MANAGEMENT AND ENTREPRENEURSHIP
(Common to All Branches)

Subject Code: 10AL61   I.A. Marks   : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

UNIX SYSTEM PROGRAMMING

Subject Code: 10CS62   I.A. Marks   : 25
Hours/Week : 04   Exam Hours: 03
Total Hours : 52   Exam Marks: 100

PART - A

UNIT – 1   **6 Hours**
Introduction: UNIX and ANSI Standards: The ANSI C Standard, The ANSI/ISO C++ Standards, Difference between ANSI C and C++, The POSIX Standards, The POSIX.1 FIPS Standard, The X/Open Standards.
UNIX and POSIX APIs: The POSIX APIs, The UNIX and POSIX Development Environment, API Common Characteristics.

UNIT – 2   **6 Hours**
UNIX Files: File Types, The UNIX and POSIX File System, The UNIX and POSIX File Attributes, Inodes in UNIX System V, Application Program Interface to Files, UNIX Kernel Support for Files, Relationship of C Stream Pointers and File Descriptors, Directory Files, Hard and Symbolic Links.

UNIT – 3   **7 Hours**
UNIX File APIs: General File APIs, File and Record Locking, Directory File APIs, Device File APIs, FIFO File APIs, Symbolic Link File APIs, General File Class, regfile Class for Regular Files, dirfile Class for Directory Files, FIFO File Class, Device File Class, Symbolic Link File Class, File Listing Program.

UNIT – 4   **7 Hours**
UNIX Processes: The Environment of a UNIX Process: Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation,

Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions, UNIX Kernel Support for Processes.

PART - B

UNIT – 5   **7 Hours**
Process Control : Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times, I/O Redirection.
Process Relationships: Introduction, Terminal Logins, Network Logins, Process Groups, Sessions, Controlling Terminal, tcgetpgrp and tcsetpgrp Functions, Job Control, Shell Execution of Programs, Orphaned Process Groups.

UNIT – 6   **7 Hours**
Signals and Daemon Processes: Signals: The UNIX Kernel Support for Signals, signal, Signal Mask, sigaction, The SIGCHLD Signal and the waitpid Function, The sigsetjmp and siglongjmp Functions, Kill, Alarm, Interval Timers, POSIX.lb Timers.
Daemon Processes: Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model.

UNIT – 7   **6 Hours**
Interprocess Communication – 1: Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores.

UNIT – 8   **6 Hours**
Interprocess Communication – 2: Shared Memory, Client-Server Properties, Stream Pipes, Passing File Descriptors, An Open Server-Version 1, Client-Server Connection Functions.

Text Books:
1. Terrence Chan: UNIX System Programming Using C++, Prentice Hall India, 1999.
   (Chapters 1, 5, 6, 7, 8, 9, 10)
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005.
   (Chapters 7, 8, 9, 13, 14, 15)

Reference Books:
1. Marc J. Rochkind: Advanced UNIX Programming, 2nd Edition, Pearson Education, 2005.
2. Maurice J Bach: The Design of the UNIX Operating System, Pearson Education, 1987.

3. Uresh Vahalia: UNIX Internals: The New Frontiers, Pearson Education, 2001.

COMPILER DESIGN

Subject Code: 10CS63	I.A. Marks : 25
Hours/Week : 04	Exam Hours: 03
Total Hours : 52	Exam Marks: 100

PART – A

UNIT – 1   **8 Hours**
Introduction, Lexical analysis: Language processors; The structure of a Compiler; The evolution pf programming languages; The science of building a Compiler; Applications of compiler technology; Programming language basics.
Lexical analysis: The Role of Lexical Analyzer; Input Buffering; Specifications of Tokens; Recognition of Tokens.

UNIT – 2   **6 Hours**
Syntax Analysis – 1: Introduction; Context-free Grammars; Writing a Grammar. Top-down Parsing; Bottom-up Parsing.

UNIT – 3   **6 Hours**
Syntax Analysis – 2: Top-down Parsing; Bottom-up Parsing.

UNIT – 4   **6 Hours**
Syntax Analysis – 3: Introduction to LR Parsing: Simple LR; More powerful LR parsers (excluding Efficient construction and compaction of parsing tables) ; Using ambiguous grammars; Parser Generators.

PART – B

UNIT – 5   **7 Hours**
Syntax-Directed Translation: Syntax-directed definitions; Evaluation orders for SDDs; Applications of syntax-directed translation; Syntax-directed translation schemes.

UNIT – 6   **6 Hours**
Intermediate Code Generation: Variants of syntax trees; Three-address code; Translation of expressions; Control flow; Back patching; Switch-statements; Procedure calls.

UNIT – 7   **6 Hours**
Run-Time Environments: Storage Organization; Stack allocation of space; Access to non-local data on the stack; Heap management; Introduction to garbage collection.

UNIT – 8   **7 Hours**
Code Generation: Issues in the design of Code Generator; The Target Language; Addresses in the target code; Basic blocks and Flow graphs; Optimization of basic blocks; A Simple Code Generator

Text Books:
1. Alfred V Aho, Monica S.Lam, Ravi Sethi, Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition, Pearson Education, 2007.
   (Chapters 1, 3.1 to 3.4, 4 excluding 4.7.5 and 4.7.6, 5.1 to 5.4, 6.1, 6.2, 6.4, 6.6, 6.7 to 6.9, 7.1 to 7.5, 8.1 to 8.6.)

Reference Books:
1. Charles N. Fischer, Richard J. leBlanc, Jr.: Crafting a Compiler with C, Pearson Education, 1991.
2. Andrew W Apple: Modern Compiler Implementation in C, Cambridge University Press, 1997.
3. Kenneth C Louden: Compiler Construction Principles & Practice, Cengage Learning, 1997.

COMPUTER NETWORKS - II

Subject Code: 10CS64   **I.A. Marks   : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART - A

UNIT - 1   **6 Hours**
Packet Switching Networks - 1: Network services and internal network operation, Packet network topology, Routing in Packet networks, Shortest path routing: Bellman-Ford algorithm.

UNIT – 2   **6 Hours**
Packet Switching Networks – 2: Shortest path routing (continued), Traffic management at the Packet level, Traffic management at Flow level, Traffic management at flow aggregate level.

UNIT – 3   **6 Hours**
 TCP/IP-1: TCP/IP architecture, The Internet Protocol, IPv6, UDP.

UNIT – 4   **8 Hours**
TCP/IP-2: TCP, Internet Routing Protocols, Multicast Routing, DHCP, NAT and Mobile IP.

PART – B
UNIT - 5   **7 Hours**
Applications, Network Management, Network Security: Application layer overview, Domain Name System (DNS), Remote Login Protocols, E-mail, File Transfer and FTP, World Wide Web and HTTP, Network management, Overview of network security, Overview of security methods, Secret-key encryption protocols, Public-key encryption protocols, Authentication, Authentication and digital signature, Firewalls.

UNIT – 6   **6 Hours**
QoS, VPNs, Tunneling, Overlay Networks: Overview of QoS, Integrated Services QoS, Differentiated services QoS, Virtual Private Networks, MPLS, Overlay networks.

UNIT - 7   **7 Hours**
Multimedia Networking: Overview of data compression, Digital voice and compression, JPEG, MPEG, Limits of compression with loss, Compression methods without loss, Overview of IP Telephony, VoIP signaling protocols, Real-Time Media Transport Protocols, Stream control Transmission Protocol (SCTP)

UNIT – 8   **6 Hours**
Mobile AdHoc Networks and Wireless Sensor Neworks: Overview of Wireless Ad-Hoc networks, Routing in AdHOc Networks, Routing protocols for and Security of AdHoc networks, Sensor Networks and protocol structures, Communication Energy model, Clustering protocols, Routing protocols, ZigBee technology and 802.15.4.

Text Books:
1. Communication Networks – Fundamental Concepts & key architectures, Alberto Leon Garcia & Indra Widjaja, 2nd Edition, Tata McGraw-Hill, India
   (7 - excluding 7.6, 8)
2. Computer & Communication Networks, Nadir F Mir, Pearson Education, India
   (9, 10 excluding 10.7, 12.1 to 12.3, 16, 17.1 to 17.6, 18.1 to18.3, 18.5, 19, 20)

Reference Books:
1. Behrouz A. Forouzan: Data Communications and Networking, 4th Edition, Tata McGraw-Hill, 2006.
2. William Stallings: Data and Computer Communication, 8th Edition, Pearson Education, 2007.
3. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2007.
4. Wayne Tomasi: Introduction to Data Communications and Networking, Pearson Education, 2005.

COMPUTER GRAPHICS AND VISUALIZATION

Subject Code: 10CS65	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A

UNIT – 1   **7 Hours**
Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging Systems; The synthetic camera model; The programmer's interface; Graphics architectures; Programmable Pipelines; Performance Characteristics
Graphics Programming: The Sierpinski gasket; Programming Two Dimensional Applications.

UNIT – 2   **6 Hours**
The OpenGL: The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program; Polygons and recursion; The three-dimensional gasket; Plotting Implicit Functions

UNIT – 3   **7 Hours**
Input and Interaction: Interaction; Input devices; Clients and Servers; Display Lists; Display Lists and Modeling; Programming Event Driven Input; Menus; Picking; A simple CAD program; Building Interactive Models; Animating Interactive Programs; Design of Interactive Programs; Logic Operations

UNIT – 4   **6 Hours**
Geometric Objects and Transformations-I: Scalars, Points, and Vectors; Three-dimensional Primitives; Coordinate Systems and Frames; Modeling a Colored Cube; Affine Transformations; Rotation, Translation and Scaling;

PART - B

UNIT – 5   **5 Hours**
Geometric Objects and Transformations-II: Geometric Objects and Transformations; Transformation in Homogeneous Coordinates; Concatenation of Transformations; OpenGL Transformation Matrices; Interfaces to three-dimensional applications; Quaternion's.

UNIT – 6   **7 Hours**
Viewing: Classical and computer viewing; Viewing with a Computer; Positioning of the camera; Simple projections; Projections in OpenGL; Hidden-surface removal; Interactive Mesh Displays; Parallel-projection matrices; Perspective-projection matrices; Projections and Shadows.

UNIT – 7   **6 Hours**
Lighting and Shading: Light and Matter; Light Sources; The Phong Lighting model; Computation of vectors; Polygonal Shading; Approximation of a sphere by recursive subdivisions; Light sources in OpenGL; Specification of materials in OpenGL; Shading of the sphere model; Global Illumination.

UNIT – 8   **8 Hours**
Implementation: Basic Implementation Strategies; Four major tasks; Clipping; Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham's algorithm; Polygon Rasterization; Hidden-surface removal; Antialiasing; Display considerations.

Text Books:
1. Edward Angel: Interactive Computer Graphics A Top-Down Approach with OpenGL, 5th Edition, Pearson Education, 2008. (Chapters 1 to 7)

Reference Books:
1. Donald Hearn and Pauline Baker: Computer Graphics- OpenGL Version, 3rd Edition, Pearson Education, 2004.

2. F.S. Hill Jr.: Computer Graphics Using OpenGL, 3rd Edition, PHI, 2009.
3. James D Foley, Andries Van Dam, Steven K Feiner, John F Hughes, Computer Graphics, Pearson Education 1997.

OPERATIONS RESEARCH

Subject Code: 10CS661   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART - A

UNIT – 1   **6 Hours**
Introduction, Linear Programming – 1: Introduction: The origin, nature and impact of OR; Defining the problem and gathering data; Formulating a mathematical model; Deriving solutions from the model; Testing the model; Preparing to apply the model; Implementation .
Introduction to Linear Programming: Prototype example; The linear programming (LP) model.

UNIT – 2   **7 Hours**
LP – 2, Simplex Method – 1: Assumptions of LP; Additional examples.
The essence of the simplex method; Setting up the simplex method; Algebra of the simplex method; the simplex method in tabular form; Tie breaking in the simplex method

UNIT – 3   **6 Hours**
Simplex Method – 2: Adapting to other model forms; Post optimality analysis; Computer implementation
Foundation of the simplex method.

UNIT – 4   **7 Hours**
Simplex Method – 2, Duality Theory: The revised simplex method, a fundamental insight.
The essence of duality theory; Economic interpretation of duality, Primal dual relationship; Adapting to other primal forms

PART - B

UNIT – 5   **7 Hours**
Duality Theory and Sensitivity Analysis, Other Algorithms for LP : The role of duality in sensitive analysis; The essence of sensitivity analysis;

Applying sensitivity analysis. The dual simplex method; Parametric linear programming; The upper bound technique.

UNIT – 6   **7 Hours**
Transportation and Assignment Problems: The transportation problem; A streamlined simplex method for the transportation problem; The assignment problem; A special algorithm for the assignment problem.

UNIT – 7   **6 Hours**
Game Theory, Decision Analysis: Game Theory: The formulation of two persons, zero sum games; Solving simple games- a prototype example; Games with mixed strategies; Graphical solution procedure; Solving by linear programming, Extensions.
Decision Analysis: A prototype example; Decision making without experimentation; Decision making with experimentation; Decision trees.

UNIT – 8   **6 Hours**
Metaheuristics: The nature of Metaheuristics, Tabu Search, Simulated Annealing, Genetic Algorithms.

Text Books:
1. Frederick S. Hillier and Gerald J. Lieberman: Introduction to Operations Research: Concepts and Cases, 8th Edition, Tata McGraw Hill, 2005.
   (Chapters: 1, 2, 3.1 to 3.4, 4.1 to 4.8, 5, 6.1 to 6.7, 7.1 to 7.3, 8, 13, 14, 15.1 to 15.4)

Reference Books:
1. Wayne L. Winston: Operations Research Applications and Algorithms, 4th Edition, Cengage Learning, 2003.
2. Hamdy A Taha: Operations Research: An Introduction, 8th Edition, Pearson Education, 2007.

SIGNALS AND SYSTEMS

Subject Code: 10CS662	**I.A. Marks : 25**
Hours/Week : 04	**Exam Hours: 03**
Total Hours : 52	**Exam Marks: 100**

PART - A
UNIT – 1   **7 Hours**
Introduction: Definitions of a signal and a system; Classification of signals; Basic operations on signals; Elementary signals.

UNIT – 2   **7 Hours**
Systems, Time-domain representations – 1: Systems viewed as interconnections of operations; Properties of systems; Convolution; Impulse response representation; Properties of impulse response representation.

UNIT – 3   **6 Hours**
Time domain representation – 2: Differential and difference equation representations; Block diagram representations.

UNIT – 4   **6 Hours**
Fourier Representation – 1: Fourier representation: Introduction; Fourier representations for four signal classes; Orthogonality of complex sinusoidal signals.

PART – B

UNIT – 5   **6 Hours**
Fourier Representation -2: DTFS representations; Continuous-tine Fourier-series representations; DTFT and FT representations; Properties of Fourier representations.

UNIT – 6   **7 Hours**
Application of Fourier representations – 1: Frequency response of LTI systems; Solution of differential and difference equations using system function.

UNIT – 7   **7 Hours**
Applications of Fourier Representations – 2, Z-Transforms – 1: Fourier transform representations for periodic signals; Sampling of continuous time signals and signal reconstruction.
Introduction to Z-transform; Properties of ROC; Properties of Z-transforms; Inversion of Z-transforms

UNIT –Z – 8   **6 Hours**
Transforms – 2: Transforms analysis of LTI systems; Transfer function; Stability and causality; Unilateral Z-transforms and its application to solve difference equations

Text Books:
1. Simon Haykin and Barry Van Veen: Signals and Systems, 2nd Edition, Wiley India, 2007.
   (Chapters: 1.1 to 1.8, 2.2 to 2.5, 3.1 to 3.6, 4.2 to 4.3, 4.7, 7.1 to 7.6, 7.8)

Reference Books:

1. Alan V. Oppenheim, Alan S. Willsky and S. Hamid Nawab: Signals and Systems, 2nd Edition, PHI, 1997, Indian reprint 2009.
2. Ganesh Rao D and Satish Tunga: Signals and Systems - A Simplified Approach, Sanguine Technical Publishers, 2003-04.

DATA COMPRESSION

Subject Code: 10CS663   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT –1   **7 Hours**
Introduction, Lossless Compression -1: Compression techniques; Modeling and coding.
Mathematical preliminaries for lossless compression: Overview; Basic concepts of Information Theory; Models; Coding; Algorithmic information theory; Minimum description length principle.
Huffman coding: Overview; The Huffman coding algorithm, Minimumvariance Huffman codes; Application of Huffman coding for text compression.

UNIT – 2   **6 Hours**
Lossless Compression – 2: Dictionary Techniques: Overview; Introduction; Static dictionary; Adaptive dictionary; Applications: UNIX compress, GIF, PNG, V.42.
Lossless image compression: Overview; Introduction; Basics; CALIC; JPEG-LS; Multiresoution approaches; Facsimile encoding: Run-length coding, T.4 and T.6.

UNIT – 3   **6 Hours**
Basics of Lossy Coding: Some mathematical concepts: Overview; Introduction; Distortion criteria; Models.
Scalar quantization: Overview; Introduction; The quantization problem; Uniform quantizer; Adaptive quantization.

UNIT – 4   **7 Hours**
Vector Quantization, Differential Encoding: Vector quantization: Overview; Introduction; Advantages of vector quantization over scalar quantization; The LBG algorithm.
Differential Encoding: Overview; Introduction; The basic algorithm; Prediction in DPCM; Adaptive DPCM; Delta modulation; Speech coding; Image coding.

UNIT – 5   **7 Hours**
Some Mathematical Concepts, Transform coding: Some mathematical concepts: Linear systems; Sampling; Discrete Fourier transform; Z-transform.
Transform coding: Overview; introduction; The transform; Transforms of interest; Quantization and coding for transform coefficients; Application to image compression – JPEG; Application to audio compression – MDCT.

UNIT – 6   **6 Hours**
Subband Coding, Audio Coding: Subband Coding: Overview; introduction; Filters; The basic subband coding algorithm; Bit allocation; Application to speech coding – G.722; Application to audio coding – MPEG audio; Application to image compression.
Audio Coding: Overview; Introduction; MPEG audio coding; MPEG advanced audio coding; Dolby AC3; Other standards.

UNIT – 7   **6 Hours**
Wavelet-Based Compression: Overview; Introduction; Wavelets; Multiresolution and the scaling function; Implementation using Filters; Image compression; Embedded zerotree coder; Set partitioning in hierarchical trees; JPEG 2000.

UNIT – 8   **7 Hours**
Video Compression: Overview; Introduction; Motion compensation; Video signal representation; H.261; Model-based coding; Asymmetric applications; MPEG-1 and MPEG-2; H.263; H.264, MPEG-4 and advanced video coding; Packet video.

Text Books:
1. Khalid Sayood: Introduction to Data Compression, 3rd Edition, Elsevier, 2006.   (Chapters 1, 2 excluding 2.2.1 and 2.4.3, 3.1, 3.2, 3.2.1, 3.8.2, 5, 7.1 to 7.5, 7.6, 7.6.1, 7.6.2, 8.1 to 8.3, 8.6, 9.1 to 9.5, 10.1 to 10.4, 11, 12.6 to 12.9, 13, 14.1 to 14.4, 14.9 to 14.12, 15, 16, 18.1 to 18.13)

Reference Books:
1. D. Salomon: Data Compression: The Complete Reference, Springer, 1998.

PATTERN RECOGNITION

Subject Code: 10CS664	I.A. Marks : 25
Hours/Week : 04	Exam Hours: 03
Total Hours : 52	Exam Marks: 100

PART – A

UNIT – 1   **6 Hours**
Introduction: Machine perception, an example; Pattern Recognition System; The Design Cycle; Learning and Adaptation.

UNIT – 2   **7 Hours**
Bayesian Decision Theory: Introduction, Bayesian Decision Theory; Continuous Features, Minimum error rate, classification, classifiers, discriminant functions, and decision surfaces; The normal density; Discriminant functions for the normal density.

UNIT – 3   **7 Hours**
Maximum-likelihood and Bayesian Parameter Estimation: Introduction; Maximum-likelihood estimation; Bayesian Estimation; Bayesian parameter estimation: Gaussian Case, general theory; Hidden Markov Models.

UNIT – 4   **6 Hours**
Non-parametric Techniques: Introduction; Density Estimation; Parzen windows; k_n – Nearest- Neighbor Estimation; The Nearest- Neighbor Rule; Metrics and Nearest-Neighbor Classification.

PART – B

UNIT – 5   **7 Hours**
Linear Discriminant Functions: Introduction; Linear Discriminant Functions and Decision Surfaces; Generalized Linear Discriminant Functions; The Two-Category Linearly Separable case; Minimizing the Perception Criterion Functions; Relaxation Procedures; Non-separable Behavior; Minimum Squared-Error procedures; The Ho-Kashyap procedures.

UNIT – 6   **6 Hours**
Stochastic Methods: Introduction; Stochastic Search; Boltzmann Learning; Boltzmann Networks and Graphical Models; Evolutionary Methods.

UNIT – 7   **6 Hours**
Non-Metric Methods: Introduction; Decision Trees; CART; Other Tree Methods; Recognition with Strings; Grammatical Methods.

UNIT – 8   7 Hours
Unsupervised Learning and Clustering: Introduction; Mixture Densities and Identifiability; Maximum-Likelihood Estimates; Application to Normal Mixtures; Unsupervised Bayesian Learning; Data Description and Clustering; Criterion Functions for Clustering.

Text Books:
1. Richard O. Duda, Peter E. Hart, and David G.Stork: Pattern Classification, 2nd Edition, Wiley-Interscience, 2001.

Reference Books:
1. Earl Gose, Richard Johnsonbaugh, Steve Jost: Pattern Recognition and Image Analysis, PHI, Indian Reprint 2008.

STOCHASTIC MODELS AND APPLICATIONS

Subject Code: 10CS665   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT – 1   6 Hours
Introduction – 1: Axioms of probability; Conditional probability and independence; Random variables; Expected value and variance; Moment-Generating Functions and Laplace Transforms; conditional expectation; Exponential random variables.

UNIT – 2   6 Hours
Introduction – 2: Limit theorems; Examples: A random graph; The Quicksort and Find algorithms; A self-organizing list model; Random permutations.

UNIT – 3   7 Hours
Probability Bounds, Approximations, and Computations: Tail probability inequalities; The second moment and conditional expectation inequality; probability bounds via the Importance sampling identity; Poisson random variables and the Poisson paradigm; Compound Poisson random variables.

UNIT – 4   7 Hours
Markov Chains: Introduction;   Chapman-Kologorov   Equations; Classification of states; Limiting and stationary probabilities; some

applications; Time-Reversible Markov Chains; Markov Chain Monte Carlo methods.

PART – B

UNIT – 5   **6 Hours**
The Probabilistic Method: Introduction; Using probability to prove existence; Obtaining bounds from expectations; The maximum weighted independent set problem: A bound and a ranom algorithm; The set covering problem; Antichains; The Lovasz Local lemma; A random algorithm for finding the minimal cut in a graph.

UNIT – 6   **6 Hours**
Martingales: Martingales: Definitions and examples; The martingale stopping theorem; The Hoeffding-Azuma inequality; Sub-martingales.

UNIT – 7   **7 Hours**
Poisson Processes, Queuing Theory – 1: The non-stationary Poisson process; The stationary Poisson process; Some Poisson process computations; Classifying the events of a non-stationary Poisson process; Conditional distribution of the arrival times
Queuing Theory: Introduction; Preliminaries; Exponential models

UNIT – 8   **7 Hours**
Queuing Theory – 2: Birth-and-Death exponential queuing systems; The backwards approach in exponential queues; A closed queuing network; An open queuing network; The M/G/1 queue; Priority queues.

Text Books:
1. Sheldon M. Ross: Probability Models for Computer Science, Elsevier, 2002.

Reference Books:
1. B. R. Bhat: Stochastic Models Analysis and Applications, New Age International, 2000.
2. Scott L. Miller, Donald G. Childers: Probability and Random Processes with Applications to Signal Processing and Communications, Elsevier, 2004.

PROGRAMMING LANGUAGES

Subject Code: 10CS666   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART - A

UNIT – 1   **7 Hours**
Introduction; Names, Scopes, and Bindings: The art of language design; Programming language spectrum; Why study programming languages? Compilation and interpretation; Programming environments.
Names, scope, and bindings: The notion of binding time; Object lifetime and storage management; Scope rules; Implementing scope; The meaning of names within a scope; The binding of referencing environments; Macro expansion.

UNIT – 2   **7 Hours**
Control Flow: Expression evaluation; Structured and unstructured flow; Sequencing; Selection; Iteration; Recursion; Non-determinacy

UNIT – 3   **6 Hours**
Data Types: Type systems; Type checking; Records and variants; Arrays; Strings; Sets; Pointers and recursive types; Lists; Files and Input/Output; Equality testing and assignment.

UNIT – 4   **6 Hours**
Subroutines and Control Abstraction: Review of stack layout; Calling sequences; Parameter passing; Generic subroutines and modules; Exception handling; Coroutines; Events.

PART – B

UNIT – 5   **6 Hours**
Data Abstraction and Object Orientation: Object oriented programming; Encapsulation and Inheritance; Initialization and finalization; Dynamic method binding; Multiple inheritance; Object oriented programming revisited.

UNIT – 6   **7 Hours**
Functional Languages, and Logic Languages: Functional Languages: Origins; Concepts; A review/overview of scheme; Evaluation order revisited; Higher-order functions; Functional programming in perspective. Logic Languages: Concepts; Prolog; Logic programming in perspective.

UNIT – 7   **6 Hours**
Concurrency: Background and motivation; Concurrency programming fundamentals; Implementing synchronization; Language-level mechanisms; Message passing.

UNIT – 8   **7 Hours**
Run-Time Program Management: Virtual machines; Late binding of machine code; Inspection/introspection.
Text Books:
1. Michael L. Scott: Programming Language Pragmatics, 3rd Edition, Elsevier, 2009.
   (Chapters 1.1 to 1.5, 3.1 to 3.7, 6 excluding the sections on CD, 7 excluding the ML type system, 8, 9, 10 excluding the sections on CD, 11 excluding the sections on CD, 12, 15. Note: Text Boxes titled Design & Implementation are excluded)

Reference Books:
1. Ravi Sethi: Programming languages Concepts and Constructs, 2nd Edition, Pearson Education, 1996.
2. R Sebesta: Concepts of Programming Languages, 8th Edition, Pearson Education, 2008.
3. Allen Tucker, Robert Nonan: Programming Languages, Principles and Paradigms, 2nd Edition, Tata McGraw-Hill, 2007.

COMPUTER GRAPHICS AND VISUALIZATION LABORATORY

Subject Code: 10CSL67   **I.A. Marks   : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks: 50**

PART - A

Design, develop, and implement the following programs in C / C++

1. Program to recursively subdivide a tetrahedron to from 3D Sierpinski gasket. The number of recursive steps is to be specified by the user.

2. Program to implement Liang-Barsky line clipping algorithm.

3. Program to draw a color cube and spin it using OpenGL transformation matrices.

4. Program to create a house like figure and rotate it about a given fixed point using OpenGL functions.

5. Program to implement the Cohen-Sutherland line-clipping algorithm. Make provision to specify the input line, window for clipping and view port for displaying the clipped image.

6. Program to create a cylinder and a parallelepiped by extruding a circle and quadrilateral respectively. Allow the user to specify the circle and the quadrilateral.

7. Program, using OpenGL functions, to draw a simple shaded scene consisting of a tea pot on a table. Define suitably the position and properties of the light source along with the properties of the properties of the surfaces of the solid object used in the scene.

8. Program to draw a color cube and allow the user to move the camera suitably to experiment with perspective viewing. Use OpenGL functions.

9. Program to fill any given polygon using scan-line area filling algorithm. (Use appropriate data structures.)

10. Program to display a set of values {fij} as a rectangular mesh.

PART - B

Develop a suitable Graphics package to implement the skills learnt in the theory and the exercises indicated in Part A. Use the OpenGL.

Note:
1. Any question from Part A may be asked in the examination.
2. A report of about 10 – 12 pages on the package developed in Part B, duly certified by the department must be submitted during examination.

Instructions:

In the examination, one exercise from Part A is to be asked for a total of 30 marks. The package developed under Part B has to be evaluated for a total of 20 marks.

UNIX SYSTEMS PROGRAMMING AND COMPILER DESIGN LABORATORY

Subject Code: 10CSL68   **I.A. Marks   : 25**
Hours/Week : 03   **Exam Hours: 03**
Total Hours : 42   **Exam Marks: 50**

List of Experiments for USP: Design, develop, and execute the following programs

1. Write a C/C++ POSIX compliant program to check the following limits:
   > (i) No. of clock ticks   (ii) Max. no. of child processes
   >   (iii) Max. path length
   >
   > (iv) Max. no. of characters in a file name   (v) Max. no.
   of open files/ process

2. Write a C/C++ POSIX compliant program that prints the POSIX defined configuration options supported on any given system using feature test macros.

3. Consider the last 100 bytes as a region. Write a C/C++ program to check whether the region is locked or not. If the region is locked, print pid of the process which has locked. If the region is not locked, lock the region with an exclusive lock, read the last 50 bytes and unlock the region.

4. Write a C/C++ program which demonstrates interprocess communication between a reader process and a writer process. Use mkfifo, open, read, write and close APIs in your program.

5. a) Write a C/C++ program that outputs the contents of its Environment list
   b) Write a C / C++ program to emulate the unix **ln** command

6. Write a C/C++ program to illustrate the race condition.

7. Write a C/C++ program that creates a zombie and then calls system to execute the **ps** command to verify that the process is zombie.

8. Write a C/C++ program to avoid zombie process by forking twice.

9. Write a C/C++ program to implement the **system** function.

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10. Write a C/C++ program to set up a real-time clock interval timer using the **alarm** API.

List of Experiments for Compiler Design: Design, develop, and execute the following programs.

11. Write a C program to implement the syntax-directed definition of "if E then S1" and "if E then S1 else S2". (Refer Fig. 8.23 in the text book prescribed for 06CS62 Compiler Design, Alfred V Aho, Ravi Sethi, and Jeffrey D Ullman: Compilers- Principles, Techniques and Tools, 2nd Edition, Pearson Education, 2007).

12. Write a yacc program that accepts a regular expression as input and produce its parse tree as output.

Note: In the examination *each* student picks one question from the lot of *all* 12 questions.

VII SEMESTER

OBJECT-ORIENTED MODELING AND DESIGN

Subject Code: 10CS71   **I.A. Marks : 25**
Hours/Week : 04   **Exam Hours: 03**
Total Hours : 52   **Exam Marks: 100**

PART – A

UNIT – 1   **7 Hours**
Introduction, Modeling Concepts, class Modeling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modeling history
Modeling as Design Technique: Modeling; abstraction; The three models.
Class Modeling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT – 2   **6 Hours**
Advanced Class Modeling, State Modeling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips.