CP-201 Logic System Design

Credits: 4 (3-0-2)

Introduction to Boolean algebra: Binary connectives, Evaluation of truth functions, Truth – function calculus as Boolean Algebra, Duality, Fundamental theorems of Boolean Algebra and simplification of Boolean expressions.
Realisation of Logic Circuits: Standard forms of Boolean Functions, Minterm and Maxterm, designation of functions. Simplification of functions on Karnaugh maps, incompletely specified functions.
Combinational circuits: Adder, subtract, encoder, decoder, multiplexer, demultiplexer, parity checker and generator.Cubical representation of Boolean functions and determination of prime implicants. Selection of an optimal set of prime implicants, multiple output circuits and map minimization of multiple output circuits. Tabular determination of multiple output prime implicants.
Latches, Flip Flops : JK, SR, D Type and T type Flip Flops and their working principals.
Counters and shift registers: Ripple, decade, up-down counters, Mod-n counters and series, parallel registers. General characteristic of sequential circuits, clock, pulse and level mode sequential circuits. Analysis and design of sequential circuit. Synthesis of state diagrams, finite memory circuits, equivalence relations, equivalent states and circuits, determination of classes of in distinguishable states and simplification by implicant tables. Mealy and Moore machines, state assignment and memory element input equation, Partitioning and state assignment. General pulse-mode circuits, clock input counters, extended state tables.
Asynchronous Mode Circuits: Analysis of a fundamental mode circuits, Synthesis of flow tables, minimization, transition tables, excitation maps and output maps, Cycles and Races, Race free assignments, Hazards in sequential circuits.
Introduction to A/D and D/A converters.

Text/ References:

1. Morris-Mano : Logic System and Design, Mc Graw Hill
2. Hill & Peterson: Switching Theory and Logic Design, John Wiley
3. J.F.Wakerly: Digital Design, Principle and Practices, Pearson.
4. Malvino leech: Digital Electronics
5. Digital Systems and Hardware and Firmware Algorithms: M.Ercegovac and T. Lang, Pearson.

CP-203 Data Structures

Credits 5 (3-1-2)

Arrays: Representation – row-major, column-major, sparse matrix – implementation, addition, multiplication; polynomial – representation, addition, evaluation and multiplication.
Strings: Representation, operations, string matching - Brute force or naïve, Robin-Karp, Knuth-Morris-Pratt.
Linked List: Static and dynamic implementation,single, double, circular, multiple linked list.
Stack: Static and dynamic implementation, expression evaluation, prefix (polish), infix, postfix (inverse polish) expressions, application, multiple stacks, recursion.
Queues: Static and dynamic implementation,applications, circular queue, multiple queue.
Tree: Binary tree, binary search tree, static and dynamic implementation, tree operations - insertion, deletion and search, tree traversal, Binary heaps. Introduction to AVL trees and B trees.
Sorting: Insertion sort, selection sort, Bubble sort, quick sort, merge sort, heap-sort, radix sort (bucket sort).
Searching: Linear and binary search, hashing.
Graph: Representation of graphs, BFS, DFS, topological sort.

Text/References:

1. Aho A.V., J.E. Hop croft, J.D. Ullman, *Data Structures and algorithms*, Addison Wesley.
2. Kruse R.L., *Data Structure and Program Design*, PHI.
3. Horowitz and Sahni: *Data Structure in C++* , Glagotia
4. Ellis Horowitz, Sartaj Sahni, *Fundamentals of Data Structures*
5. Aaron M. Tenenbaum, Y. Langsam, Moshe J. Augenstein, *Data Structures Using C*
6. Niklaus Wirth, *Algorithms + Data Structures = Programs (Prentice-Hall Series in Automatic Computation)*
7. Sartaj Sahni, Data Structures, Algorithms, and Applications in C++
8. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++ (2nd Edition)

CP-205 Discrete Structures

Credits 4 (3-1-0)

Set and Functions: Sets, relations, functions, operations, and equivalence Relations, relation of partial order, partitions, binary relations, Equivalence relations.
Monoids and Groups: Groups, Semi groups and Monoids, Cyclic semi graphs and sub monoids, Subgroups and cosets. Congruence relations on Semi groups. Morphisms Normal sub groups. Structure of cyclic groups, Permutation groups, dihedral groups, elementary applications in coding theory.
Rings: Rings, Subrings, Morphism of rings, ideal and quotient rings, Euclidean domains.
Number-theoretic algorithms: Greatest Common Divisor, Chinese Remainder Theorem, Primality testing.
Field Theory: Integral domains and Fields, polynomial representation of binary number, Galois fields, primitive roots, discrete logarithms.

Text/ References:

1. Kolman B., Busby R: *Discrete Mathematical Structures for Compute Science*, PHI.
2. Liu: *Introduction to Discrete Mathemetics*, McGraw-Hill.
3. Graham, Knuth, Pratshnik : *Concrete Mathematics*.
4. Grimaldi: *Discrete Mathematical Structures*.
5. Grossman P, *Discrete Mathematics for Computing*, Macmillan 1995
6. Ross KA & Wright CRB, *Discrete Mathematics*, Prentice-Hall 1999
7. Johnsonbaugh R, *Discrete Mathematics*, Macmillan.
8. Wiitala, *Discrete Mathematics*, McGraw Hill.
9. Biggs N L, *Discrete Mathematics*, Oxford.
10. Truss J, *Discrete Mathematics for Computer Scientists*, Addison Wesley.

CP-207 Electronic Circuits And Design

Credits: 4 (3-0-2)

1. **Transistor Characteristics**: the junction transistor, transistor current component, the transistor as an amplifier, transistor construction, the common base configuration, the common emitter configuration, the CE cut of region, the CE saturation region, typical transistor junction voltage values, common-emitter current gain, the common collector configuration.
2. **Transistor Biasing & Thermal Stabilization**: the operating point, bias stability, self-bias or emitter bias, stabilization against variation in I_{co}, V_{BE}, and ®, bias compensation, biasing techniques, for linear integrated circuits, thermistor and sensitor compensation, thermal runway, thermal stability.
3. **The transistor at low frequencies**: graphical analysis of the CE configuration, two-port devices and the hybrid model, transistor hybrid model, the h-parameter, conversion formulas for the parameters of the three transistor configuration, analysis of a transistor amplifier circuit using h- parameters, the emitter follower, comparison of transistor amplifier configuration. Simplified calculations for common-collector configuration, the common-emitter amplifier with an emitter resistance, high input resistance transistor circuits.
4. High Frequency model of BJT amplifiers.
5. **Introduction to switching devices**: positive and negative logic of OR , AND, NOR, NAND, Exclusive OR and Exclusive NOR gates. RTL, DTL,DCTL, TTL, ,ECL, HTL, MOS and CMOS logic circuit and their realisation. Speed and Delay in logic circuit.
6. **Field Effect Transistors**: The junction field effect transistor, the pinch-off voltage, the JEFT volt-ampere characteristics, the FET small signal model, the metal-oxide-semiconductor FET (MOSFET), the low frequency common source and common drain amplifiers, the FET as a voltage variable resistors (VVR).
7. **Feedback Amplifiers and Oscillators**: Concepts of feedback. Various topologies for amplifiers. Positive feedback, various oscillator circuits.
8. **Multivibrators**: Astable, Bistable and Monostable Multivibrators.

Text/References:

1. Integrated Electronics, Millman Halkias, TMH.
2. Solid state Electronics Devices, Streetman, PHI.
3. Microelectronic Circuits, Sedra Smith, Oxford Press, India.

CP-202 Principles of Programming Languages

Credits 4 (3-0-2)

Importance of programming languages, brief history and features, attributes of good programming language. Introduction to language translator, binding and binding time.

Language translation issues: Formal translation models-BNF grammars, regular grammar, FSA.

Elementary and structured data types, their specifications, representations, and implementation of numbers, vectors and arrays, records, character string, variable size data structure, sets, input output files. Type checking and type conversion, type equivalence. Encapsulation and information hiding, sub programs.

Implicit and explicit sequence control. Subprogram sequence control. Recursive sub programs, exception and exception handlers. Co-routines and scheduled subprograms, task and concurrent exception.

Name and reference environments, static dynamic and block structure. Local data and local referencing environments.

Dynamic and static scope of shared data. Block structure, parameters and their transmission. Task and shared data storage requirement for major runtime elements. Program and system controlled storage management. Static and stack based storage management. Fixed size and variable size heap storage management.

Text / References:

1. Ghezzi: *Programming Language Concepts*, Addison Wesley
2. Pratt, Zelkowitz: *Programming Language Design and Implementation* PHI.
3. Sebasta: *Concept of Programming Language*, Addison Wesley
4. Sethi Ravi: *Programming language Concepts & Constructs*, Addison Wesley.

CP-204 Microprocessor And Interfaces

Credits 4 (3-0-2)

The 8085 Microprocessor: Block diagram, pins and their description, demultiplexing of buses, control signal and flags. Introduction to 8085 based microcomputer system.
Instruction and timing: instruction classification, instruction formats, addressing modes, instruction timings and status, interrupts.
Programming the 8085: 8085 instruction set, data transfer instruction, arithmetic logic & branch operations: Rotate and compare. Instruction related to stack operations.
Programming Techniques: looping, counting and indexing, counters and time delays, subroutines.
Interfacing concepts: basic interfacing concepts, memory mapped and peripheral mapped I/O.
Interfacing peripherals: Descriptions, programming and interfacing of 8255, 8253, 8259A with 8085. Description of simple systems using above chips.
Direct Memory Access: basic concepts of DMA techniques, Description, programming and interfacing of DMA controller 8257.
Serial I/O: Basic concept of serial I/O, software controlled serial I/O.
Basic Idea of Following Bus Standard: RS232C, IEEE-4888.

Text/References:

1. Douglas V. Hall : Microprocessors and Interfacing, McGraw Hill
2. Gaonkar ; 8085 Programming, Penram Press

CP-206 Object Oriented Design

Credits 4 (3-0-2)

Object Oriented Programming and Design: Review of abstraction, objects and other basics, Encapsulation, Information hiding, method, Signature, Classes and Instances, Polymorphism and inheritance.

C++ Programming Basics: Fundamentals, variables and assignments, Input and Output, Data types and expressions, flow of control, subprograms, top-down design, predefined functions, user defined functions, procedural abstractions, local variables, overloading function names, operator overloading, parameter passing, this pointer, destructors, copy constructor, overloading the assignment operator, virtual functions, function calling functions, friend functions, recursive functions, recursive member functions. Static member function.

C++ Object oriented concepts: Objects and classes, use of file for I/O, formatting output with stream functions, Character I/O, inheritance, structures for diverse data, structures as function arguments, initializing structures, defining classes and member functions, public and private members, constructors for initialization, standard C++ classes, derived classes, flow of control, use of Boolean expressions, multiway branches, use and design of loops. Friend function and friend class.

C++ Data structures and Advanced Topics: Arrays – programming with arrays, arrays of classes, arrays as function arguments, strings, Multidimensional arrays, Arrays of strings, pointers Dynamic arrays, Classes and dynamic arrays, Base classes, access control, Templates- generic classes and functions, namespaces. Standard Template Library.

Text/References:

1. Balaguruswamy: Object-oriented Programming with C++.
2. Robert Lafore: C++ Programming
3. Ashok N. Kamthane : Object Oriented with C++, Pearson Education

CP-208 Principles Of Communication Engineering

Credits: 4 (3-1-0)

Transmission Media: Primary and secondary line constant, telephone lines and cables, Electronic Public Switch Telephone Network. Twisted pair, coaxial cable. Introduction and principles of light communication in fibers, losses in optical fiber, dispersion, light sources and photo detectors, connectors.

Modulation Of Signals: Introduction to Radio communications. Principles of Analog modulation techniques like FM, PM, SSB, Generation and detection. FDM, Pulse Modulation: Pulse transmission over band-limited signals, sampling theory, pulse amplitude modulation, Time division multiplexing.

Digital Communication: Digital representation of information, characterization of communication channels: Time and frequency domain. Fundamental limits of digital transmission: Nyquist signalling rate and Shannon channel capacity. PCM, DPCM, DM, ADM, comparison of above systems on the basis of performance criterion such as bit transmission, signalling rate, error probability, S/N ratio, bandwidth requirements.

Text/ References:

1. Simon Haykin, Comm. System 3/e ,Wiley Eastern Ltd.
3. Taub & Schilling, Principles of Comm. Systems. , McGraw Hill publications.
4.John D. Ryder:Network lines and fields,PHI
5. Communication Networks: Leon Garcia and Widjaja, Tata McgrawHill
6. Digital Telephony: John.C.Bellamy

CP-301 Computer Architecture

Credits 4 (3-1-0)

Basic Structure of computer Hardware and Software, Basic computer organization and design, Von Neumann Architecture

Processor Design: Some Fundamental Concepts, Instruction Sets: Characteristics and functions and formats.

Computer Arithmetic: Fixed Point Arithmetic and Floating point Arithmetic, Fast Adders and Multipliers, ALU Design.

Control Design: Execution of a complete Instruction. Instruction Sequencing, Instruction Interpretation.

Control Unit Operations: Hardware Control and Micro programmed Control

Memory Organization: Memory Technology, Virtual Memory: Hierarchies, Segments, Pages ,High Speed Memories, Interleaved, Internal Memory, External Memory, Cache.

System Organization: Communication with I/O devices (Asynchronous, Synchronous)

Input Output: I/O HW, Standard I/O Interfaces.

Text / References:

1. *Computer Organization and Architecture* - William Stallings (Pearson Education Asia)
2. *Computer Organization and Architecture* -John P. Hayes (McGraw -Hill)
3. *Computer Organization* -V. Carl. Hamacher (McGraw-Hill)
4. *Computer System Architecture*-M. Morris Mano (PHI)

CP-303 Data Base Management Systems

Credits 4 (3-0-2)

Need, purpose and goal of DBMS, Three tier architecture, ER Diagram, data models- Relational, Network, Hierarchical and Object Oriented.

Data Base Design: Conceptual data base design, Theory of Normalization

Primitive and Composite data types, concept of physical and logical databases, data abstraction and data independence, data aggregation, Relational Calculus.

SQL : DDL and DML, Relational Algebra.

Application Development using SQL : Host Language interface, embedded SQL programming, Stored procedures and triggers and views, Constraints assertions.

Internal of RDBMS : Physical data organisation in sequential, indexed random and hashed files. Inverted and multilist structures, B trees, B+ trees, Query Optimisation, Join Algorithm, Statistics and Cost Base optimisation.

Transaction Processing, concurrency control, and recovery management. Transaction model properties and state serialisability . Lock base protocols, two phase locking.

Text/References:

1. H.f. Korth and Silberschatz: *Database Systems Concepts*, McGraw Hill
2. Almasri and S.B. Navathe: *Fundamentals of Database Systems*,
3. C.J. Date: *Data Base Design*, Addison Wesley
4. Hansen and Hansen : *DBM and Design*, PHI

CP-305 Software Engineering

Credits 4 (3-1-0)

Introductory Concepts: Historical perspective, System Definition, Software Life Cycle, Software Engineering paradigms.
System analysis: Feasibility study requirement analysis, Cost benefit analysis, Planning systems, Analysis tools and techniques.
System Design: design fundamentals, Modular Design, Data and procedural design, object oriented design.
System Development: Code documentation, Program design paradigms, Efficiency Consideration.
Verification, Validation and Testing: testing methods, Formal Program Verification, Testing Strategies.
Software Maintenance: Maintenance Characteristics, Maintainability, Maintenance tasks and side effects.
Text / References:

1. Pressman R.S: Software Engineering: A Practitioner approach, McGraw hill
2. Sommerville I: Software Engineering, Addison Wesley
3. Ghezzi C. Jazayeri M and Mandrioli: Fundamentals of software Engg. , PHI

CP-307 Design and Analysis of Algorithms

Credits 4 (3-0-2)

Algorithm Analysis: Asymptotic notation, solution of recurrence, model of computation, time and space complexities, average and worst case analysis.
Algorithm Design Techniques: Greedy algorithm, dynamic programming, divide and conquer, backtracking, branch and bound.
Greedy Algorithms: Knapsack problem.
Dynamic Programming: Chained matrix multiplication, longest common subsequence.
Divide and Conquer: Order Statistics – finding the median, exponentiation, matrix multiplication.
Graph Algorithms: Shortest path algorithms, minimum spanning tree algorithm, network flow, matching, coverings, applications of DFS:- biconnectivity, Euler circuits, strongly connected components, topological sort, and articulation point.
Approximate Algorithm: Travelling Salesman Problem, vertex-cover problem.
Set algorithms: Disjoint set operations.
Matrix inversion – LUP decomposition.
Construction of codes: Shannon Fano and Huffman codes.
Introduction to problem classes – NP, NPC, NP-Hard.

Text / References:

1. Cormen, Leiserson, Rivest: *Introduction to Algorithms*, Prentice Hall of India.
2. Horowitz and Sahani: *Fundamental of Computer algorithms*.
3. Aho A.V , J.D Ulman: *Design and analysis of Algorithms*, Addison Wesley
4. Brassard : *Fundamental of Algorithmics*, PHI.
5. W.W. Peterson and E. J. Weldon: *Error correcting codes*.
6. Sara Baase, Allen Van Gelder: *Computer Algorithms: Introduction to Design and Analysis*, Pearson Education.

CP-309 Computer Networks

Credits: 4 (3-0-2)

Computer Network Architecture, Circuit switching, Packet And Massage Switching, Network Structure. OSI 7-layer architecture. Physical Layer, Data Link Layer, Framing, Error detection. Retransmission algorithms. Queueing models and introduction to Little's theorem, M/M/1 and M/M/m queues. Network of queues. Introduction to M/G/1 queues, reservations and priority. Stability of queueing systems. Multiple access and Aloha. CSMA/CD and Ethernet. High Speed LANs and Token Ring. High speed switch scheduling. Broadcast routing and spanning trees. Shortest path routing. Distributed routing algorithms, optimal routing. Flow control – window/credit schemes, rate control schemes. Transport layer and TCP/IP. Introduction to ATM networks and Network Management And Interoperability. Performance Issues Of LAN And WAN.

Text/ References:

1. *Data Networks*: Bertsekas and Gallagher, Phi.
2. *Computer Networking A top down Approach*: J.F.Kurose, Pearson.
3. *Data & Computer Communication* : W. Stalling , Phi
4. *Computer Networks*: L. Peterson and Davie, MKP
5. *Computer Networks and Internet*: D.E. Comer, Pearson

CP-302 Operating System

Credits: 4 (3-0-2)

1. **Introduction**: Need of Operating System, its evolution, types of operating systems, batch, multiprogramming, time sharing systems, real time systems.
2. **Processes and processor management**: process concept, systems programmers view of processes, operating systems view of processes, Process scheduling, Schedulers, interprocess communication and synchronization, race condition, mutual exclusion, semaphores, monitors, messages. Deadlocks prevention , avoidance, detection and recovery.
3. **Memory Management**:
    a. Contigious allocation- partitioned memory allocation – fixed and variable partitioning, memory management with bit maps – swapping – relocation- protection and sharing.
    b. Non contigious allocation –
        i. Paging – principles , page allocation, segmentation.
        ii. Virtual memory concepts, address translation, management of virtual memory, page replacement policies, protection and sharing, working set model, hardware support.
4. **File management**: Command language users view of file system, file system design, disk space management directory structure, shared files, file system performance. File servers, security, protection mechanism.
5. **Input/Output Management** : Device drivers, disk scheduling.
6. Introduction to loaders, linkers and relocating loaders.
7. **Case study**: UNIX.

References/text:

1. A.Silberschatz and Peter B Galvin: *Operating System concepts*, Addison Wesley publishing Company.
2. Deitel H.M: *Operating Systems*, Addison Wesley.
3. Stalling W: *Operating Systems*, Prentice Hall.
4. Tanenbaum: *Operating System Concepts*, Prentice Hall.

CP-304 Digital Signal Processing

Credits: 4 (3-1-0)

Introduction to Continuous time Systems ,idea about Linear Time Invariant System LTI systems. Fourier Transforms.

Discrete Time Systems: Sampling and aliasing, LTIs , Representation of Sequences by Fourier Transform and properties of Fourier Transform.

Z-Transform, Structures for discrete system, DFT, Computation of DFT. FIR Filters, frequency response of FIR filters. IIR Filters, spectrum analysis. FFT Algorithms

Text/ References:

1. *Discrete Time Signal Processing* by Alan V Oppenheim, Ronald W Schafer.- PHI
2. *Digital Signal Processing Primer*: K.Steiglitz, Pearson.
3. *Signal and Systems*: S.Haykin and Veen, Wiley
4. *DSP First: A Multimedia Approach*: J.F.McClellan, Schafer and Yodar, Pearson.

CP-306 Theory of Computation

Credits 4 (3-1-0)

Introduction to automata theory, languages, recursive definitions, regular expressions, finite automata, transition graphs and Kleen's theorem.
Non-determination, finite automata with output, regular languages, minimization of finite automata.
Chomsky classification of languages, regular grammars, context free grammars, simplification of context free grammars, Normal forms of CFG.
Push Down Automata Theory: push down automata and context free languages.
Turing hypothesis, Turing machine, Minskey's theorem, TM variation and encoding, computability and acceptability.
Elements of prepositional logic and predicate calculus.

Text/ References

1. Aho, Hopcropt and Ullman, *Introduction to Automata Theory, Formal Languages and Computation*, Narosa
2. Cohen, *Introduction to Computer Theory*, Addison Wesley.
3. Papadimitriou, *Introduction to Theory of Computing*, Prentice Hall.
4. K.Krishnamurthy: *Theory of Computation*.

CP-308 Computer Graphics

Credits: 4 (3-0-2)

Introduction to Interactive Computer Graphics: Picture analysis, Overview of programmer's model of interactive graphics, Fundamental problems in geometry.
Basic Raster Graphics: Scan Conversion, Aliasing, and Anti Aliasing,
Polygon: Representation, Filling and Clipping.
Geometric Manipulation: Transformations, Vectors, Matrices, and Homogeneous Co-ordinates.
Elementary 3D Graphics: Planar Geometric Projections, Vanishing Points, Specification of 3-D View.
Hidden Lines & Surfaces: Image and Object space, Depth Buffer Methods, Hidden Facets removal, Scan line algorithm, Area based algorithms, Floating horizon, Painters & BSP tree algorithms .
Curves and Splines: Parametric and Non parametric Representations, Bezier and B-Spline Curves.
Rendering: Color, Simple Light Illumination Model, Ray tracing, Gouraud and Phong Shading.

Text/ References:

1. J. Foley, A. Van Dam, S. Feiner, J. Hughes: *Computer Graphics-Principles and Practice*, Addison Wesley.
2. D. Hearn and Baker: *Computer Graphics*, PHI
3. D. Rogers and Adams: *Mathematical Elements of Computer Graphics*, Mc Graw Hill.
4. D. Rogers : *Procedural Elements of Computer Graphics*, McGraw Hill.

CP-322 Optimization Techniques

Credits 4 (3-1-0)

1. **Introduction**: Introduction, Engineering applications (models) of optimization.
2. **Linear Programming**: Graphical, simplex method, Concept of duality, Dual simplex method,.
3. **Dynamic Programming:**
4. **Transportation Problems**: basic feasibility solution by different methods, optimal solution, Degeneracy in transportation problem, unbalanced transportation problems
5. **Assignment Problems**: Balanced and unbalanced assignment, assignments to given schedule.
6. **Introduction to Non-linear programming**:.

Text/References

1. Rao S S, *Optimization: Theory and Applications.*
2. N.S. Kambo : *Mathematical Programming Techniques*, East West Press
3. Hamdy A. Taha : *Operation Research an Introduction*, PHI
4. Vasek Chvatal : *Linear Programming*, W.H. Freeman & Co.
5. Walsh G R, *Methods of Optimisation*
6. Williams H P, *Model Building in Mathematical Programming*
7. Williams H P, *Model Solving in Mathematical Programming*
8. Winston W L, *Operations Research: Applications and Algorithms*.
9. Papadimitriou, Steiglitz: *Combinatorial Optimization: Algorithms and Complexity*, PHI.

CP-324 Combinatorics

Credits 4 (3-1-0)

Graph Theory: Graphs – Directed and Unidirected, Eulerian chains and Cycles. Hamiltonian chains and cycles. Trees, chromatic number, Connectivity and other graphical parameters. Applications. Polya's Theory of enumeration and its applications.
Number Systems: Sums and Product rules, Permutation and combinations. Pigeon hole principle, Inclusion and Exclusion Principles, Ramsey, Catalan and Stirling numbers. Sequences and selections, Proofs, Induction, Relations, Combinatorial number theory.
State Machines: Invariants and Termination
Recursive Definitions and Structural Induction
Sums, Products & Asymptotics
Probability Theory: Introduction to Probability, Random Variables and Expectation

Text/References:

1. Graham, Knuth, and Patashnik: *Concrete Mathematics: A Foundation for Computer Science*, Pearson
2. Kenneth H. Rosen: *Discrete Mathematics and its Applications*, Fourth Edition.
3. Tucker: *Applied Combinatorics*, Wiley.
4. Gibbsons, A.: *Algorithmic Graph Theory*, Cambridge University Press.
5. Narsingh Deo:*Graph Theory with Application to Engineering and Computer Science*, Prentice-Hall.
6. Narsingh Deo: Com*binatorial Algorithms: Theory and Practice*, Prentice-Hall.

CP-326 Advanced Microprocessors

Credits 4 (3-1-0)

Architectural Features of X86 Microprocessors and Pentium Processors and comparison.
Addressing Modes of x86, Instruction Sets, Instruction templates, Interrupts and interrupt handling, assembly language programming.
Memory management: Real, Protected And Virtual Real Modes, segmentation and paging.
Multitasking and task switching Features in x86.

Text/ References :

1. Douglas V. Hall: Microprocessor and interfacing, Programming And Hardware, TMH
2. B.S. Chhabra: 8086 architecture and interfacing, DRP
3. Liu Gibson: Introduction to 8086/88 architecture and interfacing, PHI
4. James L. Antonakof: Introduction to Intel Family of Microprocessors, Pearson Edu. Asia

Credits 4 (3-1-0)

CP-328 Neural Networks

Credits 4 (3-1-0)

Neural Architecture: Neuron model, transfer function, hamming and hopfield network, perceptron, learning rule, recurrent networks.
Backpropagation: generalized delta rule, limitations, modeifications – momentum, variable learning rate, conjugate gradient.
Learning: Supervised, associative, competitive, unsupervised learning.
Unsupervised learning: Self-organising maps, Adaptive Resonance Theory.
Neural network applications: Pattern classification, function approximation.

Text/ References:

1. Simon Haykin: *Neural Networks: A Comprehensive Foundation (2nd Edition)*
2. Christopher M. Bishop: *Neural Networks for Pattern Recognition*
3. James A. Freeman, David M. Skapura: *Neural Networks*, Pearson Education.
4. Martin T. Hagan: *Neural Network Design,* Thomson Learning**.**
5. N. Gupta, *Optimization Techniques for Engineers*, Ashirwad Publishers and Distributors

CP-330 Mathematical Programming

Credits 4 (3-1-0)

Classical Optimization: Polyhedra; Extreme Points. Degeneracy; Optimality Conditions; The Simplex Method. Duality; Dual Simplex, Farkas Lemma, Separating Hyperplanes and Duality, Cones, Rays, Representation of Polyhedra,
Dantzig-Wolfe Decomposition
Non-linear Programming: Unconstrained and constrained optimization
Integer programming
Project Scheduling: CPM and PERT.
Theory of Games: Two person zero sum game, solution of pure strategy game (with saddle point).
Search Methods: Line search, steepest descent and Newton's method.

Text/References:

1. D. Bertsimas and J. N. Tsitsiklis, Introduction to Linear Optimization, Athena Scientific, 1997.
2. Papadimitriou, Steiglitz: *Combinatorial Optimization: Algorithms and Complexity*, PHI.
3. Rao S S, *Optimization: Theory and Applications.*
4. N.S. Kambo : *Mathematical Programming Techniques*, East West Press
5. Hamdy A. Taha : *Operation Research an Introduction*, PHI
6. N. Gupta, *Optimization Techniques for Engineers*, Ashirwad Publishers and Distributors

CP-332 Information Theory and Coding

Credits 4 (3-1-0)

Mathematical Theory of Foundation Of Information Theory in Communication system.
Measures of Information- Self information, Mutual Information, Average Information, entropy and its properties.
Source Model and Coding, channels Model and Coding. Problems of unique decipherable Codes, condition of Instantaneous codes, Code word length, Kraft Inequality. Noiseless Coding Theorem.
Construction of codes: Shannon Fano, Shannon Binary and Huffman codes.
Discrete Memory less channels: Classification of channels, calculation of channel capacity. Decoding scheme- the ideal observer. The fundamental theorem of Information theory.
Error Correcting Codes: Minimum distance principle. Relation between distance and error correcting properties of codes, The Hamming bound. Parity check Coding. Bounds on the error correcting ability of Parity Check Codes.

Text /References

1. *Information theory and Reliable Communication* by R.G.Gallager
2. *Information Theory* by Robert Ash
3. *An Introduction to Information Theory* by F. M. Reza
4. *Error correcting codes* by W.W. Peterson and E. J. Weldon

CP-401 Principles of Compiler Design

Credits 4 (3-0-2)

Translators: Introduction to compilers, translators, and interpreters, compilation process.
Lexical Analysis: Finite automata, Regular expressions, Design & implementation of lexical analysers.
Syntax Analysis: Context Free Grammars, Derivation and Parse trees, Bottom-up and Top-down Parsing.
Syntax directed translation: Syntax directed translation, Intermediate codes, Quadruples, Triples.
Symbol table organization: Hashing, linked list, tree structures.
Memory allocation: Static and dynamic structure allocation.
Code optimization: Basic blocks, Flow graphs, DAG, Global data flow analysis, Loop optimization.
Code generation: Compilation of expression and control structures. Error detection and recovery.

Text & References:

1. Aho, Ullman and Sethi: Compilers, Addison Wesley.
2. Holub, Compiler Design in C, PHI.

CP-403 AI & Expert System

Credits 4 (3-0-2)

Overview of AI, Problems, Problem space and searching techniques, Definition production system, Control strategies, Heuristic search techniques.

Knowledge representation: Representation, mappings, approaches and issues, Predicate logic, prepositional logic, Resolution, Procedural and declarative knowledge, forward and backward reasoning, Matching, Semantic nets, Frames scripts.

Learning and learning systems: Introduction to Hopfield networks, introduction to neural networks, learning in neural networks, applications of neural networks, Recurrent network.

Natural Language Processing, Perceptions and actions.

Introduction to Expert Systems, Definition types, Component, development process.

Introduction to AI languages: PROLOG and LISP.

Text & References:

1. Artificial Intelligence: Elaine Rich, Kevin Knight, Mc-Graw Hill.
2. Introduction to AI & Expert System: Dan W. Patterson, PHI.

CP-405 Introduction to VLSI Design

Credits: 4 (3-0-2)

- Introduction: IC system design options, CMOS processing, layout and design rules, Stick diagrams
- CMOS Design and Characterization using SPICE: Inverter transfer characteristics, noise margins, SPICE simulation, Transient response and transistor sizing, SPICE simulation, Speed-area trade-off , Circuit Power Consumption, design tradeoffs speed-power, introduction to low power circuit design, Capacitance estimation, buffer design, area-speed design tradeoffs. Transistors, gates and wires fabrication.
- CMOS Circuit Design and Layout: Static complementary gates, Transmission gates and tristate circuits, Storage elements, Pass transistor logic, Dynamic logic, Structured macros: PLAs etc
- Introduction to Low power design

Text/References:

1. *Modern VLSI Design*: Wayne Wolf, Pearson
2. Rabaey JM, *Digital Integrated Circuits*, Prentice-Hall/Pearson
3. Weste NHE, Eshraghian K, *Principles of CMOS VLSI Design with Verilog/VHDL manual*, Addison-Wesley/Pearson, 2000.

CP-407: Real Time Systems

Credits: 4 (3-0-2)

Introduction to Real-time systems, Issues in Real-time Systems, Real-time System Components, Classification of Real-time systems and Real-time tasks. Misconceptions about Real-time computing. Real-time System requirements: Speed, Predictability, reliability, adaptability. Specification of timing constraints.

Real-time scheduling: Requirements and Issues, Terminology, modeling, Introduction static and dynamic scheduling schemes, cyclic scheduling, priority driven scheduling of periodic tasks, schedulability tests, Aperiodic task scheduling: fixed priority server/non-server based scheduling algorithms. Practical factors/overheads.

Task Synchronization: Need and priority inversion problem, Priority Inheritance protocol, priority ceiling protocol and stack-based priority ceiling protocol for fixed priority preemptive system.

Introduction to multiprocessor real-time systems, problems and issues.

An overview of a real-time operating system

Text & References:

1. J.W.S.Liu: *Real-Time Systems*, Pearson Education Asia
2. S.T.Lavi, A.K.Agrawala: *Real-time system Design*, McGraw Hill
3. P.A.Laplante: *Real-time Systems Design and Analysis, An Engineer's Handbook*, IEEE Press
4. P.D.Laurence, K.Mauch: *Real-time Microcomputer System Design, An Introduction*, McGraw Hill

CP-421 Advanced Topics in Computer Graphics

Credits: 4 (3-0-2)

Visibility: Polygon Meshes, Depth Sorting. Triangle decomposition, Geometric Sort, Warnock's Methods
Hidden Lines and Surfaces: Special cases, Surfaces defined by a function y=f(x,y), Grid surfaces.
Colour in Computer Graphics: Color Vision, Measuring Color, Color Models, Color output, color usage.
Object Lighting and Shading: Local reflection models, shading surfaces, Texture and transparency, Forward & backward Ray-tracing
Global Illumination and classical radiosity.
Modeling natural phenomena: Fractals and chaos.
Animation Techniques: Position, speed or orientation. Animation by hierarchic control, scenario-based systems, movement control.
Shadows, Morphing.
Efficiency and complexity issues in graphics algorithms

Text/ References:

1. J. Foley, A. Van Dam, S. Feiner, J. Hughes: *Computer Graphics-Principles and Practice, Addison Wesley*.(2nd edition in C)
2. Alan Watt- *3D Computer Graphics*(3rd edition)
3. Alan Watt, Mark Watt: *Advanced Animation & Rendering Techniques:Theory & Practice*, Addison-Wesley.
4. D. Rogers and Adams: *Mathematical Elements of Computer Graphics*, Mc Graw Hill.
5. Thomas Moller: *Real-time Rendering*, Eric Haines, A.K Peters Ltd

CP-423 Advanced Topics in Networking

Credits: 4 (3-0-2)

Review of MAC and LLC Issues: Techniques for multiple access,
Adaptive LLC mechanisms for wireless links**.** Internet Routing Architecture:
Internet Service Providers and Peering. Border Gateway Protocol (BGP). Review of Open Shortest Path First Border Gateway Protocol (continued), BGP instability. Fair queuing. TCP congestion control. TCP variants. Random Early Detect (RED). TCP RTT estimation. Fast retransmit, Fast recovery. Resource ReSerVation Protocol (RSVP). Differentiated Services. Wireless TCP Mobile IP. Multicast routing Scalable Multicast routing. Core Based Trees (CBT). Scalable Multicast routing Protocol Independent Multicast (PIM). Scalable Reliable Multicast. Overlay Networks. Peer-to-Peer Networks. Domain Name System (DNS). LDAP/NIS. DHCP/BOOTP
Introduction to Web-server and redirection mechanisms. Web cache sharing: Summary-Cache.
Traffic Engineering. Introduction to the Next generation IP, IPv6,
IP Next Layer (IPNL)ng,. Multi-Protocol Label Switching (MPLS)
Access technologies: xDSL.

Text/ References:

1. *Computer Networks*: L. Peterson and Davie, MKP\
2. *Wireless communication and Networking*: W. Stallings
3. Recent RFCs and suggested reading form SIGCOMM/ACM/IEEE.

CP-425 Distributed Databases

Credits: 4 (3-0-2)

Introduction To Distributed DBMS, Overview of Relational DBMS and Computer Networking.
Distributed DBMS Architecture, Architecture Models for Distributed Data Base System, Client - Server Systems, Peer-to-Peer Distributed Systems.
Distributed Data Base Design, Distribution Design Issues, Fragmentation and Allocation.
Semantic Data Control, View Management, Data Security,
Query Processing, Characterization of Query Processor, Layers of Query Processing, Query Decomposition, Localization of Distributed Data, Optimization Of Distributed Queries.
Introduction To Transaction Management, Distributed Concurrency Control, Distributed DBMS Reliability.

Text & References:

1. *Distributed Database: Principles and System* - Ceri Pelagatti (McGraw Hill)
2. *Principles of Distributed Database Systems* - M. Tamer Ozsu, Patrick Valduriez (Pearson Education)
3. *Distributed Data Base Systems* - David Bill, Jane Grimson (Addison - Wesely)

CP-427 VHDL

Credits 4 (3-0-2)

Origins of VHDL. VHDL Design Cycle, the standardisation process.
Register-Transfer Level Design: RTL design stages. Design of Combinational Logic blocks. Synthesis and simulation models. Types and operators. Standard packages. Sequential VHDL: Concept of processes, Registers : simulation model, synthesis model, templates and types of registers.
Hierarchy of components within VHDL designs.
Subprograms and special structures.
Test benches, data and file handling.
Libraries.

Text/References:

1. *Designer's Guide to VHDL*: P.J.Ashenden, MKP
2. *Digital system Design with VHDL*: M.Zwolinski, Pearson.
3. *VHDL coding style and methodologies*: Ben Cohen
4. *VHDL Primer*; J.Bhaskar, Pearson
5. *VHDL for logic synthesis*: A. Rushton, Wiley

CP-429: Simulation and Modelling

Credits: 4 (3-0-2)

Definition of a system, System concepts, type of system, continuous & discrete systems, modeling process verification & validation.

Markov chains. Weak law of large numbers. Central limit theorem. Strong law of large numbers.

Queuing models: Little's Theorem, M/M/1, M/M/m, M/M/∞, M/M/m/m, M/G/1, and M/M/1/J queuing systems.

Introduction, classification of simulation models, advantages and disadvantages of simulation.

Discrete system simulation: Monte Carlo method, Random number generators. Probability Distributions.

Element of inventory theory, more complex inventory models, finite and infinite delivery rate model with and without back ordering. Simulation of inventory systems.

Text/ References:

1. *System simulation*, Gorden G., Prentice Hall of India
2. *System simulation*, Narsing Deo, McGraw Hill.
3. *Simulation modeling and analysis*, Law and Kelton, McGraw Hill.

CP-441 Embedded Systems

Credits: 4 (3-0-2)

Introduction to embedded systems., design representations, level of abstractions, design methodologies, Models and architectures, Taxonomy of models and architectures, brief descriptions of specification languages, Specification requirement for embedded systems, Spec Chart and Spec Chart Description.

Design challenges & issues, hardware and software design, co-design of software and hardware, ASIC.

Design quality estimation : Quality matrix, software and hardware estimation.

Introduction

Sample design Specification of Answering machine/ Microcontroller 8051.

Text / References:

1. Denial D. Gajski , frank Vahid: *Specification and design of embedded systems*, PH
2. Jonathan W. Valvano: *Embedded Microcomputer Systems*, Thomson Learning
3. Myke Predko: *Programming and Customizing the 8051 Micro Controller*, TMH

3. Ayala : *8051 Micro controllers*, Penram Press

CP-443 Cryptography

Credits: 4 (3-0-2)

Number theory: Prime numbers, modular arithmetic, Fermat's theorem, Euler's theorem, Chinese remainder theorem, Discrete logarithms, Random number generation, factoring, prime number generation, one-way hash functions – MD5, SHA (Secure Hash Algorithm).
Cryptography: Need, conventional techniques, stream ciphers, block cipher, steganography. Public v/s private key cryptography.
Stream Ciphers: Caesar Cipher, mono-alphabetic and poly-alphabetic ciphers, Playfair Cipher, Hill Cipher, Rotor machines, One time pad,.
Steganography: Visual, Textual, Cipher hiding, False errors.
Private-key cryptography: Feistel structure, DES (Data encryption standard), design of S-boxes, AES, Triple DES,
Public key cryptography: Key management, Key exchange – Diffie-Hellman, Authentication, Signatures, Deniability, RSA.
Digital Signature: DSA and its variants, discrete logarithm based digital signatures.
Algorithms: International data encryption algorithm (IDEA), PGP.
Cryptanalysis: Differential and linear cryptanalysis - cracking DES.

Text & References:

1. Stallings, Cryptography and Network Security: Principles and Practice, Pearson Education Asia. ISBN 981-403-589-0.
2. B Schneier, Applied Cryptography, Wiley. ISBN 0-471-11709-9
3. D Kahn. The Codebreakers, Sphere books. ISBN 0-7221-51497
4. P Wayner, Disappearing Cryptography, Academic Press. ISBN 0-12-738671-8
5. Cracking DES, Electronic Frontier Foundation. ISBN 1-56592-520-3
6. A.J. Menezes, P.C. van Oorschot and S.A. Vanstone, Applied Cryptography, CRC Press, ISBN 0-8493-8523-7, 1997
7. D.R. Stinson, Cryptography - Theory and practice, CRC Press, ISBN 0-8493-8521-0, 1995

CP-445 Advanced Data Structures and Algorithms

Credits 4 (3-0-2)

Binary heaps, binomial heaps, Fibonaaci heaps.
AVL trees, Red-black trees, B-trees, Splay trees.
Disjoint set – union and path compression, Amortized analysis
Recurrence equations. Time and space complexity, NP, NPC and NP-Hard problems, undecidability.
Convex hull, line segments, Optimal polygon triangulation.
Primality testing, Integer factorization, Randomized algorithms, Probabilistic algorithms.
Dynamic programming: Longest common subsequence. Chain of matrix multiplication,
Approximate Algorithms: Vertex-cover, set-covering problems, Travelling Salesman problem.
Combinatorial algorithms, Randomized algorithms.

Texts/References:

1. Cormen, Leiserson, Rivest: Introduction to Algorithms, Prentice Hall of India.
2. Horowitz and Sahani: *Fundamental of Computer algorithms*.
3. Aho A.V , J.D Ulman: *Design and analysis of Algorithms*, Addison Wesley
4. Brassard : *Fundamental of Algorithmics*, PHI.
5. W.W. Peterson and E. J. Weldon: *Error correcting codes*.
6. Sara Baase, Allen Van Gelder: *Computer Algorithms: Introduction to Design and Analysis*, Pearson Education.
7. Papadimitriou, Steiglitz: *Combinatorial Optimization: Algorithms and Complexity*, PHI.

CP-447 Image Processing & Pattern Recognition

Credits: 4 (3-0-2)

Image processing: Image formation, Image acquisition - cameras, displays, frame grabbers, Sampling and quantisation.

Image Transforms: Fourier transform, Discrete Fourier transform (DFT), fast Fourier transform (FFT), Discrete cosine transform (DCT), wavelet transform, Principal component analysis (PCA), independent component analysis (ICA).

Image Enhancement: Point and region operators, Image filtering, Convolution, Histogram. Morphological operations – dilation and erosion.

Image Segmentation: Segmentation by thresholding, optimal thresholding, region – representation, split and merge regions, quadtree, shape number, boundary descriptors.

Image Restoration: Direct, inverse, pseudo-inverse.

Image Representation: 2-D Shape representation and matching, Recovering depth information, 3-D representation and matching.

Image Interpretation: Edge detection, feature extraction, template matching, Hough transform.

Image classification: Metric, k-NN classification, clustering.

Case Studies: Ultrasound image analysis, Face recognition.

Text & References:

1. Gonzalez et al., Digital Image Processing, Prentice Hall, 2001
2. Sonka M, Hlavac V and Boyle R, Image Processing, Analysis and Machine Vision, Chapman and Hall, 2nd Ed. 1999.
3. Jain A K, Fundamentals of Digital Image Processing, Prentice Hall, 1989.
4. Stockman and Shapiro, Computer Vision, Prentice Hall, 2001
5. Banks S J, Signal Processing, Image Processing and Pattern Recognition, Addison Wesley, 1991.
6. Rabiner L R and Gold B, Theory and Applications of digital Signal Processing, Prentice Hall, 1975.
7. Efford, N., Digital Image Processing Using Java, Addison Wesley, 2000

CP-449 Biometrics

Credits 4 (3-0-2)

Biometrics: Need, Conventional techniques of authentication, challenges - legal and privacy issues. Biometrics: DNA, fingerprint, Iris, Face, hand geometry, human gait, speech, infra-red spectrum, ear. Combining biometrics, scaling issues.

Texts/References:

1. Julian D. M. Ashbourn, Biometrics: Advanced Identify Verification: The Complete Guide
2. Davide Maltoni (Editor), et al, Handbook of Fingerprint Recognition
3. L.C. Jain (Editor) et al, Intelligent Biometric Techniques in Fingerprint and Face Recognition
4. John Chirillo, Scott Blaul, Implementing Biometric Security
5. Nalini Ratha (Editor), Ruud Bolle
6. Authentication: From Passwords to Public Keys, Richard E. Smith

CP-420 Advanced topics in Operating Systems

Credits 4: (3-0-2)

Introduction: Goals, Functions, Design issues of Distributed OS, Distributed v/s network operating system.
Communication: Client Server, RPC
Distributed OS: Issues, process management, inter-process communication, scheduling, deadlocks
Design and implementation of distributed file systems, distributed shared memory
Security: Concepts and Distributed Systems
Distributed Concurrency, Transactions.
Case study: Unix, Amoeba.

Text/References:

1. Tanenbaum: *Distributed Operating Systems,* Pearson Education.
2. Bach, *Design of Unix O/S*.
3. Coulouris, Dollimore and Kindberg, *Distributed Systems: Concepts and Design*, Addison Wesley.
4. Mullender*: Distributed Systems*, Addison Wesley.

Tanenbaum and Steen: *Distributed Systems: Principles and Paradigms*, Pearson Education

CP-422: Parallel and Distributed Computing

Credits 4 (3-0-2)

Introduction to parallel computing. Parallel processing terminology, Pipelining Vs Data parallelism, Control parallelism, Scalability, Control parallel approach, Data parallel approach, Data parallel approach with I/O
Parallel reduction, Prefix sums, List ranking, Preorder tree traversal, Merging two sorted lists, Graph coloring, Reducing the number of processors, Problems defying fast solutions on PRAMS
Thread and process level parallel architectures: MIMD, multi-threaded architectures. Distributed and shared memory MIMD architectures.
Dynamic interconnection networks.
Mapping and scheduling: Mapping data to processors on processor arrays and multicomputers, Dynamic Load Balancing on multicomputers, Static scheduling on UMA multiprocessors, Deadlock.
Parallel programming and parallel algorithms: Programming models, parallel programming on multiprocessors and multicomputers. Parallel algorithm structure, analyzing parallel algorithm. Elementary parallel algorithms, Matrix algorithms, sorting, Graph algorithms.

Text & References:

1. Parallel computing – theory and practice, Quinn, Tata McGraw Hill.
2. Advanced Computer Architectures, Sima and Fountain, Pearson Education.
3. Computer Architectures single and parallel systems, Mehdi R. Zargham, PHI.
4. Foundations of parallel processing, Ghosh, Moona and Gupta, Narosa publishing.
5. Michael Quinn: Parallel Computing-Theory and Practice, MGH
6. Ed. Afonso Ferreira and Jose' D. P. Rolin, Parallel Algorithms for irregular problems - State of the art, Kluwer Academic Publishers.
7. Selim G. Akl, The Design and Analysis of Parallel Algorithms, PH International.

CP-424 Computer Human Interaction

Credits: 4(3-0-2)

Goals of human Computer Interaction and its relevance to the appluications of interactive computer graphics

Phychological Aspects Cognitive psychology, visual perception, auditory perception, haptic perception, human memory, human error

Devices for human computer interactuion: Text input devices, positioning and pointing devices, 3D devices, Devices for visual, auditory, and haptic output, Interfaces and devices for disabled users

Models and paradigms of HCI: Characterizing different phases of interaction. Ergonomic aspects of interaction. Interaction styles: from command language to 3D interfaces. Windows interfaces(WIMP). Menu and icon design. Interaction paradigms.

HCI and software Lifecycle: Analysis of usability requirements, Usability principles. User-centered design. Usability engg, prototyping techniques, Environment, user, task Analysis

Formal Methods in HCI: State transition Networks and other diagrammatic notations, Textual notations

Guidelines and standard user interfaces: Definition choosing and using guidelines. ISO 9241 standard

Tools for user interface implementation: windowing ststem, programming techniques, user interface management systems.

Usability Evaluation: Goals, recording tools, predictive evaluation, interpretive evaluation

Help: Requirement, Main approaches, adaptive and adaptable interfaces.

Recent Paradigms of HCI: Virtual reality, Multi-sensory intyerfaces, information visualization, Hypertext, Multimedia and Hypermedia interfaces, WWW interfaces. Design of usable web pages.

Text / References:

1. A.Dix, J.Finlay, G. Abowd and R. Beale, Human Computer Interaction, Second Edition, PHI, 1998
2. B. Scneiderman, Designing the User Interface, Addison Wesl;ey, III ed.
3. Preece, Rodgers, Sharp, Benion, Holland and Carey, Human Computer Interaction, Addison Wesley
4. Dix A, Finlay J, Abowd G and Beale R, *Human-Computer Interaction* , 3rd Edition. Prentice Hall, 2003
5. Norman DA, *The Design of Everyday Things*, Doubleday, 1990
6. Preece J and Keller L, *Human-Computer Interaction,* Prentice Hall, 1989
7. Barfield L, *The User Interface: Concepts & Design*, Addison Wesley, 1993
8. Cox K & Walker D, *User Interface Design*, Prentice Hall, 1993
9. Preece J, Rogers Y, Sharp H *Interaction Design: beyond human-computer interaction*, Wiley, 2002.

CP-426 Software Project Management

Credits 4 (3-0-2)

1. Software Project Management Concept:
   The Management Spectrum, People, Product, Process & Project.
2. Software Process & Project Matrix:
   Software Measurement Size Oriented Matrixes, Function Oriented Matrices.
3. Software Project Planning:
   Objectives, Decomposition Techniques, Empirical Estimation Model.
4. Risk Analyses And Management:
   Risk Identification, Projection, Risk Identification, Projection, Risk Refinement, Risk Monitoring And Management.
5. Project Scheduling & Tracking, Software Quality Assurance, Software Configuration Management.

Text & References:

1. R. S. Pressman, Software Engineering
2. P. Jalote, Software Project Management In Practice.
3. B. Hughest & M. Cotterell, Software Project Management.

CP-428 Advanced Topics in Databases

Credits 4 (3-0-2)

Real-time Database: Implementation and issues. Concurrency control and locking. Recovery. Transaction management.

Design and implementation issues in Relational Databases, Object-Oriented Databases, Temporal databases, Spatial databases, Multi-media databases

Data mining, Data warehouse

Text/References

1) Elmasri R and Navathe SB, *Fundamentals of Database Systems,* 3rd Edition, Addison Wesley,2000. This book covers most of the material on the course.
2) Connolly T, Begg C and Strachan A, *Database Systems,* 2nd Edition, Addison Wesley, 1999
3) Simon AR, *Strategic Database Technology: Management for the Year 2000*, Morgan Kaufmann, 1995
4) Gray J and Reuter A, *Transaction Processing: Concepts and Techniques*, Morgan Kaufmann, 1993
5) Date CJ, *An Introduction to Database Systems*, 7th Edition, Addison Wesley, 1999
6) Khashafian S and Baker AB, *Multimedia and Imaging Databases*, Morgan Kaufmann,1996
7) McFadden FR, Hofer JA and Prescott MB, *Modern Database Management* 5th Edition, Addison-Wesley 1999

CP-440 Robotics

Credits: 4 (3-0-2)

Robotics: Introduction to robotics, advantages, applications.
Robotic kinematics and dynamics: Direct and inverse kinematics problem. Axis transformations as applied to robotics; application and definition of the DH matrix; forward and reverse kinematics, trajectory planning. Robot manipulators and their control.
Robot sensors: Active and passive robot sensors Construction of tactile, touch and vision sensors; interpretation of sensory information; vision processing; use of sensory data to determine kinematic information.
Robot Intelligence: State space search, Robot learning, Robot task planning, robotics in computer vision applications.
Robotic end effectors: Stable grip; constraints; types of contact; mathematical representation of stable grip; use of screw twist, and wrench gripper design; tools as end effectors.
Problems of implementation of automatic systems.
Text & References:

1. Fu K, Gonzalez R and Lee C, *Robotics - Control Sensing Vision & Intelligence*, McGraw Hill.
2. Craig J J, *Introduction to Robotics, Mechanics and Control*, Addison Wesley, 1993.
3. McKerrow P J, *Introduction to Robotics*, Addison Wesley, 1993.
4. Selig M, *Introductory Robotics*, Prentice Hall, 1992.

CP-442 Behavioural Synthesis

Credits 4 (3-0-2)

- Review of hardware description languages and behavioural synthesis of digital systems.
- Behavioural synthesis data structures and algorithms: Data and control flow representations, Data flow graph (DFG) descriptions, Control data flow graph (CDFG) descriptions, Extended Petri-net models
- Synthesis and design space: Design space exploration, Constructive vs. transformational/iterative techniques, Behavioural optimization, Scheduling, allocation, module binding and controller synthesis
- Scheduling algorithms – constructive: Unconstrained scheduling: ASAP and ALAP algorithms, Constrained scheduling: list scheduling and force-directed scheduling, Scheduling of multicycled and pipelined functional modules
- Allocation and binding algorithms: Lifetime analysis of registers, Variable-to-register mapping using the left edge algorithm
- Interconnect allocation and optimisation
- Transformational/iterative approaches: Cost functions, Transformations, Simulated annealing, Genetic algorithms
- Test synthesis for digital systems: Design for testability: scan-based and built-in-self-test (BIST) techniques, Test scheduling, Test controllers, On-line test
- Related areas: Aalogue synthesis, HW/SW codesign, Design confidence (design verification, online test), Optimisation with respect to power dissipation, routability, interconnect delay, testability, Logic optimisation

Text/References:

1. Giovanni De Micheli, *Synthesis and optimisation of digital circuits,* McGraw Hill.
2. Sabih Gerez, *Algorithms for VLSI design automation,* , Wiley
3. John P Elliott, *Understanding behvioural synthesis,* , Kluwer.

CP-444: Multimedia Systems

Credits 4 (3-0-2)

Multimedia Systems Design: An introduction.
Compression and Decompression.
Data and file format standards: Overview of other image file formats as JPEG, GIF, TIFF, BMP, PNG etc.
Multimedia Input/Output Technologies: Storage and retrieval technologies, Architectural and telecommunication consideration.
Making still images; editing and capturing images; scanning images; computer color models; color palettes; vector drawing; 3-D drawing and rendering;
Multimedia application design, Multimedia authoring and user interface.
Multimedia information networks, distributed multimedia systems, System design methodology and considerations, Multimedia applications.
MPEG Audio; audio compression & decompression; brief survey of speech recognition and generation; audio synthesis; Musical Instrument Digital Interface (MIDI); digital video and image compression; MPEG motion video compression standard; DVI technology; time-based media representation and delivery.
Introduction to Virtual Reality

Text & References:

1.Multimedia Systems Design, Prabhat Andleigh and Thakkar, PHI.
2.Multimedia Information Networking, N.K.Sharda, PHI.
3.Villamil & Molina, Multimedia : An Introduction, PHI
4.Lozano, Multimedia : Sound & Video, PHI.
5.Tay Vaughan, Multimedia :Making it work, TMH
6.Sinclair, Multimedia on the PC, BPB.
7.Villamil & Molina, Multimedia : Production, Planning and Delivery, PHI.

CP-446: Mobile Computing

Credits: 4 (3-0-2)

Introduction to mobile computing: principles, classification & overview of devices, operating systems.
Wireless transmission: brief overview, multipath propagation, hidden & exposed terminals.
Medium access control & protocols: SDMA, FDMA, TDMA, DAMA, FAMA, PRMA, Reservation TDMA, polling, CSMA/CA, CDMA etc,
Wireless LAN: infrastructure & ad-hoc networks, IEEE 802.11, HIPERLAN.
Mobile network layer: mobile IP, DHCP, infrastructure & Ad-hoc routing.
Mobile transport layer: indirect TCP, snooping TCP, mobile TCP etc.
mobile support, WWW & mobility, WAP.

Text & References:

1. Principles of mobile computing Hansmann & Merk. , Springer
2. Mobile communications Jochen Schiller , Pearson
3. 802.11 wireless networks Matthew S.Gast, O'REILLY.
4. Wireless LANs: Davis & McGuffin, McGraw Hill
5. Mobile Communications Handbook by Jerry D. Gybson
6. Mobile Communications Handbook by Raymond Steel

CP-448: Advanced Computer Architecture

Fundamentals: Computational models, concept of computer architecture, Von Newmann architecture.
Instruction level parallel processors: Pipelining (instruction and arithmetic), Pipeline scheduling (static and dynamic), Throughput improvement, VLIW architectures.
RISC and CISC architectures: RISC design versus CISC design.
Instruction level data-parallel architectures: SIMD, vector architectures.
Interconnection networks: Network topology, Static NW, Interconnection design decisions.
Multiprocessors and multicomputers, Common interconnection structures,
Data Flow computers: Introduction, Data Flow Program Graph, Activity Template, Scheme, Implementation, Pipelining in Data Flow Programs, Basic Mechanism, Data Flow Multiprocessor, Token labeling, MIT architecture.

Text & References:

1. *Advanced Computer Architectures*, Sima and Fountain, Pearson Education.
2. *Computer Architectures single and parallel systems*, Mehdi R. Zargham, PHI.
3. *Advanced Computer Architectures*, Hwang, Tata McGraw Hill.