implementation. Priority queues

Trees, definition and mathematical properties. Binary trees. Binary tree traversal - Preorder, inorder and post order. Expression trees. Threaded Binary Trees. Representation of trees using binary trees. Search trees. Balanced binary trees.

Module III

Graphs. Mathematical properties - Degree - connectedness. Directed graphs - Directed acyclic graphs. Representation using matrix. Graphs traversal. Shortest path. Minimum Spanning Tree - Kruskal Algorithm. Symbol tables. Binary search. Hash tables. hashing functions.

Module IV

File structures. Random Access files. Indexed Sequential Files. B- Trees and B+ trees. External and internal sorting algorithms.

Note: The course should be taught using Object Oriented Programming Language JAVA

References:

1) Aaron M.Tanenbaum, Moshe J.Augenstein, “Data Structures using C”, Prentice Hall International Inc., Englewood Cliffs, NJ, 1986
2) Ellis Horowitz and Sartaj Sahni, “ An introduction to Data Structures”, Computer Science Press, Rockville, MA, 1984
3) Gregory L. Heileman, “Data structures, Algorithms and Object oriented programming”, McGraw-Hill, New York 1997.
4) Jean Paul Tremblay and Paul G Sorenson, “An introduction to Data Structures with Applications”, McGraw-Hill, Singapore, 1984
5) Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Benjamin/Cummings Publishing Company Inc., Redwood City, CA, 1991
6) Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Peach pit Press Benjamin/Cummings Publishing Company Inc., Redwood City, CA, 1991
7) Michael T. Goodrich and Roberto Tamassia, “ Data Structures and Algorithms in Java”, John Wiley and Sons, Inc., 1999
8) Michael Waite and Robert Lafore, “Data Structures and Algorithms in Java” , Techmedia, New Delhi, 1998
9) Robert L.Cruse, "Data Structures and Program Design", Prentice Hall India, 3rd ed., 1999
10) Sartaj Sahni, 'Data Structures, Algorithms, and Applications in Java", McGraw-Hill

CS/ EB/ EC/EE/EI 406 DIGITAL ELECTRONICS LABORATORY

1. Transfer characteristics and specifications of TTL and MOS gate
2. Design of half adder and full adder using NAND gates.
3. Set up R-S & JK flip flops using NAND Gates
4. Code conveters - Binary to Gray and gray to Binary using mode control.
5. Asynchronous UP / DOWN counter using JK Flip flops
6. Design and realisation of sequence generators.
7. Study of shift registers and design of Johnson and Ring counter using it.
8. Binary addition and subtraction (a) 1's complement (b) 2's complement
9. Study of IC counters 7490, 7492, 7493 and 74192.
10. Astable and monostable multi-vibrators using gates - IC version Timing circuit using 555
11. ADC using dual slope method.
12. Study of MUX & Demux
13. ROM & RAM Chips - Verification as memories

CS/IT 407 Data Structures Lab

Implementation and study of algorithms in a suitable programming language for the following

1. Sorting and Searching
2. Linked List
3. Stacks and Queues
4. Trees and Graphs

CS 501 LANGUAGE PROCESSORS

Module I

Assembler: Overview of the assembly process – Design of two pass assembler – Single pass assembler – Macros – Macro definition and usage schematics for macro expansion – Design of a Macro pre-processor – Design of a Macro assembler – Introduction to Loaders and Linkers.

Module II

Compiler: Introduction – Analysis of the source program – phases of a compiler – Compiler construction tools – Lexical analysis – Role of the lexical analyser – Specification of tokens – Recognition of tokens – Lexical analyser generators.

Module III

Syntax Analysis – Role of the parser – Context free grammars – Top-down parsing – Bottom-up parsing – Operator precedence parsing – LR parsers (SLR, Canonical LR, LALR) – Parser generators.

Module IV

Syntax-directed translation – Syntax-directed definitions – S-attributed definition – L-attributed definition – Top-down and bottom-up translation – Type checking – Type systems – Specification of a type checker. Run time environment – Source language issues – Storage organization – Storage allocation strategies – Access to nonlocal names – Parameter passing – Symbol tables.

Module V

Intermediate code generation – Intermediate languages – Declaration – Assignment Statement – Boolean expression – Procedure calls - Code optimisation – Introduction – Sources of optimisation – Introduction to data flow analysis. Code generator – Issues in the design of a code generator, the target machine, A simple code generator.

Text Book:

1) Alfred V. Aho, Ravi Sethi & Jeffrey. D. Ullman, Compilers Principles, Techniques & Tools.

References:

1) Aho. A.V & Ullman J.D Principles of Compiler Design .
2) S.S. Muchnick – Harcourt Asra (Morgan Kaufman),Advanced Compiler Design implementation, 1997
3) Modern Compiler Implementation in C , Cambridge Uty. Press 1997.
4) Alan Holub, Compiler Design in C, PHI
5) Kenneth C. Louden, Compiler Construction, Principle and Practice, Thomson Books
6) Leland L.Beck, “System Software – An Introuction to System Programming”, Addison Wesely
7) D.M.Dhamdhere, "System Programming and Operating Systems”, 2ond Ed., Tata Mcgrawhill

CS/IT 502 SOFTWARE ENGINEERING

Module I

Software Life Cycle – Waterfall Model – Prototyping – Object Oriented Analysis – Object, Dynamic & Functional Models – SRS – Format for SRS – Data Dictionary

Module II

Design: Principles – Cohesion & Coupling – Abstraction.

Object Oriented Design:- System Design – Object Design – Designing Algorithms – Design of association – Design Implementation

Module III

UML: Structural Modelling: Developing UML Object diagrams – Basic Components of Object Diagrams – Classes – Interfaces – Packages. ***UML***: Behavioural Modelling: Use Case Diagrams – Activity Diagrams – State Chart Diagrams

Module IV

UML Architectural Modelling: Component Diagrams – Deployment Diagrams – Unified Process

Case Study: - Applying Object Oriented Methodologies in Software Development

Module V

Case Tools: - A Study on Computer Aided Software Engineering – Workbenches – General Study on Case Tool usage in various phases

Case Study: - Preparing SRS, Plan and Object Oriented Design of typical Software project.

References:

1) Pankaj Jalote ,An Integrated approach to Software Engg: ,Narosa Publishers
2) Roger. S. Pressman.,Software Engg – A Practioner's approach (Mc. Graw Hill Publishers)
3) James Rimbough & Blaha.,Object Oriented Modelling & Design (PHA Publishers)
4) Booch & Rambaugh. – User Guide ,The Unified Modelling Language (Addisson Wesly Publishers)

CS 503 MICROPROCESSORS

Module I

Introduction to microprocessors - Architecture of typical 8 bit microprocessor – Intel 8085 microprocessors - study of functional units. Function of various controls signals -Design of CPU section with buffers and latches. Interrupt structure of 8085.

Module II

Instruction set of 8085 microprocessors - Addressing modes - Programming - examples - Instruction timing .Memory design - Design of memory using standard chips – Address decoding - I/O addressing schemes - I/O mapped I/O, and memory mapped I/O techniques

Module III

Interfacing peripherals – Basic interfacing concepts - Interfacing output displays – Interfacing input keyboards . 8085 Interrupts – Programmable Interrupt Controller (8259A)-Block diagram and operation - Direct Memory Access(DMA) – DMA Controller (Intel 8257)- Interfacing 8085 with Digital to Analog and Analog to Digital converters.

Module IV

Programmable peripheral interface (Intel 8255A) - Programmable communication interface (Intel 8251 - Programmable interval timer(Intel 8253 and 8254). Programmable Keyboard /display controller(Intel 8279). Serial and parallel bus standards– RS 232 C, IEEE 488, Centronics. Microprocessors Application

Module V

Introduction to microcontrollers - comparison with microprocessors - Study of Microcontroller (MCS 51 family) -8051 microcontroller: Architecture –instruction set - addressing modes – interrupts-programming- Interfacing with Stepper motor ,ADC and DAC- Typical applications.

References:

1) Ramesh S. Gaonkar ,*Microprocessor Architecture, Programming, and Applications with the 8085,* 5/E Prentice Hall ,2002.
2) Adithya P. Mathur , *Introduction to Microprocessors* , 3/E Tata McGrahill
3) Barry B. Brey ,*8085A Microprocessor, The: Software, Programming and Architecture*, 2/E Prentice Hall , 1993.
4) Richard H. Barnett, *The 8051 Family of Microcontrollers*, Prentice Hall ,1995.
5) Muhammad Ali Mazidi and Janice Gillispie Mazidi, *The 8051 Microcontroller and Embedded Systems* , Pearson education ,2000
6) Scott MacKenzie , *The 8051 Microcontroller*, 3/E Prentice Hall ,1999
7) James W. Stewart, *8051 Microcontroller, The: Hardware, Software, and Interfacin*g, 2/E Prentice Hall ,1999.

CS 504 Data Communication

Module I

Introduction – Various types of communication systems. ***Modulation***: need for modulation - different types - definition – expression. ***Noise in Communication Systems***: classification, SNR, CNR noise figure, relationships between noise figures. ***Voice Signal Digitization***: PAM, PPM, PWM, PCM, Delta modulation, PCM and DM voice signal comparison, TDM of PCM signals.

Module II

Digital Radio: block diagram, ASK, FSK, PSK, QAM, digital demodulation, QAM demodulation Components in a data communication system - Transmission media: transmission rate - bandwidth requirements. Shannon's theorem - channel capacity - Bandwidth, Modems - Switching - Multiplexing digital PBXs

Module III

Data Encoding, Data transmission basics: bit – serial transmission, transmission modes - asynchronous and synchronous transmission, bit, character and frame synchronization

Module IV

Protocol basics, Error control, Idle RQ, Continuous RQ, Link utilization, selective repeat and go-back-N. Link management.

Module V

Error detection methods, Parity, Block sum check, Cyclic redundancy check, Data compression, Huffman coding, Dynamic Huffman coding, Facsimile compression, transmission control circuits, Communication control devices: time division multiplexer, statistical multiplexer. Block-mode device

Text Books

1) Fred Halsall : Data Communications Computer Networks and Open Systems, Pearson Education, Fourth edition
2) William Stallings : Data & Computer Computer Communications:, Pearson Education, Sixth edition

References:

1) B. Forouzan, Introduction to Data Communicatio n and networking 5/E, PHI, 1997
2) Prakash. C. Gupta, Data Communications, PHI, 1999
3) R.P. Singh, S.D. Sapre : Communication systems Analog & Digital

CS/IT 505 DATABASE MANAGEMENT SYSTEMS

Module I

Introduction: Characteristics of the Database approach – Data models, schemas and instances – DBMS architecture – Data independence – Database languages and interfaces – Database administrator – Data modeling using Entity - Relationship (ER), Entity sets, attributes and keys - Relationships, Relationship types, roles and structural constraints - Weak Entity types - Enhanced Entity-Relationship (EER) and object modeling. Sub classes, super classes and inheritance - Specialization and generalization.

Module II

Record storage and file organizations: Placing file records on disks – Fixed length and variable length record Spanned Vs unspanned records – Allocating file records on disk– Files of unordered records(Heap files), F of ordered records(Sorted files).- Hashing Techniques. Indexed structures for files – Types of single le ordered index, multi-level indexes - B - trees and B^+ trees, Indexes on multiple keys, Other types of indexe

Module III

The Relational model: Relational model concepts – Relational model constraints - The Relational Algebra – Relational calculus – Tuple Relational calculus, Domain Relational calculus. - SQL.

Database Design: Functional dependencies – Basic definitions – Trivial and non trivial dependencies – Closure of a set of dependencies – Closure of a set of attributes – Irreducible sets of dependencies – Non loss decomposition and Functional dependencies. First, Second and Third normal forms – Boyce-codd normal form.

Module IV

Transaction processing - Desirable properties of Transactions, Schedules and Recoverability - Serializability of Schedules. Concurrency Control Techniques - Locking techniques, Time Stamp Ordering, Multi version concurrency control techniques, Granularity of data items. Database recovery techniques - Database recovery techniques based on deferred update and immediate update, Shadow paging, ARIES recovery algorithm. Database security and Authorization - Security issues, Access Control based on granting/revoking of privileges, Mandatory access for Multilevel Security.

Module V

Distributed databases: Motivation for distributed databases – concepts – Types of distribution – Distributed Query Processing – Commit Protocol for distributed databases.

Introduction to object oriented databases, Active databases. Data warehouses – Data mining.

References:

1) Elmasri and Navathe, *"Fundamentals of Database Systems"* , 3/e, Addison - Wesley, 2001.
2) A Silberschatz, H. F. Korth, and S Sudarshan, "*Database System Concepts*", 3/e,Tata McGraw Hill, 1997
3) C.J Date, " *An Introduction to Database Systems* ", Addison-Wesley, 1995
4) M.Tamer Ozsu & Patric Valduriez , *"Principles of Distributed Database Systems"*.
5) Margaret.H.Dunham ,*"Data Mining. Introductory and advanced topics"*, Pearson Education,2003.
6) Hector Garcia-Molina,Jeffret D. Ullman, Jenniffer Widom ,*"Database System implementation"*, Prentice Hall International, Inc, 2000.

CS/ EB/EC/EE/EI 506 MICROPROCESSOR LAB

CS 507 LANGUAGE PROCESSORS LAB

- Creation of Single Pass – Two Pass assembler – Macro processor.
- Generation of Lexical Analyzer using tools such as Lex
- Generation of Parser using tools such as YACC.
- Generation of LL(1) Parser
- Generation of intermediate code
- Creation of type checker
- Developing a compiler for a subset of a programming language.

CS/EE/EI 601 DIGITAL SIGNAL PROCESSING

CS/IT 602 OPERATING SYSTEMS

Module I

Introduction to Operating Systems. Extended Machine - Operating System Structure . Processes - Interprocess Communication - Race Conditions - Critical Sections - Mutual Exclusion - Busy Waiting - Sleep And Wakeup - Semaphores - Event Counters - Monitors - Message Passing. Process Scheduling - Round Robin Scheduling - Priority scheduling - multiple queues - Shortest Job First - Guaranteed scheduling - Two-level scheduling.

Module II

Memory management. Multiprogramming. Multiprogramming and memory usage - Multiprogramming with fixed partitions. Swapping - multiprogramming with variable partitions - Memory management with bit maps, linked lists, Buddy system - allocation of swap space. Virtual memory - paging and page tables, associative memory - inverted page tables. Page replacement algorithms. Design issues for paging systems - Working set model. Example systems.

Module III

File systems and I/O files. Directories - File system implementation - security and protection mechanisms. Principles of I/O hardware - I/O devices - device controllers - DMA. Principles of I/O software - interrupt handlers - device drivers - Disk scheduling - clocks and terminals.

Module IV

Deadlock - conditions for deadlock - deadlock modelling. Deadlock detection and recovery. Deadlock avoidance - resource trajectories - safe and unsafe states - bankers algorithm. Deadlock prevention. Two phase locking – non-resource deadlocks - starvation.

Module V

Introduction to distributed operating systems - distributed systems - design issues. Client server model. Remote procedure call. Synchronisation in distributed systems - clock synchronisation - concurrency control - Deadlocks in distributed systems. Process management - threads - system models - processor allocation algorithms - distributed file systems.

Case Study

UNIX / LINUX operating system

Text Book

1) Andrew S. Tanenbaum, “Modern Operating Systems”, Prentice Hall, 1991

Reference:

1) Bach, M.J., “Design of UNIX Operating System”, Prentice Hall
2) Charles Crowley, “Operating systems – A Design Oriented Approach”, Tata McGrawhill, 1997
3) D.M.Dhamdhere, “System Programming and Operating Systems”, Tata McGraw-Hill,1996
4) Deital, H.M., “Operating Systems”, Addison Wesley, 1992
5) Garry Nutt, “Operating Systems – A Modern perspective ”, Second Edition, Addison Wesley, 2000
6) Pradeep K.Sinha, “Distributed Operating Systems”, Tata McGrahill, 1998
7) Silberschatz et.al., “Operating System Concepts”, Addison Wesley, 1993
8) William Stallings, “Operating systems”, Prentice Hall, 1997
9) Michael Palmer, Guide to Operating System, Thomson

CS 603 COMPUTER GRAPHICS

Module I

Overview of Graphics systems. Video display devices - Raster scan systems - Random Scan systems - input devices. Hardcopy devices - Graphic Software. Output primitives –points and lines. Line drawing algorithms - circle generating algorithms - polygon filling algorithms – Filling arcs –pttern filling Output attributes - Bundled attributes. Antialiasing. Graphical user interface - Logical classification of input devices.

Module II

Two dimensional transformations. basic transformations - translation - rotation - scaling. Matrix representation and homogeneous cordinates - composite transformations. Transformation between cordinate systems - Affine transformations. Two dimensional viewing - viewing pipeline - Windows to viewport transformations - clipping operations - point clipping - line clipping - polygon clipping.

Module III

Three dimensional object representations. polygon surfaces - curved surfaces. Spline representations - Hermite polynomials - Cubic splines - Bezier curves - B-splines. Octrees and BSP trees. Fractal geometry methods. Three dimensional transformations.. Three dimensional viewing. Projections. View volumes. Three dimensional clipping - Hardware implementation.

Modula IV

Visible surface detection. Classification of visible surface detection algorithms. Back face detection - Depth buffer - A-buffer. Scan line algorithms- Depth sorting - Area subdivision methods octrees - BSP trees - octrees - Ray casting.

Module V

Shading . Illumination models - light sources. Basic Illumination models. Polygon rendering - constant intensity - Goraud shading - Phong shading . Ray tracing. Texture mapping. Color models. Introduction to Animation. Raster animation – animation languages- Key frame systems - Morphing - Motion specifications. Introduction to Virtual reality - Virtual Reality Modellling Language(VRML).

Text Book

1. Donald Hearn ,M Pauline Baker, *Computer Graphics C version,* 2/E
Pearson Education ,2003 .

References:

1) James D.Foley et.al., *Introduction to Computer Graphic*s, Addison Wesley Publishing Company, 1994
2) Alan Watt, Mark Watt, *Introduction to Animation and Rendering*,, Addison Wesley Publishing Company, 1994
3) Newmann W and Sproull R.F., *Principles of Interactive Computer Graphic*s, McGraw-Hill,1980
4) Rogers D.*F., Procedural Elements for Computer Graphic*s, McGraw-Hill, 1985

CS 604 MICROPROCESSOR SYSTEM DESIGN

Module I

Architecture 16 bit microprocessors : Intel 8086 Archetecture- Memory address space and data organization - Segment registers and memory segmentation - I/O address space - Addressing modes - Comparison of 8086 and 8088 - Basic 8086/8088 configuration - Minimum mode - Maximum mode - System timing. – Bus interface. Interrupts and interrupt priority management. Intel 80286 Archetecture- Comparison with 8086 processor.

Module II

Architecture of 32 bit Microprocessors : Intel 80386 Architecture – Special 80386 Registers- Memory management -interrupts and exceptions - management of tasks - Real, protected and virtual 8086 mode- Introduction to 80486 microprocessor – Architecture – Comparison with 80386 processor.

Module III

Advanced Microprocessors: Introduction to Pentium and Pentium pro architectures: RISC concepts- BUS operation- Super scalar architecture- Pipelining-Branch prediction-Instruction and data caches- FPU- Comparison of Pentium and Pentium pro architecture. Introduction to Pentium II, Pentium III and Pentium IV processors – Introduction to Intel and AMD 64 bit architectures. RISC Archetecture : Definition of RISC –Properties of RISC Systems– Practices in RISC Systems –Register windowing – Advantages and shortcomings – Comparison with CISC architecture .

Module IV

Intel 80x86 Programming: 80x86 Instruction set , Assembly level programming with DEBUG and MASM – MS-DOS Functions andBIOS Calls - programming examples using 80x86.

Module V

Introduction IBM PC Architecture , Peripherals & Interface Buses: Motherboard- Chip sets - graphic adapters and monitors-drive controllers - floppy and hard disk drives- IDE and SCSI - streamers and other drives -parallel interfaces and printers - serial interfaces – 16550 UART CMOS RAM and real time clock- keyboard and mouse- the power supply (SMPS) - BIOS and Boot Process Bus Systems: PC/XT and AT Buses – Microchannel and ISA – Local Buses: VESA and PCI- I/O Buses: SCSI and USB

References :

1) Barry B. Brey , *The Intel Microprocessors 8086 to Pentum 4- Archetecture Programming and Interfaceing*, 6/e Pearson Education ,2003.
2) James L. Antonacos , *An Introduction to Intel Family of Microprocessors* , 3/e Pearson Education, 2002.
3) John Uffenbeck , *The 80x86 Family – Design Programming and Interfacing,* 3/e Pearson Education, 2002
4) YU-Cheng Liu & Glenn A Gibson, *Microprocessor System , Architecture Programming & Design,* Pentice Hall of India.
5) Douglas V Hall, *Microprocessors & Interfacing, Tata* McGrahill, 1998
6) Intel Users manual for 8086, 80386 & 80486, Pentium processors
7) H. P. Messmer, *The Indispensable PC Hardware Boo*k, 3/e, Addison Wesley, 1997
8) S. J. Bigelow, *Troubleshooting, Maintaining, and Repairing PC*s, 2/e, Tata McGraw Hill, New Delhi, 1999
9) Ytha Yu and Charles Marut , *Assembly Language Programming and Organisation of IBM PC,* International Edition , McGrawhill Inc, 1992
10) K. Miller, *An Assembly Language Introduction to Computer Architecture using the Intel Pentiu*m, Oxford University Press, 1999.

CS /EB/EC/EI 605 CONTROL SYSTEMS ENGINEERING

CS 606 SYSTEM PROGRAMMING AND HARDWARE LAB

1. Identification of components/cards and PC assembling from components
2. Assembly language program for implementing arithmetic operations
3. Assembly Language programs for time and date manipulation.
4. Assembly Language programs for display /video manipulation
5. Assembly Language program for equipment status
6. Implementation of a file manager using DOS/BIOS interrupts
7. TSR (Terminate and Stay Resident) Programming
8. ADC interface

9 .Stepper Motor interface using DAC

10. Parallel Interface: Printer and HEX keyboard.
11. Serial Interface: PC to PC serial interface using null modem

Note: Programs can be implemented using MASM /TASM

References :

1) H. P. Messmer, *The Indispensable PC Hardware Boo*k, 3/e, Addison Wesley, 1997
2) S. J. Bigelow, *Troubleshooting, Maintaining, and Repairing PC*s, 2/e, Tata McGraw Hill, New Delhi, 1999
3) Douglas V. Hall, *Microprocessors and Interfacin*g, 2/e, Tata McGraw Hill, 1988
4) Ytha Yu and Charles Marut , *Assembly Language Programming and Organisation of IBM PC*, International Edition , McGrawhill Inc , 1992
5) Barry B. Brey , *The Intel Microprocessors 8086 to Pentium 4- Archetecture Programming and Interfacein*g, 6/e Pearson Education ,2003

CS 607 MINOR PROJECT

CS/EC/I/IT 701 COMPUTER NETWORKS

Module I

Introduction to Computer Network and Physical Layer

Types of Networks: Broadcast and Point-to-point- LAN-MAN-WAN- Wireless networks. Layered Architecture and Reference Models: Layered architecture- OSI reference model, TCP/IP reference model – Internet Protocol Stack – Network Entities in Layers- Connection oriented and Connection less services, Examples of networks: Novell Netware, Arpanet, and Internet. Examples of Data Communication Services: X.25 Networks, Frame relay, Broad band ISDN and ATM. Physical Layer: Transmission media - Narrow band ISDN: Services-Architecture- Interface , Broad band ISDN and ATM- Virtual Circuits versus Circuit Switching –Transmission in ATM networks . FDDI

Module II

Link Layer and Local Area Networks Data link layer:

Service provided by data link layer-Error detection and correction Techniques-Elementary data link layer protocols-Sliding Window protocols- Data link layer in HDLC, Internet and ATM . Multiple Access protocols: Channel partitioning protocols: TDM-FDM-Code Division Multiple Access(CDMA) .Random Access protocols : ALOHA-CSMA and CSMA/CD . Local area Network: LAN addresses- Address Resolution Protocol-Reverse Address Resolution Protocol. Ethernet: Ethernet Technologies-IEEE standards- Hubs-Bridges and Switches

Module -III

Network Layer and Routing

Network Service model – Datagram and Virtual circuit service-Roting principles-Link state routing-distant vector routing-hierarchical routing-multicast routing-IGMP Internet Protocol (IP): IPv4 addressing-routing and forwarding datagram-datagram format-datagram fragmentation- ICMP- DHCP- Network Address Translators (NATs)-IPv6 packet format-transition from IPv4 to IPv6-Mobile IP. Routing in the Internet: Intra Autonomous System Routing : RIP and OSPF-Inter Autonomous System Routing : BGP – Network layer in ATM.

Module IV

Transport Layer

Transport Layer Services-Relationship between Transport Layer and Network Layer-Transport Layer in Internet-Multiplexing and De multiplexing. Connectionless Transport: UDP-Segment structure-Checksum Connection Oriented Transport: TCP-TCP connection-TCP Segment Structure-Round trip Time estimation and Time out-Reliable Data transfer-Flow control-TCP connection Management. Congestion Control: Causes and costs of congestion- Approaches to congestion control- TCP congestion control: Fairness-TCP delay modeling. ATM ABR congestion control. ATM AAL Layer protocols.

Module V

Application Layer and Network Security .

Application Layer Protocols- WWW and HTTP-File transfer Protocol: FTP Commands and Replies – Domain Name System (DNS)- SMTP - SNMP- multimedia. Remote Procedure Call. Security in Computer Networks: Principles of Cryptography-Symmetric key-Public key-authentication protocols-Digital Signatures – Firewalls. Security in different Layers: Secure E-mail- SSL – IP security.

References:

1. James F. Kurose and Keith W. Ross, Computer Networking – *A Top-Down ApproachFeaturing the Internet,* 2/e Pearson Education ,2003
2. S. Keshav, *An Engineering Approach to Computer Networkin*g, Pearson education ,2002
3. F. Halsall, *Data Communication, Computer Networks and Open System*s, Addison Wesley, 1996
4. Andrew S. Tanenbaum, *Computer Networks* , 4/e, Pearson education, 2003
5. Behrouz A. Fourouzan ,*Data Communications and Networking,* 2/e Tat McGrawhill,2000
6. Leon-Garcia and I. Widjaja, *Communication Network*s, Tata McGraw Hill, 2000
7. Bertsekas and Gallagar , *Data Networ*ks, 2/e, PHI, 1992

8. Douglas Comer and David L. Stevens, *Internetworking with TCP/IP Vol. I, II, and III*,Prentice Hall, New York, 1990
9. Richard Stevens. W, *TCP/IP Utilities - Vol. I, The protocol*s, Addison Wesley, 1994
10. Sidnie Feit, *TCP/IP, Architecture, Protocols and implementatio*n, McGraw-Hill, New York, 1993
11. Uyless Black, *Computer Networks - Protocols, Statndards and Interface*s, Prentice Hall India, New Delhi, 1994

CS 702 ARTIFICIAL INTELLIGENCE

Module I. Introduction - Problem spaces and search - Production systems - Characteristics. Heuristic search techniques - Generate and Test - Hill climbing -Best fit. Graph search - A* algorithm. Problem reduction - constraint satisfaction - Means and End analysis. Game playing - Minimax - Alpha-beta cut-off.

Module II. Logic and Deduction. Introduction to symbolic logic - Propositional logic - Well Formed Formula. Predicate Logic - predicates variables and constants - First order logic, Quantifiers. Forward chaining and Unification. Goal trees. Resolution by refutation.

Module III. Natural Language Processing - Levels of language. Expressing rules of syntax. Context Free Grammars. Dictionaries. Transformational grammar. Syntactic parsing. Top Down and Bottom up parsing. Transition Networks. Augmented Transition networks (ATN). Syntax to Semantics. Case grammar - Syntactic use of Semantic knowledge.

Module IV. Representing Knowledge. Procedural versus Declarative. Reasoning under uncertainty - Nonmonotonic reasoning - Statistical reasoning. Bayesian networks. Expert systems.- representing and using Domain knowledge - Expert system shell. Fuzzy Logic - Fuzzy sets - Fuzzy model - Fuzzy rule generation - Fuzzy inference systems. Fuzzy rule based expert systems.

Module V. Learning: Learning by analysing, by explaining experience, by correcting mistakes, by recording cases. Introduction to LISP and PROLOG: (Basic functions and methods of representing rules / knowledge is sufficient)

References:

1) Elaine Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1990
2) Dan W.Patterson, "Introduction to Artificial Intelligence and Expert Systems", Prentice Hall India Ltd., New Delhi, 1996
3) Winston, P.H., "Artificial Intelligence", Addison Wesley Publishing House, Reading, MA
4) Eugene Charmiak, Drew McDermott, "Introduction to Artificial Intelligence", Addison Wesley , Reading, Massachusetts, 1985
5) Akshar Bharati, Vineet Chaitanya, Rajeev Sangal, "Natural Language Processing: A Paninian Perspective", Prentice Hall India Ltd., New Delhi, 1996
6) Nils J.Nillson, 'Principles of Artificial Intelligence", Morgan Kauffman Publishers Inc., Palo Alto, CaliforniaRober J,. Schalkoft, "Artificial Intelligence, An Engineering Approach", McGraw-Hill Publishing company, New York 1990

CS 703 ANALYSIS & DESIGN OF ALGORITHMS

Module I. Analysing Algorithms and problems. Classifying functions by their asymptotic growth rate. Recursive procedures. Induction proofs. Proving correctness of procedures. Recurrence equations. Recurrence Tree-Master Theorem

Design Techniques- Divide and Conquer, Dynamic Programming, Greedy, Backtracking

Module II. Analysis of searching and sorting. Insertion sort, quick sort, merge sort and heap sort. Lower bounds for sorting by comparison of keys. Comparison of sorting algorithms. Amortized Time Analysis. Red-Black Trees. Hashing.

Module III. Graphs and graph traversals. Strongly connected components of a Directed graph. Biconnected components of an undirected graph. Minimum Spanning tree algorithms.

Module IV. Transitive closure of a Binary relation. Warshalls algorithm for Transitive closure. All pair shortest path in graphs. Dynamic programming. Subproblem graphs and their traversal. Constructing optimal binary search trees.

Module V. Complexity Theory - Introduction. P and NP. NP-Complete problems. Approximation algorithms. Bin packing, Graph coloring. Travelling salesperson Problem.

References

1. Allen Van Gelder, Sara Baase, "Computer Algorithms - Introduction to Design and Analysis", 3rd ed., Addison Wesley, 2000
2. T. H. Corman, C. E. Lieserson, R. L. Rivest, Introduction to Algorithms, Prentice Hall India, 1990.
3. Anany Levitin, "Introduction to the design and analysis of algorithms",
4. A.V.Aho, J.E.Hopcroft and J.D. Ullman, "The Design and Analysis of Computer Algorithms", Addison Wesley Publishing House, Reading, MA, 1974
5. E Horowitz and S Sahni, "Fundamentals of Computer Algorithms", Computer Science Press, Rockville, MA, 1984
6. Jeffrey H.Kingston, "Algorithms and Data Structures - Design, Correctness and Analysis ", Addison Wesley, Singapore, 1990
7. Knuth, "Art of Computer Programming Vol II, Sorting and Searching,", Prentice Hall
8. Anany levitin, Introduction to Design and Analysis of Algorithms, Pearson Education

CS 704 ADVANCED ARCHITECTURE & PARALLEL PROCESSING

Module I. Introduction to Parallel Processing-Shared Memory Multiprocessing-Distributed Memory-Parallel Processing Architectures- Introdution-Parallelism in sequential Machines—Abstract Model of Parallel Computer – Multiprocessor Architecture- Array Processors.

Module II. Pipelining and Super Scalar Techniques-Linear Pipeline Processors-Non-Linear Pipeline processors-Instruction pipeline design-Arithmetic pipeline Design- Super Scalar and Super pipeline Design.

Module III. Programmability Issues-An Overview-Operating system support-Types of Operating Systems-Parallel Programming models-Software Tools-Data Dependency Analysis- Types of Dependencies-Program Transformations.

Module IV. Shared Memory Programming-Thread –based Implementation-thread Management-Attributes of Threads- Mutual Exclusion with Threads- Mutex Usage of Threads- Thread implementation-Events and Conditions variables-Deviation Computation with Threads-Java Threads Distributed Computing –Message Passing Model-General Model-Programming Model- PVM.

Module V. Algorithms for Parallel Machines- Debugging Parallel programming –Other Parallelism Paradigms -Distributed Data Bases-Distributed Operating Systems.

Text Books

1. Kai Hwang, "Advanced Computer Architecture*:* Parallelism, Scalability, Programmability", McGRawHill International Edition, 1993.
2. M.Sasikumar, et.al., "Introduction to Parallel Processing", PHI, New Delhi, 2000

References

1. P. Pal Chaudhuri , "Computer Organisation and Design", PHI, New Delhi, 1994.
2. William Stallings, "Computer Organisation and Architechture", PHI, New Delhi, 1996.
3. "Proceedings of Third International Conference on High Performance Computing", IEEE, Computer Society Press , California, USA, 1996.
4. "Parellel Processing", Learning Material Series, Indian Society for Technical Education, New Delhi, 1996.
5. V.Rajaraman, C. Siva Ram Murthy, "Parallel Computers Architecture and Programming", PHI, New Delhi, 2000

CS/EE/IT 705(A) Digital Image Processing

Module I. Image representation and modelling - enhancement - restoration - Image analysis and reconstruction - image data compression. Two dimensional systems - linear systems and shift invariance. Fourier transform - Z - transform - Block matrices and Kronecker products - Random signals

Module II. Image perception - introduction - light - luminance - brightness and contrast - MTF of the visual system - visibility - function - monochrome vision models - color representation - color matching and reproduction - color vision model Image sampling and quantization - Two dimensional sampling theory -reconstruction of images from its samples - Myquistrate - aliasing - sampling thorem. Practical limits in sampling reconstruction. Image quantization - visual quatization.

Module III. Image transforms - Two dimensional orthogonal and unitary transforms - properties of unitary transforms - one dimensional DFT - cosine, sine Harmrd and Haar transforms

Module IV. Image enhancement - Point operations - contrast stretching - clipping and thresholding - digital negative intensity level slicing - bit extraction. Histogram modelling - histogram equalisation - modification. Spatial operations - smoothing techniques. Magnification and interpolation. Transform operations. Color image enhancement.

Module V. Image analysis and computer vision - spatial feature extraction - transform features. Edge detection - gradient operators - compass operators - stochastic gradients - line and spot detection.

References:

1) Jain Anil K , "Fundamentals of Digital Image Processing-" , Prentice Hall
2) Gonzalez Rafel C, Wintz Paul , "Digital Image Processing,-", Addison Wesley
3) Pratt William K , "Digital Image Processing, ", John Wiley and Sons
4) Rosenfield Azriel, Kak Avinash C, " Digital Picture Processing", Academic Press Inc.

CS/IT 705(B) INFORMATION RETRIEVAL

Module I

Introduction – Information versus Data Retrieval. Modelling of Information retrieval. Formal charectrisation of Information retrieval- Alternate set theoretic models. Alternate algebric models. Alternate probablistic models. Stuctured text retreival models. Models for Browsing. Retreival Evaluation.

Module II

Query languages. Text and multimedia languages-structure-syntax, semantics. Mark up languages. Text Operations-Document pre processing. Text compression.

Module III

Indexing and searching.Inverted files. Suffix trees and suffix arrays. Boolean queries. Sequential searching. Pattern matching. Structural queries. User interface and visualization.

Module IV

Parellel and Distributed Information Retreival. Implementation of Inverted files, suffix arrays and signature files in MIMD architecture. Implementation of Inverted files,suffix arrays and signature files in SIMD architechture.

Module V

Searching the web. Modelling the web. Web as graph. Hubs and Authorities. Web self organization. Searching the web. crawling, Indexing, Ranking web pages, Web self organisation. Searching the web, Crawling, Indexing, Ranking web pages, Web Directories.

Text Book

R. Baeza-yates and B. Riberio-Neto, Modern Information retrieval, Addison Wesley Longman, 1999

References

1. J. Kleinberg, et.al, The Web as a graph: Measurements, models and methods, Lecture notes in computer Science, springer Verlag, 1999
2. Gary Flake et. Al, Selff- Organization and Identification of Web communities, IEEE Computer",Vol35, No 3,
3. Sergey Brin and Lawrence page, The anatomy of large scale hyper textual (Web) search engine, Computer- Networks and ISDN systems, Vol 30, No,1—7.

CS/EB/EC/EI/IT 705(C) ARTIFICIAL NEURAL NETWORKS

Module I. Fundamentals of ANN – Biological prototype – Neural Network Concepts, Definitions - Activation. Functions – single layer and multilayer networks. Training ANNs – perceptrons – Exclusive OR problem – Linear seperability – storage efficiency – perceptron learning - perceptron training algorithms – Hebbian learning rule - Delta rule – Kohonen learning law – problem with the perceptron training algorithm.

Module II. The back propagation Neural network – Architecture of the back propagation Network – Training algorithm – network configurations – Back propagation error surfaces – Back propagation learning laws – Network paralysis _ Local minima – temporal instability

Module III. Counter propagation Networks – Architecture of the counter propagation network – Kohonen layer – Training the Kohonen layer – preprocessing the input vectors – initializing the weight vectors – Statistical properties. Training the Grossberg layer- Feed forward counter propagation Neural Networks – Applications.

Module IV. Statistical methods – simulated annealing – Bloltzman Training – Cauchy training -artificial specific heat methods. Application to general non-linear optimization problems – back propagation and cauchy training.

Module V. Hopfield net – stability – Associative memory – statistical Hopfield networks – Applications – ART NETWORKS – GENETIC ALGORITHMS –Bidirectional Associative memories- retreiving stored information. Encoding the association – continous BAMS

References

1) Linus Fe, *Neural Network in Computer Intelligence* , McGrawHill
2) Philip D.Wasserman, *Neural Computing(Theory and Practice)*
3) Robert Hecht-Nilson, *Neuro Computing*
4) James A.Anderson, *An Introduction to Neural Networks*
5) Jack M. Zureda, *Introduction to Artificial Neural Systems*

CS 705(D) ADVANCED DIGITAL SYSTEM DESIGN

Module I

Advanced topics in Boolean Algebra

Shannon's expansion theorem, Conseusus theorem, Octal designation, Run measure, INHIBIT / INCLUSION /AOI / Driver / Buffer gates, Gate expander, Reed Muller expansion, Synthesis of multiple output combinational logic circuits by product map method, Design of static hazard free and dynamic hazard free logic circuits.

Module II

Threshold Logic Linear seperability, Unateness, Physical implementation, Dual comparability, Reduced functions, Various theorems in threshold logic, Synthesis of single gate and multigate threshold Network.

Module III

Symmetric Functions Elementary symmetric functions, Partially symmetric and totally symmetric functions, Mc Cluskey decomposition method, Unity ratio symmetric ratio functions, Synthesis of symmetric function by contact networks.

Module IV

Sequential Logic Circuits

Mealy machine, Moore machine, Trivial / Reversible / Isomorphic sequential machines, State diagrams, State table minimization, Incompletely specified sequential machines, State assignments, Design of synchronous and asynchronous sequential logic circuits working in the fundamental mode and pulse mode, Essential hazards Unger's theorem.

Module V

Programmable Logic Devices

Basic concepts, Programming technologies, Programmable Logic Element (PLE), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Structure of Standard PLD's, Complex PLD's (CPLD). System Design Using PLD's - Design of combinational and sequential circuits using PLD's, Programming PAL device using PALASM, Design of state machine using Algorithmic State Machines (ASM) chart as a design tool. Introduction To Field Programmable Gate Arrays - Types of FPGA, Xilinx XC3000 series, Logic Cell array (LCA), Configurable Logic Blocks (CLB) Input/Output Block (IOB)- Programmable Interconnect Point (PIP), Introduction to Actel ACT2 family and Xilinx XC4000 families, Design examples.

References:

1. William I. Fletcher, *" An Engineering Approach to Digital Design "* , Prentice Hall of India, 1996.

2. James E. Palmer, *David E. Perlman, " Introduction to Digital Systems ",* Tata McGraw Hill, 1996.
3. N.N. Biswas, " Logic Design Theory ", Prentice Hall of India, 1993.
4. S. Devadas, A. Ghosh and K. Keutzer, *" Logic Synthesis* ", Mc Graw Hill, 1994.

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CS 706 NETWORK AND OPERATING SYSTEMS LAB

1. Study of system level calls of a suitable multitasking operating system. Exercises involving the system calls. (E.g. fork(),exec(),create() etc. in UNIX.)
2. Inter process communication. Shared memory, messages, Semaphores and monitors. Implementation of typical problems(E.g. Bounded buffer, Dining Philosophers. etc.)
3. Study of Communication protocols. TCP/IP or a suitable protocol. Client server programming. Distributed algorithms. performance modelling of networks.
4. Internet programming using a suitable programming language and Operating system (E.g. JAVA)

References

1. Douglas E.Comer, Hands on Networking with Internet Technologies, Pearson Education

2. Bach, M.J., "Design of UNIX Operating System", Prentice Hall

CS 707 COMPUTER GRAPHICS LAB

1. Implementing Line ,Circle and Ellipse drawing algorithms
2. Implementing scan line polygon filling algorithm
3. Implementing seed filling algorithms –flood fill, Boudary fill (recursive and non recursive)
4. Implementing line clipping methods
5. Implementing polygon clipping methods
6. Generation of different 2D patterns and images.
7. 2D transformations using homogeneous coordinates
8. Generating Bazier and B-spine curves
9. Implementation of Hidden surface elimination techniques of 3D objects
10. Implementation of Shading methods for 3D objects
11. Implementation of animation methods.
12. Programming using Open GL
    (Can be done as a development of a small 2D/3D graphics package or Game using OpenGL)

References:

1. Donald Hearn ,M Pauline Baker, *Computer Graphics C version*, 2/E Pearson Education ,2003
2. James D.Foley ct.al., *Introduction to Computer Graphics*, Addison Wesley Publishing

Company, 1994.
3. Mason Woo et.al, *OpenGL Programming Guide – The official guide to OpenGL*, 3rd Edition, OpenGL Architecture Review board
4. Noman Lin, *Linux 3D Graphics Programming*, Worldwide Game Development Library.
5. Ron Fosner, *OpenGL programming for Windows 95 and Windows NT*

CS 708 SEMINAR

Each student shall individually prepare and submit a seminar report on a topic of current relevance on stipulated time. Few panels consisting of three teachers (internal) each should evaluate the seminar report and the presentation. Marks should be distributed considering report writing, presentation, technical content, depth of knowledge, brevity and references and their participation in seminar. The time allotted for presentation is 30 minutes.

CS 801 SECURITY IN COMPUTING

MODULE 1

Introduction – Security problem in computing – Elementary Cryptography – Introduction – Substitution ciphers – Transpositions – Encryption Algorithms – DES – AES – Public key encryption – Uses of encryption.

MODULE 2

Program security – Secure programs – Nonmalicious program errors – Viruses and other malicious code – Targeted malicious code – Controls against program threats

MODULE 3

Protection in general purpose operating systems – Protected objects and Methods of protection – Memory and address protection – Control of access to general objects – File protection mechanisms – User authentication – Designing – Trusted operating systems – Security policies – Models of security – Trusted operating system design – Assurance in trusted operating systems.

MODULE 4

Data base security – Introduction – Security requirements – Reliability and Integrity – Sensitive data – Inference – Multilevel databases – Proposals for multilevel security.

MODULE 5

Security in Networks – Threats in networks – Network security controls – Firewalls – Intrusion detection systems.

Reference:

1. Charles. P. Pfleeger & Shari Lawrence Pfleeger ,Security in Computing , – 3/e – Pearson Education.
2. William Stallings ,Network Security Essentials, Applications and Standards Pearson Education.
3. William Stallings ,Cryptography and Network Security Principles and practice. 2/e,Pearson Education.

4. Michael. E. Whitman and Herbert J. Mattord – Principles of Information Security.

CS 802 DISTRIBUTED COMPUTING

Module I. Distributed systems – architecture. Key characteristics – resource sharing openness –concurrency – scalability – fault tolerance – transparency. Design issues – naming – communication – software structure – workload allocation – consistency maintenance. User requirement – functionality – Quality of service – reconfigurability. Review of network protocols. Interprocess communication-building blocks – client server communication group communication. Interprocess communication in UNIX. Remote procedure calling. Design issues – interface definition language exception handling. Implementation - interface processing – communication handling. Binding. Case study – sun RPC – Java RMI.

Module II. Distributed Operating systems- kernel – processes and threads – Naming and protection - Communication and Invocation – virtual memory. Distributed file service - design issues – interfaces – implementation techniques. Case study sun NFS. Name service SNS and DNS.

Module III. Time and co-ordination. Synchronizing physical clocks -logical time and logical clocks. Distributed co-ordination –distributed mutual exclusion – elections. Replication – basic architectural model – consistency and request ordering.

Module IV. Shared data and transactions – client server – fault tolerance and recovery – transactions – nested transactions. Concurrency control - locks – optimistic concurrency control – timestamp ordering. Distributed transactions – atomic commit protocols – concurrency control in distributed transactions – distributed deadlocks – transactions with replicated data.

Module V. Recovery and fault tolerances. Transaction recovery – logging -shadow versions – fault model for transactions. Fault tolerance – characteristics. Hierarchical and group masking of faults. Security – authentication and key distribution – logic of authentication – digital signatures.

References

1. George Coulouris, et. al., "Distributed Systems – Concepts and Design", Third Edition., Addison Wesely, 2002
2. C.A.R.Hoare, "Communicating Sequential Processes", Prentice Hall, 1980
3. Dimitri P.Bertsekas, John N.Tsitiklis, "Parallel and Distributed Computation : Numerical Methods", Prentice Hall International, Inc., 1989
4. Douglas Comer and David L.Stevens, "Internetworking with TCP/IP Vol III: Client server Programming and Applications", Prentice Hall, New York, 1990
5. Gerard Tel, "Introduction to Distributed Algorithms", Cambridge University Press, 1994
6. H.S.M.Sedan, "Distributed Computer systems", Butterworths, London, 1988
7. Joel M.Crichlow, "Introduction to Distributed and Parallel Computing", Prentice Hall, New York, 1988
8. M.Sasikumar, et.al., "Introduction to Parallel Processing", PHI, New Delhi, 2000

CS/EB/EC/IT 803 INDUSTRIAL ORGANISATION AND MANAGEMENT

Module I

Organisation : Concept of organisation, characteristics of organisation, elements of organisation, organisational structure, organisation charts, Types of organisation- formal line, military or scalar organisation, functional organisation, line & staff organisation, project organisation, matrix organisation, authority and responsibility, span of control, delegation of authority.

Industrial ownership: Types of ownership- single ownership, partnership, joint stock company, co-operative societies, public sector, private sector, scientific management- review of different schools of thoughts.

Module II

Personal Management: Recruitment and training, labour turnover, operator training, suggestion systems.

Industrial safety: working conditions, environmental factors, psychological attitude to work and working conditions, fatigue, accidents and hazards.

Wages and Incentives: feature of wages, time and piece rate, different incentive plans, profit sharing, job evaluation and merit rating, factors of comparison and point rating.

Industrial relations: industrial disputes, collective bargaining, trade unions, workers' participation in management, labour welfare.

Module III

Marketing Management: Concept of marketing VS sales approach, consumer behaviour and demand concept, buying motives, influence of income level, product design, new product distribution, pricing decisions, major price policy considerations, pricing methods and tools, break even analysis and marginal costing in pricing, sales promotion, marketing research, test marketing, marketing of services, advertising management- types of advertising, choice of media, economic and psychological factors in advertising.

Module IV

Finance Management : Tasks, evolution of corporate management, long term financing, equity, preference and debenture capitals, term loans, dividends and share valuation, legal aspects of dividends, short term financing, working capital influencing factors, cash budgeting, terms of liquidity, management of receivable and inventories, budgets and budgetary control-objectives of budgeting, classification, ratio analysis.

Module V

Management accounting: Fundamentals of book keeping, journalising, ledger accounts, subdivision of journal, cash book, banking transactions, trial balance, preparation of trading, profit and loss account, and balance sheet, adjustments.

References:

1. Industrial Organisation and Management: Bethel et.al, McGraw Hill
2. Principles of Industrial Management : Kootnz & Donnel
3. Financial Management : Prasanna Chandra, Tata McGraw Hill

4. Operation Management : Fabricky et al, Tata McGraw Hill
5. Hand Book of MBO : Reddin & Ryan, Tata McGraw Hill.
6. Industrial finance of India : SK Basu
7. First steps in book keeping : J B Batliboi
8. Management accounting : Hingrani & Bemnath.

CS 804 (A) EMBEDDED SYSTEMS

CS/EB/IT 804 (B) BIOINFORMATICS

CS 804 (C) SOFTWARE ARCHITECTURE

Module I. Software Architecture –Introduction-Architectural Styels-Pipes and Filters-Data Abstraction and Object Oriented Organization-Event based, Implicit Invocation-Layered Systems-Repositories-Interpreters-Process Control-Process control Paradigms-Software Paradigm for Process Control-Distributed processes-Main program / subroutine organizations – Domain – specific software architecture – heterogeneous architectures .

Module II. Shared Information Systems – Data base integration –Batch sequential – Simple Repository – Virtual Repository – Hierarchical Layers – Evolution of Shared Information Systems in Business Data Processing – Integration in Software Development Environments – Integration in Design of Buildings- Architectural Structures for Shared Information Systems.

Module III. Architectural Design Guidance- Guidance for User-Interface Architectures -Design Space and rules-Design Space for User Inter face Architectures-Design. Rules for User Interface Architecture applying the Design Space – Example – A Validation Experiment – How the Design Space Was Prepared .

Module IV. Value of Architectural Formalism – Formalizing the Architecture of a Specific System – Formalizing an Architectural Style – Formalizing an Architectural Design.Linguistic Issues – Requirements for Architecture - Description Languages - First Class Connectors – Adding Implicit Invocation to Traditional Programming Languages .

Module V. Tools for Architectural Design – UniCon : Universal Connector Language – Exploiting Style in Architectural Design Environments –Architectural Interconnection – Education of Software Architects.

Reference

Mary Shaw, David Garlan, "Software Architecture", Prentice Hall India, 2000

CS 804 (D) ALGORITHMS AND COMPLEXITY

Module I

Review of concepts : Algorithms and Complexity – Models of computation – Sorting Algorithms and order statistics – set manipulation problems – Algorithms on graphs and digraphs – pattern matching algorithms-NP complete problems.

Module II

Dynamic Programming : Introduction-matrix multiplication and optimal binary search trees-approximate string

matching-distances in graphs and digraphs.

Module III

Matrices and Fast Fourier Transforms : strassen algorithm – matrix inversion- decomposition- Boolean matrix multiplication-Fast Fourier Transform and applic ations.

Module IV

Integer and Polynomial arithmetic – integer and polynomial multiplication and division – modular arithmetic – Chinese remaindering – Euclid's Algorithm-Polynomial GCDs-sparse polynomial.

Module V

Parallel Algorithms-Parallelism-PRAM and other models – PRAM and other models-PRAM algorithms – handling write conflicts- merging and sorting-parallel connected component algorithm – lower bounds.

References :-

1. Brassard G and Brately P Algorithmics : Theory and Practice, Prentice Hall, 1988.
2. Atho A V , Hopcroft J E and Ullman J D, The Design and Analysis of Computer Algorithms, Addison Wesley, 1974.
3. Melhron K, Data Structure and Algorithms, Volume II and III, Springer – Verlag, 1984.
4. Baase S, Computer Algorithms : Introduction to Design and Analysis (Second Edition), Addison Wesley, 1993.
5. Manber U , Introduction to Algorithms : A creative approach, Addison-Wesley, 1989.
6. Brassard G and Brately P Algorithmics : Theory and Practice, Prentice Hall, 1988.
7. **Atho A V , Hopcroft J E and Ullman J D, The Design and Analysis of Computer Algorithms, Addison Wesley, 1974.**

CS 805 PROJECT

The project work commencing from the VII th semester shall be completed and project report shall be submitted by each student by the end of the VIII th semester. There will be an internal examination of the project that includes demonstration and oral examination of the project work. The evaluation panel shall consisting of at least three faculty members including the project guide as appointed by Head of the department

CS 806 VIVA_VOCE

Each student is required to appear for a viva-voce examination, and he/she has to bring his/her seminar report and project report. The evaluation panel should contain at least one External and Two internal examiners appointed by the university. There can be more than one panel in case the number of students is large