COMPUTER GRAPHICS (TCS-501)

Unit-I
Line generation: Points lines, Planes, Pixels and Frame buffers, vector and character generation. Graphics Primitives: Display devices, Primitive devices, Display File Structure, Display control text.

Unit-II
Polygon: Polygon Representation, Entering polygons, Filling polygons. Segments: Segments table, creating deleting and renaming segments, visibility, image transformations.

Unit-III
Transformations: Matrices transformation, transformation routines, displays procedure. Windowing and Clipping: Viewing transformation and clipping, generalize clipping, multiple windowing.

Unit-IV
Three Dimension: 3-D geometry primitives, transformations, projection clipping. Interaction: Hardware input devices handling algorithms, Event handling echoing, Interactive techniques.

Unit-V
Hidden Line and Surface: Back face removal algorithms, hidden line methods. Rendering and Illumination: Introduction to curve generation, Bezier, Hermite and B-spline algorithms and their comparisons.

References :

1. Rogers, "Procedural Elements of Computer Graphics", McGraw Hill
2. Asthana, Sinha, "Computer Graphics", Addison Wesley Newman and Sproul, "Principle of Interactive Computer Graphics", McGraw Hill
3. Steven Harrington, "Computer Graphics", A Programming Approach, 2nd Edition
4. Rogar and Adams, "Mathematical Elements of Computer Graphics", McGraw Hill.

COMPILER DESIGN (TCS-502)

Unit-I
Introduction to Compiler, Phases and passes, Bootstrapping, Finite state machines and regular expressions and their applications to lexical analysis, Implementation of lexical analyzers, lexical-analyzer generator, LEX-compiler, Formal grammars and their application to syntax analysis, BNF notation, ambiguity, YACC. The syntactic specification of programming languages: Context free grammars, derivation and parse trees, capabilities of CFG.

Unit-II
Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables, constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars, an automatic parser generator, implementation of LR parsing tables, constructing LALR sets of items.

Unit-III
Syntax-directed Translation: Syntax-directed Translation schemes, Implementation of Syntax-directed Translators, Intermediate code, postfix notation, Parse trees & syntax trees, three address code, quadruple & triples, translation of assignment statements, Boolean expressions, statements that alter the flow of control, postfix translation, translation with a top down parser. More about translation: Array references in arithmetic expressions, procedures call, declarations, case statements.

Unit-IV
Symbol Tables: Data structure for symbols tables, representing scope information. Run-Time Administration: Implementation of simple stack allocation scheme, storage allocation in block structured language. Error Detection & Recovery: Lexical Phase errors, syntactic phase errors semantic errors.

Unit-V
Introduction to code optimization: Loop optimization, the DAG representation of basic blocks, value numbers and algebraic laws, Global Data-Flow analysis.

References:

Aho, Sethi & Ullman, "Compiler Design", Addision Wesley.

DESIGN & ANALYSIS OF ALGORITHMS (TCS-503)

Unit -I
Introduction: Algorithms, analysis of algorithms, Growth of Functions, Master's Theorem, Designing of Algorithms. Sorting and order Statistics: Heap sort, Quick sort, Sorting in Linear time, Medians and Order Statistics.

Unit -II
Advanced Data Structure: Red-Black Trees, Augmenting Data Structure. B-Trees, Binomial Heaps, Fibonacci Heaps, Data Stricture for Disjoint Sets.

Unit -III
Advanced Design and Analysis Techniques: Dynamic Programming, Greedy Algorithms, Amortized Analysis, Back Tracking.

Unit -IV
Graph Algorithms: Elementary Graphs Algorithms, Minimum Spanning Trees, Single-source Shortest Paths, All-Pairs Shortest Paths, Maximum Flow, Traveling Salesman Problem.

Unit -V
Selected Topics: Randomized Algorithms, String Matching, NP Completeness, Approximation Algorithms.

References:

1. Coreman, Rivest, Lisserson, : “Algorithm", PHI.

2. Basse, "Computer Algorithms: Introduction to Design & Analysis", Addision Wesley.
3. Horowitz & Sahani, "Fundamental of Computer Algorithm", Galgotia.

PRINCIPLES OF PROGRAMMING LANGUAGES (TCS-504)

Unit -I

Introduction: Characteristics of programming Languages, Factors influencing the evolution of programming language, developments in programming methodologies, desirable features and design issues. Programming language processors: Structure and operations of translators, software simulated computer, syntax, semantics, structure, virtual computers, binding and binding time.

Unit -II

Elementary and Structured Data Types: Data object variables, constants, data types, elementary data types, declaration, assignment and initialization, enumeration, characters, strings. Structured data type and objects: Specification of data structured types, vectors and arrays, records, variable size data structure, pointers and programmer constructed data structure, Sets files. Sub Program and programmer defined data types: Evolution of data types, abstractions, encapsulations, information hiding, sub programmes, abstract data types.

Unit -III

Sequence Control; Implicit and Explicit sequence control, sequence control with within expression and statements, recursive sub programmes, exception handling, co routines, Scheduled sub programmes, concurrent execution. Data control referencing environments, static and dynamic scope, local data local data referencing environment, shared data: Explicit common environment dynamic scope parameter passing mechanism.

Unit -IV

Storage Management: Major run time requirements, storage management phases, static storage management, stack based, heap based storage management. Syntax and translation: General syntactic criteria, syntactic element of a language, stages in translation, formal syntax and semantics.

Unit -V

Operating and Programming Environment: Batch Processing Environments, Embedded system requirements, Theoretical models, Introduction to Functional Programming, Lambda calculus, Data flow language and Object Oriented language, Comparison in various general and special purpose programming languages e.g. Fortran, C, Pascal, Lisp, etc.

References:

1. Terrance W Pratt, "Programming Languages: Design and Implementation" PHI
2. Sebesta, "Concept of Programming Language", Addison Wesley
3. E Horowitz, "Programming Languages", 2nd Edition, Addison Wesley
4. "Fundamentals of Programming Languages", Galgotia.

INDUSTRIAL ECONOMICS AND PRINCIPLES OF MANAGEMENT (THU 501)

Industrial Economics:

Unit –1.Introduction: Nature and significance of Economics. Meaning of Science, Engineering and Technology and their relationship with economic development.

Unit –2. Basic Concept: The concept of demand and supply. Elasticity of Demand and Supply. Indifference Curve Analysis, Price Effect, Income Effect and Substitution Effect.

Unit –3. Money and Banking: Functions of Money, Value of Money, Inflation and measures to control it. Brief idea of functions of banking system, viz., Commercial and central banking, Business fluctuations.

Management:

Unit –4. Introduction: Definition, Nature and Significance of Management,. Evaluation of Management thought, Contributions of Max Weber, Taylor and Fayol.

Unit –5. Human Behaviour: Factors of Individual Behaviour, Perception, Learning and Personality Development, Interpersonal Relationship and Group Behaviour.

References:

1. Dewett, K.K. / Modern Economic Theory/S.Chand & Co.
2. Luthers Fred/ Organizational Behaviour.
3. Prasad L.M./ Principles of Management.
4. A.W. Stonier & D.C. Horgne / A TextBook of Economic Theory/ Oxford Publishing House Pvt. Ltd.

OPERATING SYSTEMS (TCS-601)

Unit -I

Introduction: [02] Operating System and Function, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time System, System Protection. Operating System Structure: [04] , ' System Components, System Structure, Operating System Services.

Unit - II

Concurrent Processes: [06] Process Concept, Principle of Concurrency, Producer / Consumer Problem, Critical Section, Problem, Semaphores, Classical Problems in Concurrency, Inter Processes Communication, Process Generation, Process Scheduling.

Unit - III

CPU Scheduling: [05] Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling. Deadlock: [05] System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery From Deadlock Combined Approach.

Unit - IV

Memory Management: [06] Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming With Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual' Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

Unit - V
I/O Management & Disk Scheduling: [04] I/O Devices and The Organization of I/O Function, I/O Buffering, Disk I/O, Operating System Design Issues. File System: [04] File Concept, File Organization and Access Mechanism, File Directories, File Sharing, Implementation Issues.

Suggested Books and References:
1. Milenekovie, "Operating System Concept", McGraw Hill.
2. Petersons, "Operating Systems", Addision Wesley.
3. Dietal, "An Introduction to Operating System", Addision Wesley.
4. Tannenbaum, "Operating System Design and Implementation", PHI.
5. Gary Nutt, "Operating System, A Modern Perspective", Addision Wesley.
6. Stalling, Willium, "Operating System", Maxwell Macmillan
7. Silveschatza, Peterson J, "Operating System Concepts", Willey.
8. Crowley, "Operating System", TMH.

COMPUTER NETWORKS (TCS-602)

Unit -I
Introduction Concepts: Goals and Applications of Networks, Network structure and architecture, The OSI reference model, services, Network Topology Design - Delay Analysis, Back Bone Design, Local Access Network Design. Physical Layer Transmission Media, Switching methods, ISDN, Terminal Handling.

Unit-II
Medium Access sub layer: Medium Access sub layer - Channel Allocations, LAN protocols - ALOHA protocols - Overview of IEEE standards - FDDI. Data Link Layer - Elementary Data Link Protocols, Sliding Window protocols, Error Handling.

Unit - III
Network Layer: Network Layer - Point - to Pont Networks, routing, Congestion control Internetworking -TCP / IP - IP packet, IP address, IPv6. '

Unit - IV
Transport Layer: Transport Layer - Design issues, connection management, session Layer-Design issues, remote procedure call. Presentation Layer-Design issues, Data compression techniques, cryptography - TCP - Window Management.

Unit-V
Application Layer: Application Layer: File Transfer, Access and Management, Electronic mail, Virtual Terminals, Other application, Example Networks - Internet and Public Networks.

References:

1. Forouzen, "Data Communication and Networking", TMH
2. A.S. Tanenbaum, “Computer Networks”, 3rd Edition, Prentice Hall India, 1997.
3. S. Keshav, “An Engineering Approach on Computer Networking”, Addison Wesley, 1997
4. W. Stallings, “Data and Computer Communication”, Macmillan Press, 1989.

ARTIFICIAL INTELLIGENCE (TCS- 603)

UNIT -I

Introduction
Introduction to Artificial Intelligence, Simulation of sophisticated & Intelligent Behavior in different area problem 3OIving in games, natural language, automated reasoning, visual perception, heuristic algorithm versus solution guaranteed algorithms.

UNIT - II
Understanding Natural Languages.
Parsing techniques, context free and transformational grammars, transition nets, augmented transition nets, Fillmore's grammars, Shanks Conceptual Dependency, grammar free analyzers, sentence generation, and translation.

UNIT III
Knowledge Representation
First order predicate calculus, Horn Clauses, Introduction to PROLOG, Semantic Nets, Partitioned Nets, Minskey frames, Case Grammar Theory, Production Rules Knowledge Base, The Interface System, Forward & Backward Deduction.

UNIT - IV
Expert System
Existing Systems (DENDRAL, MYCIN) domain exploration Meta Knowledge, Expertise Transfer, Self Explaining System

UNIT - V
Pattern Recognition
Introduction to Pattern Recognition, Structured Description, Symbolic Description, Machine perception, Line Finding, Interception Semantic & Model, Object Identification, Speech Recognition.
Programming Language
Introduction to programming Language, LISP, PROLOG

References:

1. Charnick “Introduction to A.I.”, Addision Wesley
2. Rich & Knight, “Artificial Intelligence”
3. Winston, “LISP”, Addision Wesley
4. Marcellous, “Expert System Programming”, PHI
5. Elamie, “Artificial Intelligence”, Academic Press
6. Lioyed, “Foundation of Logic Processing”, Springer Verlag

GRAPH THEORY (TMA011)

Unit -I

Graphs, Sub graphs, some basic properties, various example of graphs & their sub graphs, walks, path & circuits, connected graphs, disconnected graphs and component, euler graphs, various operation on graphs, Hamiltonian paths and circuits, the traveling sales man problem.

Unit- II

Trees and fundamental circuits, distance diameters, radius and pendent vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal and dijkstra Algorithms.

Unit -III

Cuts sets and cut vertices, some properties, all cut sets in a graph, fundamental circuits and cut sets , connectivity and separability, network flows, planer graphs, combinatorial and geometric dual, Kuratowski to graphs detection of planarity, geometric dual , some more criterion of planarity, thickness and crossings.

Unit -IV

Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set verses subspaces, orthogonal vectors and subspaces, incidence matrix of graph, sub matrices of A(G), circuit matrix, cut set matrix, path matrix and relationships among A_f, B_f, and C_f, fundamental circuit matrix and rank of B, adjacency matrices, rank- nullity theorem .

Unit -V

Coloring and covering and partitioning of a graph, chromatic number, chromatic partitioning, chromatic polynomials, matching, covering, four color problem, Directed graphs, some type of directed graphs, Directed paths, and connectedness, Euler digraphs, trees with directed edges, fundamental circuits in digraph, matrices A, B and C of digraphs adjacency matrix of a digraph,, enumeration, types of enumeration, counting of labeled and unlabeled trees, polya's theorem, graph enumeration with polya's theorem.

Graph theoretic algorithm must be provided wherever required to solve the problems .

References:-

1. Deo, N: Graph theory, PHI
2. Harary, F: Graph Theory, Narosa
3. Bondy and Murthy: Graph theory and application. Addison Wesley.

PROBABILITY & STOCHASTIC PROCESS (TMA012)

Unit-I

Introduction: Probability models, Algebra of events, probability axioms, conditional probability, Baye's rules, Bernoulli traits.

Discrete Random Variables: Discrete random variables, probability mass functions, discrete distribution functions-Bernoulli, Binomial, geometric, Poisson, hyper geometric & uniform distributions, probability generating function.

Unit-II

Continuous Random variable: Exponential distribution, memory less property, application to reliability, hypo exponential, Erlang, Gamma, hyper exponential & Normal distributions ,order statistics, distribution of sums.

Unit III

Expectation: Expectation, variance, moments of important distribution, Expectation of functions of more than one random variable, Application to the computation of MTTF of series system parallel system, standby redundancy, TMR & NMR system.

Unit IV

Stochastic process: classification of stochastic process, Markov process, Bernoulli process, Poisson process , renewal processes.

Discrete Parameter Markov Chains: Computation of n-step transition probability, state classification & limiting distribution of times between state changes irreducible finite chains with aperiodic states, discrete parameter birth-death processes, Analysis of program execution time, M|G|1 , Queue, pollackek-khinchin formula.

Unit-V

Continuous parameter Markov chains

Birth & death process, M|M|1 Queue, M|M|m Queue, cyclic Queuing model of a multiprogramming system, Machine repairman model, computation of response time in a terminal oriented system. Queuing system with finite populations.

Networks of queues: Introductory concept of open & closed queuing networks.

References:

- P.K.S Trivedi,-Probability and Statistics with reliability, Queuing and computer science applications, PHI, New Delhi
- Hisashi Kobayashi: Modeling and Analysis-An Introduction to system performance Evalution Methodology," Addison Wesley
- W.feller-An introduction to probability theory & its application (vol1.)(John Wiley & sons, NY.)
- U.N.Bhat-Elements of applied stochastic processes, John Wiley & sons, NY.

PRINCIPLES OF OPERATION RESEARCH (TMA013)

Unit-I

Linear programming problems: Linear programming problems (LPP)- Formulation of a LPP-graphical method-Simplex method- Revised simplex method-two phase method-Dual simplex method-Primal-Dual Problem (Emphasis should be on algorithms and problems).

Unit-II

Transportation and Assignment problem: Principles of duality-Interpretation sensitivity analysis-degeneracy-Integer (Linear) programming, branch and bound method computational procedure application of IP,0-1 linear programming problem, Knapsack problem, facility location problem assignment problems, mathematical formulation, fundamental theorem, Hungarian method for solving an assignment problem , variation of an assignment problem, Application(Emphasis should be more on problem than theory).

Unit-III

CPM and PERT: CPM and PERT- network diagram-Events and activities- project planning-reducing critical events and activities-critical path calculations-Examples- Resources and man power leveling. Sequencing problems-travelling salesman problems –machine-scheduling problem (Job-shop).

Unit-IV

Replacement problems and Inventory models: Replacement problems-capital equipment-Discounting costs-Replacement in anticipation of failure-Group replacement –stochastic nature underlying the failure phenomenon. Inventory models-various costs-Deterministic inventory models-Economic lot sizes –Price breaks –Finite storage.

Unit-V

Inventory Model Application and Dynamic programming: Single period inventory model with shortest cost-stochastic models-Application of inventory models. Dynamic programming formulation- Investment problem-general allocation problem –storage coach problem-production scheduling.

References:

1. H.A. TAHA, "Operation research- An Introduction", Macmillan1976.
2. Hillier and Liebarman: "Introduction to operation research" , (1990) Mc Graw Hill, Company.
3. Ecker and Kuperfersch mid: "Introduction to Operation research" (1988), John Wiley & Sons.
4. B.E. Gillet, "introduction to Operation Research-A Computer oriented Algorithmic Approach", McGraw Hill 1989

5. K.Swarup, P. K. Gupta & A. Manmohan, "Operation Research", S.chand 1978.

ORGANIZATIONAL BEHAVIOR (THU-602)

Introduction to organizations and individuals:

What is an organization, components of organization, nature and variety of organizations (in terms of objectives, structure etc.), models of analyzing organizational phenomena, organizational and business variables, organizations in the Indian context, institutions and structures, basic roles in an organization, etc. perceptions, attitudes, motives (achievement, power and affiliation), commitment, values, creativity, and other personality factors, profile of a manager and a entrepreneur.

Interpersonal and group processes:

Interpersonal trust, understanding the other person from his/her point of view, interpersonal communication, listening, feedback, counseling, transactional analysis, self-fulfilling prophecy, etc., leadership, motivating people, working as a member of a team, team functioning, team decision-making, team conflict resolution, team problem solving.

Organizational structure and integrating interpersonal and group dynamics elements of structure, functions of structures, determinants of structures, dysfunctionalities of structures, structure - technology?environment-people relationships, principles underlying design of organizations, organizational politics, issues of power and authority, organizational communications, organizational change, integrating cases (s). Case method and lectures should be supplemented with a variety of other methodologies such as feedback on questionnaires and tests, role plays, and behavior simulation exercise.

References :
1. Jit S Chandan "Organizational Behavior", Vikas
2. M.N. Mishra :Organization Behavior", Vikas
3. Arnold, John, Robertson, Ivan 1. and Cooper, Cary, I.," Work Psychology:understanding human behavior in the workplace", Macmillan India Ltd., Delhi. 1996.
4. Dwivedi, RS., Human relations and organizational behavior: a global perspective, Macmillan India Ltd., Delhi, .1995.
5. Hersey and Blanchard (6th ed.). "Management of organizational behavior L utilising human resources", Prentice Hall of India Pv1. Ltd., New Delhi, 1996.
6. Robbins (4th ed.), "Essentials of organizational behavior", Prentice Hall of India Pv1. Ltd., New Delhi, 1995.
7. Luthans Fred., "Organizational Behavior", McGraw Hill, 1998.

COMPUTER GRAPHICS LAB (TCS-551)

1. Implementation of line generation using slope's method, DDA and Bresenham's algorithms.
2. **Implementation of circle generation using Mid-point method and Bresenham's algorithm.**
3. Implementation of ellipse generation using Mid-point method.
4. Implementation of polygon filling using Flood-fill, Boundary-fill and Scan-line algorithms.
5. Implementation of 2D transformation: Translation, Scaling, Rotation, Mirror Reflection and Shearing (write a menu driven program).
6. Implementation of Line Clipping using Cohen-Sutherland algorithm and Bisection Method.
7. Implementation of Polygon Clipping using Sutherland-Hodgman algorithm.
8. Implementation of 3D geometric transformations: Translation, Scalind and rotation.
9. Implementation of Curve generation using Interpolation methods.
10. Implementation of Curve generation using B-spline and Bezier curves.
11. Implementation of any one of Back face removal algorithms such as Depth-Buffer algorithm, Painter's algorithm, Warnock's algorithm, Scan-line algorithm).

COMPILER DESIGN LAB (TCS-552)

1. Simulation of a Finite state Automata to recognize the tokens of various control statements.
2. Simulation of a Finite state machine to distinguish among Integers, Real Numbers & Numbers with Exponents.
3. Program in LEX tool to recognize the tokens and to return the token found for a C like Language
4. Parsing of arithmetic and algebraic expressions and equations.
5. Use of YACC tool to parse the statements of C like Language.

DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY WORK (TCS-553)

Programming assignments on each algorithmic strategy:

1. Divide and conquer method (quick sort, merge sort, Strassen's matrix multiplication),
2. Greedy method (knapsack problem, job sequencing, optimal merge patterns, minimal spanning trees).
3. Dynamic programming (multistage graphs, OBST, 0/1 knapsack, traveling salesperson problem).
4. Back tracking (n-queens problem, graph coloring problem, Hamiltonian cycles).
5. Sorting : Insertion sort, Heap sort, Bubble sort
6. Searching : Sequential and Binary Search
7. Selection : Minimum/ Maximum, Kth smallest element

OPERATING SYSTEMS LAB (TCS-651)

1. Simulation of the CPU scheduling algorithms a) Round Robin b) SJF c) FCFS d) Priority
2. Simulation of MUTEX and SEMAPHORES.
3. Simulation of Bankers Deadlock Avoidance and Prevention algorithms.
4. Implementation of Process Synchronization (Reader-Writer, Sleeping Barber and Dining Philosopher's Problem)
5. Simulation of page Replacement Algorithms a) FIFO b) LRU c) LFU
6. Simulation of paging techniques of memory management.
7. Simulation of file allocation Strategies a) Sequential b) Indexed c) Linked
8. Simulation of file organization techniques a) Single Level Directory b) Two Level c) Hierarchical d) DAG

COMPUTER NETWORKS LAB (TCS-652)

1. Implementation of the Data Link Layer framing method such as character stuffing and bit stuffing in C.
2. Implementation of CRC algorithm in C.
3. Implementation of a Hamming (7,4) code to limit the noise. We have to code the 4 bit data in to 7 bit data by adding 3 parity bits. Implementation will be in C.
4. Implementation of LZW compression algorithm in C.
5. Write a socket program in C to implement a listener and a talker.

6. Simulation of a network of 3 nodes and measure the performance on the same network.
7. Write a program in C to encrypt 64-bit text using DES algorithm.

ARTIFICIAL INTELLIGENCE LAB (TCS-653)

1. Write a LISP Program to solve the water-jug problem using heuristic function.
2. Create a compound object using Turbo Prolog.
3. Write a Prolog Program to show the advantage and disadvantage of green and red cuts.
4. Write a prolog program to use of BEST-FIRST SEARCH applied to the eight puzzle problem.
5. Implementation of the problem solving strategies: Forward Chaining, Backward Chaining, Problem Reduction.
6. Write a Lisp Program to implement the STEEPEST-ASCENT HILL CLIMBING.
7. Write a Prolog Program to implement COUNTE PROPAGATION NETWORK.

U.P. TECHNICAL UNIVERSITY
LUCKNOW

Syllabus

3rd yr. (V & VI Semester)

B.TECH.

COMPUTER SCIENCE & ENGINEERING