Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

(*An Autonomous Institute affiliated to University of Pune*)

Structure & Syllabus of

B.E. (Computer Engineering)

Pattern 'A11'

Effective from Academic Year 2011-12

Prepared by: - Board of Studies in Computer Engineering

Approved by: - Academic Board, Vishwakarma Institute of Technology, Pune

Signed by,

Chairman – BOS

Chairman – Academic Board

Content

$ *Please Refer Academic Information*
! *Please Refer F.E. Structure and Syllabi Booklet*
@ *Please Refer GP-PD-OE Structure & Syllabi Booklet*

Program Educational Objectives (PEO)
B.E. (Computer Engineering)

1. Program and Course Outcomes

Programme objectives:

PEO No.	Description of the Objective
I	**Preparation:** To prepare the students with a commitment towards intellectual, creative and professional growth by application of innovative practices widely accepted by industry or global educational platform.
II	**Core competence:** To provide students with foundation in application of mathematical & engineering fundamentals to computing solutions that can result in product or process.
III	**Breadth:** To enable student to exercise problem solving capacity with effective use of analysis, design, development that address idea realization.
IV	**Professionalism:** To inculcate students with professional and ethical values communication and collaboration skill and involvement in team work as a member having multidisciplinary knowledge useful to the society.
V	**Learning Environment:**To provide students an academic environment that developed leadership qualities, excellent in subject area of computer engineering and lifelong learning in every sphere of their life.

Course Objectives: Course objectives are specified in the course syllabus.

2. Program and Course Outcomes

Programme Outcomes:

a. **Broad foundations:** Graduates will understand and apply mathematical foundations, algorithmic principles, and computer science theory in the modeling and design of computer-based systems in a way that demonstrates comprehension of the tradeoffs involved in design choices.

b. **Disciplinary Foundation:** Graduates will recognize of the need for, and an ability to engage in, continuing professional development and demonstrate an ability to use current techniques, skills, and tools necessary for computing practices.

c. **Specialization:** Graduates will have understanding of and ability to apply the concepts and skills related to writing technical documents such as specifications, design and users manuals in appropriate formats.

d. **Design:** Graduates will be able to analyze, design, implement, and test a solution to real world problems including appreciating the value of efficient design created to meet clearly developed requirements.

e. **Innovations:** Graduates will demonstrate ability to formulate and answer empirical questions through participation in projects especially addressing design and deployment, of computing infrastructure with technology integration and user-centered design

f. **Communication skills:** Graduates will demonstrate ability to communicate effectively through verbal and written form.

g. **Interpersonal skills:** Graduates should be able to interact professionally with others in the workplace and engage themselves, effectively in team work for group projects.

h. **Engineering and society:** Graduates will understand professional ethical and social responsibility which will prepare then to address local and global impact of engineering solutions.

i. **Engineering Applications:** Graduates will understand and apply engineering artifacts of engineering solutions in meaningful and useful way to society and global environment.

j. **Lifelong Learning:** Graduate will acquire skills necessary to engage in life long learning and understanding of need to continuity improve the skills in refining and updating the knowledge base.

Course Outcomes: Course outcomes are specified in the course syllabus.

MODULE VI

Structure, T.E. (Module VI)

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Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_5	CS30102	Software Engineering	3	0	0	3
S_6	CS30104	Computer Graphics	3	0	0	3
S_7	CS30106	Database Management Systems	3	0	0	3
S_8	CS30108	Design and Analysis of Algorithms	3	0	0	3
T_3	CS30202	Software Engineering	0	1	0	1
T_4	CS30204	Computer Graphics	0	1	0	1
P_3	CS30302	Software Engineering	0	0	2	1
P_4	CS30306	Database Management Systems	0	0	2	1
MP_6	CS37402	Mini Project	0	0	2	2
* PD_2	PD	Institute Level Elective	0	0	2	1
CVV_4	CS30402	Comprehensive Viva Voce	Based on Courses S5, S7			1
PS_1	CS37302	PROJECT STAGE 1 (T.E. Semester II) Irrespective of Module	0	0	4	2
		Total	12	2	12	22

FF No. : 654

CS 30102:: SOFTWARE ENGINEERING

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures

Objectives:

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams
- Transforming analysis into design and relate it to implementation model
- Mapping with PEOs: III, (e).

Unit I **(8+1 Hrs)**

Software Process Models and OO Methodologies

A. Overview of Software Engineering, Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Code-and-Fix, Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Extreme Programming, Cleanroom Methodology, CMMI, Impact of Processes and Outcomes, Process Selection and applicability, Software Engineering Principles and Practices, The importance of modeling, UML Building blocks: things, relationships and diagrams, Architectural views: use case, design, implementation, process and deployment, Levels of detail: visualization, specification and construction, Object properties: Abstraction, encapsulation, Modularity, Hierarchy

B. Overview of OO Methodologies: OOAD, OOSE, OMT, DSDM

Unit II **(8+1 Hrs)**

Requirement Engineering and Model Driven Development

A. Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization, Context Models, Behavioral Models, Data Models, Object Models, Structured Methods, Overview of Model Driven Development, Introduction to Model Driven Architecture: MDA Terms and Concepts, Model Mappings, Marking Models, Executable Models, MOF and XMI, Introduction to UML Metamodel

B. Programming In Small Versus Programming In Large, Extensibility Mechanisms and its usage, Introduction to OCL , UML 2.0 Diagram set

Unit III **(8+1 Hrs)**
System Behavior Analysis

A. Static Behavior: Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Using Use Cases, The Domain Perspective, Data Dictionary: Finding the Objects, Responsibilities, Collaborators, and Attributes, CRC Cards, Class Models and Use Case Models, Judging the Domain Model, Capturing system behavior in use cases
Dynamic Behavior: Sequence diagrams, object lifelines and message types, Modeling collections multiobjects, Refining sequence diagrams, Collaboration diagrams, States, events and actions, Nested machines and concurrency, Modifying the object model to facilitate states, Modeling methods with activity diagrams, Activity Diagrams: Decisions and Merges, Synchronization, Iteration, Partitions, Parameters and Pins, Expansion Regions, Swimlanes, concurrency and synchronization
B. Study of other Behavioral Diagrams: Communication Diagram, Interaction Overview Diagrams, Timing Diagrams

Unit IV **(8+1 Hrs)**
System Design Engineering

A. Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles, Reference Architectures Architectural Design: Software Architecture, Data Design and Architectural Design, Design of Software Objects, Features and Methods, Cohesion and Coupling between Objects, Coupling and Visibility, Interfaces, Interfaces with Ball and Socket Notation, Templates, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control , Modeling associations and collections, Preserving referential integrity , Achieving reusability, Reuse through delegation, Identifying and using service packages, Improving reuse with design patterns
B. User Interface Design: Rules, User Interface Analysis and Steps in Interface Design, Design Evaluation, Software Reuse, Component-Based Software Engineering

Unit V **(8+1 Hrs)**
System Implementation and Project Management

A. Packages and interfaces: Distinguishing between classes/interfaces, Exposing class and package interfaces, Component and deployment diagrams: Describing dependencies, Deploying components across threads, processes and processors
Project Activities, Project Definition, Structures and Frameworks, Strategy and Project Management, Role of Teams, Types of Teams and Team Life Cycles, Teamwork, Project Planning, Project Scheduling, Project Cost Estimation, Risk analysis and Planning, Risk

Estimation and Control, Classic Mistakes, Empirical Cost Estimation, COCOMO, Software Sizing, Software Scope Management, Introduction to Function Point Analysis

Text Books

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.

Reference Books

1. Roger S Pressman,'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X

Additional Reading

1. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
2. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974.
3. Quality Software Project Management, Robert T. Futrell, Donald F. Shafer, Linda I. Shafer Publisher: Prentice Hall PTR; 1st edition (January 24, 2002ISBN-10: 0130912972 ISBN-13: 978-0130912978

FF No. : 654

CS30104:: COMPUTER GRAPHICS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand basic concepts of computer graphics.
- To understand algorithms to draw various graphics primitives.
- To understand 2-D and 3-D transformations.
- To understand hidden surface removal, light, color, shading
- To understand curve and fractals.
- Mapping with PEOs: I, II, (b).

Unit I **(8+1 Hrs)**
Basic Concepts

A. Graphics Primitives: Introduction to computer graphics, Display adapters, Display modes, Pixel, Frame Buffer, Display file structure, Display file interpreter, Raster scan & random scan displays, Aliasing and Antialiasing.
Mathematical foundations: Lines and line representations, Vector and affine spaces, Polygons and polygon interiors, Dot and cross products, Planes and plane representations, Line-line and line-plane intersections, Homogeneous coordinates, Normalized Device Coordinates
Scan conversions: DDA and Bresenham's line and circle drawing algorithms, Curve functions, Midpoint circle algorithm.
B. Display devices, Interactive devices, Data generating devices, Thick lines.

Unit II **(9+1 Hrs)**
Polygons

A. Polygons**:** Introduction, Types of polygons, Inside-outside test of polygon, Polygon filling: Seed fill, Boundary fill, Edge fill, Scan line fill algorithm.
Windowing and Clipping: Introduction, viewing transforms, Line clipping: Cohen Sutherland algorithm, Liang-Barsky algorithm, Cyrus beck algorithm, Polygon clipping: Sutherland Hodgeman algorithm, Weller Atherton algorithm, Newman and Sproull clipping, Text clipping.
B. Fence fill, Generalized Polygon clipping.

Unit III **(9+1 Hrs)**
Geometric Transformations

A. 2D Transformations**:** Introduction, Scaling, Rotation, Translation, Derivation of matrix representation of 2D transformation, Homogeneous coordinates for transformations, Reflection Transformations, Transformations about an arbitrary point, Inverse transforms and shear transforms. Problems on transformation, Eigen values and Matrix Diagonalization, Affine Transformations.

3D Transformations: Introduction, 3D point representation, 3D maths, Left handed system, Right handed system, Scaling, Rotation, Translation, Matrix representation, Derivation of Rotation matrices along the main axis, Rotation about an arbitrary axis, Euler angles, Quaternion.

Projection: Projection concept, parallel and perspective projections, mathematics of planer geometric projections, Projection matrices, Viewing parameters.

Viewing: 3D viewing transformations, Orthographic viewing, Foley-vanDam, Perspective API, Mathematics of perspective, Projection taxonomy.

B. Problems based on 2D and 3D transformation, 3D reflection, 3D clipping.

Unit IV **(7+1 Hrs)**

Hidden Surfaces, Light, Color and shading

A. Introduction, Back-face removal algorithm, Z buffers, Painters algorithm, Warnock algorithm, binary space partition.

Light, Color and Shading**:** Introduction, Line vs rays, Lighting properties, Light Illumination(Diffuse, Ambient, Specular), Point source illumination, Shading Algorithms (Phong, Gourad), Human vision and color, RGB Color Model.

B. Scan line algorithm for Depth Comparison, CMY and HSV color model, shadows.

Unit V **(7+1 Hrs)**

Curve Design and Fractals

A. Introduction, Curve generation, Curve continuity, Conic curves, Piecewise curve design, LeGrange interpolated curves, Spline curve representation, B Spline Curves, Non Uniform Rational B Spline curves, Fractals, Hilbert curve, Triadic Koch Curve, Fractal lines.

B. Bezier curves, Fractal surfaces.

Text Books

1. "Computer Graphics", D. Hearn, M. Baker, 2nd Edition, Pearson Education, 2002, ISBN 81-7808-794-4.
2. "Procedural Elements for Computer Graphics", D. Rogers, 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0-07-047371-4.

Reference Books

1. "Computer Graphics", S. Harrington, 2nd Edition, McGraw-Hill Publications, ISBN 0 - 07 -100472 -6.
2. "Computer Graphics Principles and Practice", J. Foley, V. Dam, S. Feiner, J. Hughes, 2nd Edition, Pearson Education, 2003, ISBN 81-7808-038-9.

Additional Reading

1. "Fundamentals of Computer Graphics", P. Shirley, 2nd edition, AK Peters Ltd, ISBN: 1568811241

FF No. : 654

CS30106:: DATABASE MANAGEMENT SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data structures

Objectives:

- To understand importance of Database Management System (DBMS) over traditional file processing system.
- To understand significance of requirement analysis phases in designing entity relationship data model.
- To apply normalization process to design a relational model in the required normal form.
- To use SQL to create database objects, populate tables, and retrieve data.
- To understand the concept of transaction and the implementation of transaction management process.
- Mapping with PEOs: II, III, (d).

Unit I **(8+2 Hrs)**
Introduction to DBMS and ER Data Model

A. Data Storage: File processing system, Disadvantages; DBMS: Need of DBMS, Terms: Data, Database, Metadata, Data Dictionary, Database System, Database Management System, Data Abstraction, Data Independence, System Architecture of DBMS; Data Model: Definition, ER and Relational Data Model, Object Oriented, Object Relational Models; ER Model: Entity, Entity Set, Attributes, Primary Key, Relationship, Types and Attributes of Relationship, Role, Cardinality Ratio, Participation Constraint, Weak Entity Set, EER Features.
B. Hierarchical and Network Data Models, Comparison of Different Data Models, Selection as 1. Entity Vs Attribute, 2. Entity Vs Relationship, 3. Binary Vs Ternary Relationship, Tools for Designing ER Model, Introduction of Popularly used Relational DBMS Packages.

Unit II **(8+2 Hrs)**
Relational Data Model

A. Relational Data Model: Terms: Relation, Schema, Attributes, Tuples, Domains, Relation Degree (or Arity) and Cardinality, Relation Intention and Extension, Super Key, Candidate Key, Primary Key and Foreign Key, Relational Model Constraints, Schema

Diagram, ER to Relational Mapping; Database Query Languages: Relational Algebra, Tuple Relational Calculus.
B. Characteristics of Relation, Codd's Twelve Rules for Relational DBMS, Domain Relational Calculus, Life Cycle of a Relational Database, Reverse Engineering: Relational Database into ER/ EER Model.

Unit III **(8+1 Hrs)**
Normalization

A. Normalization: Anomalies of un-Normalized Relation, Need of Normalization, Pros and Cons of Normalization, Denormalization; Functional Dependency: Trivial, Full, Partial, Transitive, Multivalued, Join, Inclusion Dependency, Dependency Diagram, Inference Rules For Functional Dependencies, Closure of Functional Dependencies, Algorithms to find: 1. Candidate Key, 2. Closure of Attribute Set, 3. Minimal Cover of Functional Dependencies; Normal Forms: Checking of Lossless Join Decomposition and Dependency Preservation, Normal Forms: 1NF, 2NF, 3NF, BCNF, 4NF.

B. Normal Forms: 5NF and DKNF, Normalization at Conceptual Level.

Unit IV **(9+2 Hrs)**
Structured Query Language (SQL)

A. SQL: Introduction, Types of queries: DDL, DML, Select, TCL, DCL, Advantages and Disadvantages of SQL; DDL: Create, Drop, Alter Various Database Objects (Table, Table Constraints, View etc.); DML: Insert, Delete and Update Queries, TCL; SELECT Queries: Simple and Nested Queries, Set Membership, Aggregate Functions, Group-by, Having Construct, Join Types, Set Operations, Set Comparison, SQL String Functions PL/SQL: Block, Cursor, Cursor Types, Procedure, Trigger, Row-level, Statement-level Triggers.
B. DCL-Security and Authorization, SQL Date-Timestamp and Numerical Functions, PL/SQL Function, Mapping of Relational Algebra to SQL.

Unit V **(7+1 Hrs)**
Transaction Management

A. Transaction: Concept, ACID properties, Transaction States; Schedule: Definition, Types, Serializability, Conflict and View Serializability, Precedence Graph, un/Recoverable Schedule, Cascadeless Schedule, Deadlock; Concurrency Control Protocols: Lock Based, Timestamp Based Protocol; Recovery System: Log Based Recovery, Checkpoints and Shadow Paging.

B. Tree and Multiversion Protocol for Concurrency Control, ARIES Recovery Technique, Deadlock Handling.

Text Books

1. "Database System Concepts", Silberschatz, Korth, Sudarshan, McGraw Hill International Edition, ISBN- 0-07-228363-7, 4th Edition.
2. "Fundamentals of Database Systems", Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.

Reference Books

1. "Database Systems", Thomas Connolly and Carolyn Begg, Pearson Education, ISBN 81-7808-861-4, 3rd Edition.
2. "Database Management Systems", Ramakrishnan and Gehrke, McGraw-Hill International Edition, ISBN 0-07-115110-9, 3rd Edition.

FF No. : 654

CS30108:: DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures and Files

Objectives:

- Fundamental understanding of the mathematics used to analyze, evaluate, and design algorithms
- Develop the ability to assess the advantages and disadvantages of different types of algorithms.
- Understand methods for designing time and space efficient algorithms.
- Increased ability to design and implement efficient solutions to problems.
- Proving problems NP-Completed and understand its impact in Computer Science
- Mapping with PEOs: III, (e).

Unit I (9+1 Hrs)

Unit 1: Overview of Time Complexity analysis, Divide and Conquer and Greedy Strategies.

A. Time Complexity notations, Stable matching problem. Overview of Brute Force algorithms (sorting/searching). Using Recurrence equations and Mathematical Induction to find Time Complexity and prove correctness of algorithms. Divide and Conquer : Analyzing Quick Sort, Merge Sort. Strassen's Matrix Multiplication, Finding median, Counting Inversions, Integer Arithmetic, Application of Divide and Conquer to Geometric Problems. Greedy Method : Analysis of Minimum Spanning Tree and Shortest Path algorithms, Scheduling Algorithms. Optimal Storage Problems.

B. Finding Maximum and Minimum, Convex Hull problem.

Unit II (8+1 Hrs)

Dynamic Programming Strategy

A. General Strategy, Review of Multistage graphs, OBST and 0/1 Knapsack, Traveling Salesperson Problem, Shortest path in a Graph, Sequence Alignment problem, Scheduling problem.

B. String Editing Problem.

Unit III (7+1 Hrs)

Backtracking and Branch & Bound

A. Backtracking: General Strategy, n Queen's problem, Graph Coloring, Hamiltonian Cycles, 0/1 Knapsack, Sum of Subsets
Branch and Bound: General Strategy, 0/1 Knapsack, Traveling Salesperson Problem
B. Postage stamp problem, n*n*n Queens problem.

Unit IV **(7+1 Hrs)**
NP-Theory

A. Overview of Deterministic and Non Deterministic Algorithms, Complexity-intractability, Non-Deterministic Polynomial time (NP) Decision problems, Cooks Theorem implication. NP-Hard problems : Halting problem.
NP-Complete problems- Satisfiability problem, vertex cover problem, graph problems, scheduling, code generation problems, Dealing with NP completeness.
B. Simplified NP-Hard Problems.

Unit V **(9+1 Hrs)**
Overview of Parallel Algorithms, Approximation algorithms and Randomized Algorithms.

A. Parallel Algorithms : Selection, Merging two sorted lists, Sorting and Shortest path in a graph algorithms using Parallel strategy. Approximation algorithms : TSP algorithms, Load Balancing problem, Graph problems. Randomized algorithms : Las Vegas and Monte Carlo categories. Quick Sort and Median finding, Min Cut problem, Coupon Collector problem.
Files: Definition and concepts, File organizations, File Operations, Processing of
B. Preparata's sorting algorithm, Approximation algorithm for graph coloring.

Text Books

1. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition, 1998.ISBN 81-7515-257-5
2. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6

Reference Books

1. Bressard, Bratley "Fundamentals of Algorithmics." ,PHI, 2nd Edition,1996, ISBN 81-203-1131-0
2. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" ,PHI 2nd edition, 2001. ISBN 81-203-2141-3

FF No. : 654

CS 30202:: SOFTWARE ENGINEERING

Credits: 01 **Teaching Scheme: -**Tutorial 1 Hr/Week

Prerequisites: Data Structures

Objectives:

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams
- Transforming analysis into design and relate it to implementation model
- Mapping with PEOs: III, (a).

List of Contents

A TERM-WORK containing the record of the following:

1. To study modeling methodologies and identify their applicability to various categories of projects.

2. To understand Requirement Elicitation Techniques and recognize types of requirement while preparing System Requirement Specification.

3. To study MDD / MDA and identify the importance of Model Transformation.

4. To study types of MOF and metamodel concepts for various diagrams in UML 2.0.

5. To identify System Scope, Actors, Use Cases, Use Case structuring for a given problem and perform Use Case narration in template form with normal/alternate flows.

6. To identify Entity, Control, Boundary objects and trace object interactions for scenarios from use cases.

7. To identify object states, transitions, entry-exit points, concurrency, action parallelism and prepare a state chart diagram for given object scenario.

8. To prepare detailed Activity diagram with notational compliance to UML 2.0 indicating clear use of pins, fork-join, synchronization, datastores.

9. To prepare Class diagram for a defined problem with relationships, associations, hierarchies, interfaces, roles and multiplicity indicators.

10. To prepare Component and Deployment diagram for a defined problem.

Text Books

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.

Reference Books

1. Roger S Pressman,'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X

Additional Reading

1. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
2. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974.
3. Quality Software Project Management, Robert T. Futrell, Donald F. Shafer, Linda I. Shafer Publisher: Prentice Hall PTR; 1st edition (January 24, 2002ISBN-10: 0130912972 ISBN-13: 978-0130912978

FF No. : 654

CS30204:: COMPUTER GRAPHICS

Credits: 01 **Teaching Scheme: -** Tutorial 1 Hr/Week

Prerequisites: : Nil

Objectives:

- To understand algorithms to draw various graphics primitives.
- To understand 2-D and 3-D transformations.
- To understand clipping, curve, fractals.
- Mapping with PEOs: I, II, (b).

List of Contents

A TERM-WORK containing the record of the following:

A. Assignments :

1. Write a Program to implement DDA Line drawing algorithm.
2. Write a Program to implement Bresenham's Circle drawing algorithm.
3. Write a Program to implement Scan Line fill algorithm.
4. Write a Program to implement Cohen Sutherland line clipping algorithm.
5. Write a Program to implement Polygon clipping algorithm.
6. Write a Program to draw a Traidic Koch curve.
7. Write a Program to draw a fractal line and surface.

Text Books

1. "Computer Graphics", S. Harrington, 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0-07-100472-6.
2. "Procedural Elements for Computer Graphics", D. Rogers, 2nd Edition, Tata McGraw-Hill Publication, 2001, ISBN 0-07-047371-4.

Reference Books

1. "Computer Graphics Principles and Practice", J. Foley, V. Dam, S. Feiner, J. Hughes, 2nd Edition, Pearson Education, 2003, ISBN 81-7808-038-9.
2. "Computer Graphics – C Version", D. Hearn, M. Baker, 2nd Edition, Pearson Education, 2002, ISBN 81-7808-794-4.

FF No. : 654

CS 30302:: SOFTWARE ENGINEERING

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Data Structures

Objectives:

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams
  Transforming analysis into design and relate it to implementation model
- Mapping with PEOs: III, (a).

List of Practical

1. To narrate Requirement Definition Document for the target system with following three areas:
   a. Problem Identification
   b. Problem Definition
   c. Problem Statement

2. To narrate System Requirements Specification Document for target system with reference to the IEEE 610.12.1990 Std guidelines.

3. To decompose and organize the problem domain area into broad subject areas and identify the boundaries of problem/system. Specify the behavior of the target system and map requirements to Use cases.
   The System Context Diagram depicts the overall System behavioral trace and Requirement Capture diagram depicts the hierarchical Use case Organization. The Use Case diagram should encompass
   a. Actors (External Users)
   b. Transactions (Use Cases)
   c. Event responses related to transactions with external agents.
   d. Detection of System boundaries indicating scope of system.

4. To depict the dynamic behavior of the target system using sequence diagram. The Sequence diagram should be based on the Scenarios generated by the inter-object Communication. The model should depict:
   a. Discrete, distinguishable entities (class).

   b. Events (Individual stimulus from one object to another).
   c. Conditional events and relationship representation.

5. To depict the state transition with the life history of objects of a given class model. The model should depict:
   a. Possible ways the object can respond to events from other objects.
   b. Determine of start, end, and transition states.

6. To depict the dynamic behavior using detailed Activity diagram.

7. To develop logical static structure of target system with Class diagram. To prepare Class Collaboration-Responsibility (CRC) cards for the Conceptual classes traced from System analysis phase. The design model should depict
   a. Relationship between classes: inheritance, Assertion, Aggregation, Instantiation
   b. Identification of objects and their purpose.
   c. Roles / responsibilities entities that determine system behavior.

8. To represent physical module that provides occurrence of classes or other logical elements identified during analysis and design of system using Component diagram. The model should depict allocation of classes to modules. To narrate the Program Design Language Constructs for the target system.

9. To represent deployment view of the system through Architecture Diagram.

10. To implement the system according to specification.

Text Books

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.

Reference Books

1. Roger S Pressman,'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. Mellor, Scott, Uhl, Weise, "MDA Distilled", Pearson Education, ISBN 81-297-0529X

Additional Reading

1. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design.", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
2. Grady Booch, James Rambaugh, Ivar Jacobson, "Unified Modeling Language Users Guide", 2nd Edition, Addison- Wesley, ISBN – 0321267974.

3. Quality Software Project Management, Robert T. Futrell, Donald F. Shafer, Linda I. Shafer Publisher: Prentice Hall PTR; 1st edition (January 24, 2002ISBN-10: 0130912972 ISBN-13: 978-0130912978

FF No. : 654

CS30306:: DATABASE MANAGEMENT SYSTEMS

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Data structures

Objectives:

- Deep understanding of database design.
- Implementation of database systems.
- Conversant with oracle database: SQLPlus, PL/SQL.
- Mapping with PEOs: II, III, (d).

List of Practical

1. Choose a database application; you propose to work on throughout the course. Perform requirement analysis in detail for the same.

2. Draw an entity-relationship diagram for the proposed database.

3. Translate above E/R model to relational model.

4. Normalize these relations up to 3NF. Check normalized relations for lossless join decomposition.

5. Create tables for the above schema using DDL queries. Apply appropriate constraints. Alter the table design by adding/removing column and constraints. Write DML statements to modify data in tables.

6. Execute 'SELECT' queries using various operators. Also make use of order by, group by, having clause, aggregate functions and set operators.

7. Write queries involving multiple tables using equijoin, non equijoin, self join and outer join. Write queries involving subqueries.

8. Create views, indices, and sequence on your database schema involving two or more tables. Use SQL single row functions: date, time, string functions etc.

9. Write meaningful stored functions, procedures, triggers in PL/SQL. Make use of cursors.

Mini project: For the above created database, design front end and develop a complete database application. Use suitable application development environment. Generate necessary reports using appropriate tool. Mini project should be done individually.

Text Books

1. "Fundamentals of Database Systems", Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.
2. "SQL, PL/SQL", Bayross Ivan, BPB Publications New Delhi, ISBN 81-7656-964-X, 3rd Edition.

Reference Books

1. "Oracle: Applications Development", Bayross Ivan, BPB Publications, New Delhi, ISBN 81-7656-912-7.
2. "Oracle SQL * Plus", Gennick Jonathan, Shroff Publishers & Distributors P Ltd Mumbai, ISBN 81-7366-606-7.

HONORS

Structure, HONORS (INFORMATION TECHNOLOGY)

FF653, Issue No. 3, Rev 1, dt 02/04/2011

Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS28102	Unix Programming	2	0	0	3
P_1	CS28302	Unix Programming (Laboratory Course)	0	0	2	
S_2	CS38101	Advanced Data Structures	3	0	0	3
S_3	CS38102	Routing Algorithms	3	0	0	3
S_4	CS48101	Modeling and Design of Computer Networks	3	0	0	3
S_5	CS48102	Mobile Adhoc Networks	3	0	0	3
		Total	14	0	2	15

FF No. : 654

CS28102:: UNIX PROGRAMMING

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites: Familiarity with Computer Operations, C Programming.

Objectives:

- Teaches the fundamentals of Unix Operating System.
- Prepares the student for Unix Administration.
- Prepare the students for Shell Programming, AWK Programming.
- Mapping with PEOs: II, III, (d).

Unit I **(5+1 Hrs)**
Introduction

A. Introduction: Operating System, Functions of OS, Unix Architecture, Kernel, Shell, Different types of Shells, File System / Directory Structure, Features of Unix.

B. Comparison of Windows with Unix.

Unit II **(5+1 Hrs)**
Unix Commands

A. Basic commands: Internal and External Commands, Command Structure, man, cat, cal, date, passwd, echo, printf, less, more, wc, bc, uname, who, tty, clear, script.
File & Directory Manipulation under Unix: File Concepts, cat, cp, rm, mv, more, file, wc, od, cmp, diff, dos2unix, unix2dos, mkdir, rmdir, cd, ls, pwd.
B. Input and output redirection

Unit II **(5+1 Hrs)**
File permissions, Filters and vi Editor

A. Working with File Permissions: Understanding Permissions, Changing File and Directory Permissions, Changing Ownership and Group.
Filter and Redirection: Concepts, pr, head, tail, cut, paste, sort, uniq, tr, tee, grep, Pipe and I/O Redirection.
vi Editor: Creating and Viewing Files using the vi Editor, vi commands
B. Sed: The Stream Editor

(5+1 Hrs)

Unit IV
Shell Programming

A. Shell Programming: Read Statement, Command Line Arguments, Different Operators Control Structures: if, for, while, case.
Positional Parameters, Arrays, Functions, Writing Shell Scripts, Debugging.
B. Comparison of different Shell Scripting.

Unit V **(5+1 Hrs)**
AWK Programming

A. AWK Programming: Format of AWK Programs, Records, Fields, Variables, Variables, Expressions, Operators, Print Statement, Control Statements in Actions, BEGIN and END block.Control Structures: if, for, while.
AWK Functions: String Handling Functions, Mathematical Functions, Arrays

B. Passing Shell Arguments to AWK, Passing AWK Output to the shell.

Text Books

1. "Unix Concepts and Applications", Das Sumitabha, Tata McGraw Hill, ISBN: 0-07-053475-6, 3rd Edition.
2. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.

Reference Books

1. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6, 1st Edition.
2. "Unix: Concepts and Programming", Sethuraman Murugan, Dennet and Co, 1st Edition, 2006, ISBN: 819032281-8.

Additional Reading

1. Vijay Mukhi's The C Odyssey Unix: Open Boundless C", Shah Rajiv, Shetty Tilak, Gandhi Meeta, BPB Publications, ISBN: 81-7029-165-8, 1992.
2. "Test Your Unix Skills", Yashwant Kanetkar, BPB Publications, ISBN: 81-7029-848-2, 1997.
3. "UNIX Programming Environment", Kernighan B. W. , Pike R., Prentice Hall Of India, ISBN: 81-203-0499-3, 1984.
4. "Unix for You", Koparkar Pramod, Tata McGraw Hill, ISBN: 0-07-052849-7, 1991.
5. "Linux: The Complete Reference", Petersen R. L., Tata McGraw Hill, ISBN: 0-07-05849-7, 2003

FF No. : 654

CS38101:: ADVANCED DATA STRUCTURES

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures

Objectives:

- To introduce advanced data structures, problem solving paradigms
- To study the representation, implementation & applications of data structures.
- To compare alternative implementations of data structures.
- To choose the appropriate data structure for modeling a given problem.
- Mapping with PEOs: III, (e).

Unit I **(8+1 Hrs)**
Hashing

A. Static Hashing: Hash tables, Hash functions, Overflow Handling. Dynamic Hashing: Motivation for Dynamic Hashing, Dynamic Hashing using Directories, directory less Dynamic Hashing. Bloom Filters: An application-differential files, Bloom Filter Design.
B. Theoretical evaluation of overflow techniques.

Unit II **(8+2 Hrs)**
Priority Queue and Advance Heaps

A. Single and Double Ended Priority queues, Leftist Trees: Height Biased, Weight Biased. Binomial Heaps: Cost Amortization, Definition of Binomial Heaps, Insertion, Melding two Binomial Heaps, deletion of min element. Fibonacci Heaps: Definition, Deletion from an F-heap, Decrease key, Cascading Cut. Pairing Heaps: Definition, Meld and Insert, Decrease Key, Delete Min, Arbitrary delete. Interval Heaps: Definition and Properties, Insertion and Initialization, Deletion of Min element.
B. Symmetric Min-max Heaps.

Unit III **(9+1 Hrs)**
Advanced Binary Search Trees

A. Red-Black Trees: Definition, Representation, Searching, Insertion, Deletion, Joining, Splitting a Red-Black Tree. Splay Trees: Bottom-up, Top-down Splay trees, Multiway Search trees: Definition and Properties, Searching an m-way Search Tree. B-Tree: Definition and Properties, number of elements in a B-Tree, Insertion, deletion of a B-tree.

B+ Tree: Searching, Insertion, Deletion.
B. AA Trees.

(9+1 Hrs)

Unit IV
Digital Search Structures

A. Digital Search Trees: Definition, Search, Insert and Delete. Binary Tries, Compressed Binary Tries. Multiway Tries: Definition, searching a Trie, sampling Strategies, Insertion, Deletion, Height of a Trie, Space required and alternative node structures, Prefix Search and applications. Compressed Tries: with Skip fields and with Labeled edges. Suffix Trees as a data structure.
B. Searching a Suffix Tree.

Unit V **(8+1 Hrs)**
Data structures for Disjoint Sets and Linear Programming

A. Data structures for Disjoint Sets: Disjoint Set Operations, Linked list representation of disjoint sets, Disjoint set forests. Linear Programming: Overview, Applications, Algorithms, Standard and Slack forms, Formulating problems as linear programs, Simplex Algorithm.
B. Linear Programming duality

Text Books

1. "Fundamentals of Data Structures in C", E. Horwitz , S. Sahani, Anderson-Freed, Universities Press, Second Edition, 2008, ISBN 978-81-7371-605-8.
2. "Introduction to Algorithms", T. Cormen, R.Rivest, C. Stein, C. Leiserson, PHI publication, Second Edition, 2004, ISBN 81-203-2141-3.

Reference Books

1. "Advanced Data structures", Peter Brass, Cambridge Publication, 1st Edition, 2008 ,ISBN – 978-0-521-88037-4.
2. "Data Structures and algorithms with Object Oriented design Patterns in Java", Bruno R. Preiss, wiley Publication, 1st Edition, 2000. ISBN: 978-0-471-34613-5.

FF No. : 654

CS38102:: ROUTING ALGORITHMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Computer Networks.

Objectives:

- To explain routing algorithms in the Internet; link-state routing and distance-vector routing; broadcast and multicast routing algorithms.
- To explain path determination, strengths of link state and distance vector protocols in differing configurations.
- To describe the goals of routing protocols and convergence as impacted by different protocols.
- To explain the similarities and differences between several types of routing protocols.
- Mapping with PEOs: IV, V, (i).

Unit I **(8 Hrs)**
Networking and Network Routing

A. Addressing and Internet Service: An Overview, Network Routing, IP Addressing, Service Architecture, Protocol Stack Architecture, Router Architecture, Network Topology, Architecture, Network Management Architecture, Public Switched Telephone Network.
B. ICMP, PING, DHCP, ARP,RARP
SLIP, SONET, MPLS.

Unit II **(8 Hrs)**
Shortest and Widest path Algorithms

A. Shortest Path and Widest Path: Bellman–Ford Algorithm and the Distance Vector Approach, Dijkstra's Algorithm, Widest Path Algorithm, Dijkstra-Based Approach, Bellman–Ford-Based Approach.
B. k-Shortest Paths Algorithm.

Unit III **(8 Hrs)**
Routing Protocols: Framework and Principles

A. Routing Protocol, Routing Algorithm, and Routing Table, Routing Information Representation and Protocol Messages, Distance Vector Routing Protocol, Link State

Routing Protocol, Protocol, and Link Cost.
B. Path Vector Routing.

Unit IV **(8 Hrs)**
Internet Routing Algorithms

A. IP Routing and Distance Vector Protocol Family: RIPv1 and RIPv2, OSPF and Integrated IS-IS: OSPF: Protocol Features, OSPF Packet Format, Integrated IS-IS, Key Features, comparison, BGP: Features, Operations, Configuration Initialization, phases.
B. BGP Message Format.

Unit V **(8 Hrs)**
Analysis of Network Algorithms

A. IP Address Lookup Algorithms : Impact, Address Aggregation, Longest Prefix Matching, Naïve Algorithms, Binary , Multibit and Compressing Multibit Tries, Search by Length Algorithms, Search by Value Approaches, Hardware Algorithms, Comparing Different Approaches. IP Packet Filtering and Classification: Classification, Classification Algorithms, Naïve Solutions, Two-Dimensional Solutions, Approaches for *d* Dimensions.

B. IPv6

Text Books

1. "Network Routing: Algorithms, Protocols, and Architectures", Deepankar Medhi and Karthikeyan Ramasamy , Morgan Kaufmann , ISBN-10: 0-12-088588-3, 2007.
2. "Network Algorithmic: An Interdisciplinary Approach to Designing Fast Networked Devices", George Varghese, Morgan Kaufmann, ISBN: 0-12-088477-1, 2004.

FF No. : 654

CS48101:: MODELING AND DESIGN OF COMPUTER NETWORKS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Computer Networks.

Objectives:

- To understand analysis of a problem, design of its solution, implementation of the solution, testing of the solution.
- To describe the methods used in modeling, analysis and design communications systems.
- To describe the organization of computer networks and evaluate alternative organizations.
- To evaluate the protocols used in computer networks.
- Mapping with PEOs: III, IV, (f).

Unit I **(8 Hrs)**
Introduction to Queuing Theory

A. Multiplexing of Traffic on a Communication Link**,** Queuing Models- Little's Theorem**,** Little's Theorem**,** Probabilistic Form of Little's Theorem**,** Application of Little's Theorem**,** The M/M/1 Queuing System**,** Arrival Statistics, Service Statistics**,** Markov Chain Formulation**,** Deviation of the Stationary Distribution**,** Occupancy Distribution upon Arrival**,** Occupancy Distribution upon Departure**,** The M/M/m, M/M/∝, M/M/m/m, AND Other Markov Systems**,** The M/M/m: The m-Server Case**,** M/M/∝: The Infinite-Server Case**,** M/M/m/m: The m-Server Loss System**,** multidimensional Markov Chains- Applications in Circuit Switching, The M/G/1 System, M/G/1 Queues with Vacations**,** Reservations and Polling**,** Priority Queuing, The D/D/1 Queue.
B. Problems on queuing theory.

Unit II **(8 Hrs)**

Delay Models in Data Networks

A. M/M/1 queue - Time-dependent behavior, Limiting behavior, Direct approach Recursion, Generating function approach, Global balance principle, Mean performance measures, Distribution of the sojourn time and the waiting time, Priorities, Preemptive-resume priority, Non-preemptive priority, Busy period ,Mean busy period, Distribution of the busy period.

B. problem on M/M/ 1 system for related topics.

Unit III **(8 Hrs)**
Network Design

A. Problem definition: Multipoint line layout heuristics, CMST algorithm, ESAU-William's algorithm, Sharma's algorithm, Unified algorithm, Bin packing, Terminal assignments, Concentrator location.

B. Problems on CMST, Bin packing, Terminal Assignment, Concentrator location.

(8 Hrs)
Unit IV
Optical network design

A. Introduction, telecom network overview, roles of three fields in optical network, cross layer design, WDM networking evolution, WDM network constructions, Optical access network, overview of PON technologies, Ethernet PON (EPON) Access Network, Routing Wavelength Assignment(RWA): Problem formulation of RWA, illustrative examples from ILP. Virtual-Topology Reconfiguration, Virtual-Topology Adaptation under Dynamic traffic.
B. WDM-PON, Heuristic Adaptation Algorithm for Larger Networks.

Unit V **(8 Hrs)**
Survivable optical network

A. Introduction, Fault management in SONET/SDH, Fault management in WDM mesh network, Traffic grooming: static and dynamic, Hierarchical Switching and Waveband Grooming, Survivable Traffic Grooming.
B. Advanced Topics in Network Survivability, Virtual Concatenation.

Text Books

1. "Telecommunication Network Design Algorithms", by Kershenbaum A., Tata McGraw HillPublication, ISBN 0-07-034228-8, 1st Edition.
2. "Data Networks", by Bertsekas D. and Gallager R., Prentice-Hall, Englewood Cliffs, N.J., ISBN0-87692-780-0, 2nd Edition, 1992.

Reference Books

1. "OPTICAL NETWORKS SERIES", by Biswanath Mukherjee, Springer, e-ISBN 0-387-29188-1, 2006.
2. "Design and Analysis of Computer Communication Networks", by Vijay Ahuja, McGraw Hill, ISBN 0070006970, 1st Edition, 1981.

Additional Reading

1. "Computer Networks", by Andrew S. Tenenbaum , Prentice Hall of India, ISBN 81-203-2175-8, 4th Edition.
2. "Data and Computer Communications", by Stallings W, Prentice Hall of India Pvt. Ltd., 2002, ISBN 81-203-2067-0, Sixth Edition.

FF No. : 654

CS48102:: MOBILE ADHOC NETWORKS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Computer Networks.

Objectives:

- To understand MANET and WSN.
- To learn various routing algorithms used in MANET.
- To understand security mechanisms in MANET.
- Mapping with PEOs: I, V, (j).

Unit I **(8 Hrs)**
Introduction

A. Introduction. Fundamentals of Wireless Communication Technology. The Electromagnetic Spectrum. Radio Propagation Mechanisms. Characteristics of the Wireless Channel. IEEE 802.11a b Standard. Origin of Ad hoc Packet Radio Networks. Technical Challenges. Architecture of PRNETs. Components of Packet Radios. Ad hoc Wireless Networks. Wireless Sensor Networks.
B. Challenges Facing Ad hoc Mobile Networks, Ad hoc wireless Internet.

Unit II **(8 Hrs)**
Medium Access Control

A. Introduction. Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks. Design Goals of a MAC Protocol for Ad Hoc Wireless Networks. Classifications of MAC Protocols. Contention-Based Protocols. Contention-Based Protocols with Reservation Mechanisms. Contention-Based MAC Protocols with Scheduling Mechanisms.
B. MAC Protocols That Use Directional Antennas. Other MAC Protocols.

Unit III **(8 Hrs)**
Ad Hoc Routing Protocols

A. Introduction. Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks. Classifications of Routing Protocols. Table-Driven Routing Protocols. On-Demand Routing Protocols. Hybrid Routing Protocols. Routing Protocols with Efficient Flooding Mechanisms. Hierarchical Routing Protocols.
B. Power-Aware Routing Protocols.

Unit IV **(8 Hrs)**

Multicast Routing In Ad hoc Networks

A. Introduction. Issues in Designing a Multicast Routing Protocol. Operation of Multicast Routing Protocols. An Architecture Reference Model for Multicast Routing Protocols. Classifications of Multicast Routing Protocols. Tree-Based Multicast Routing Protocols. Mesh-Based Multicast Routing Protocols. Summary of Tree-and Mesh-Based Protocols. Energy-Efficient Multicasting. Multicasting with Quality of Service Guarantees. Application-Dependent Multicast Routing.

B. Application-Dependent Multicast Routing. Comparisons of Multicast Routing Protocols.

Unit V **(8 Hrs)**

Transport Layer And Security Protocols

A. Introduction. Issues in Designing a Transport Layer Protocol for Ad Hoc Wireless Networks. Design Goals of a Transport Layer Protocol for Ad Hoc Wireless Networks. Classification of Transport Layer Solutions. TCP Over Ad Hoc Wireless Networks. Other Transport Layer Protocols for Ad Hoc Wireless Networks. Security in Ad Hoc Wireless Networks. Network Security Requirements. Secure Routing in Ad Hoc Wireless Networks.

B. Issues and Challenges in Security Provisioning. Network Security Attacks.

Text Books

1. "Ad Hoc Wireless Networks Architectures and Protocols" by C. Siva Ram Murthy and B. S. Manoj, Prentice Hall, ISBN-9780131470231, 2004.
2. "Ad Hoc Mobile Wireless Networks Protocols and Systems" by C. K. Toh, Prentice Hall, ISBN-9780130078179, 2001.

Reference Books

1. "Ad Hoc Networking" by Charles E. Perkins, Addison Wesley, ISBN: 0-201-30976-9, 2000.
2. "ZigBee Wireless Sensor and Control Network" by Elahi & Gschwender, Prentice Hall, ISBN- 0137134851, 2010.

FF No. : 654

CS28302:: UNIX PROGRAMMING

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Operating Systems, Familiarity with Computer Operations, C Programming

Objectives

- Teaches the fundamentals of Unix Operating System.
- Prepares the student for Unix Administration.
- Prepare the students for Shell Programming, AWK Programming.
- Mapping with PEOs: II, III, (d).

List of Practical

1. Installation of Linux
2. Execution of basic Linux commands.
3. Execution of advanced Linux commands.
4. Working with vi editor: Shell program for Fibonacci Series.
5. Shell Program to check file permissions
6. Shell Program to check string is palindrome or not.
7. Shell Program to perform arithmetic operations using case statement
8. Shell Program for Bubble Sort using Array.
9. Shell program using Function.
10. Execution of AWK related commands.
11. Generate a student report using AWK programming
12. AWK program for passing shell arguments and Passing AWK Output to the shell.

13. Managing Users and Groups and Basic Network Setup

14. Execution of C & Java program on Unix.

Text Books

1. "Unix Concepts and Applications", Das Sumitabha, Tata McGraw Hill, ISBN: 0-07-053475-6, 3rd Edition.
2. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.

Reference Books

1. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, 1st Edition, 2003, ISBN: 981-243-127-6
2. "Unix: Concepts and Programming", Sethuraman Murugan, Dennet and Co, 1st Edition, 2006, ISBN: 819032281-8.

Additional Reading

1. "Vijay Mukhi's The C Odyssey Unix: Open Boundless C", Shah Rajiv, Shetty Tilak, Gandhi Meeta, BPB Publications, ISBN: 81-7029-165-8, 1992.
2. "Test Your Unix Skills", Yashwant Kanetkar, BPB Publications, ISBN: 81-7029-848-2, 1997.
3. "UNIX Programming Environment", Kernighan B. W. , Pike R., Prentice Hall Of India, ISBN: 81-203-0499-3, 1984.
4. "Unix For You", Koparkar Pramod, Tata McGraw Hill, ISBN: 0-07-052849-7, 1991.
5. "Linux: The Complete Reference", Petersen R. L., Tata McGraw Hill, ISBN: 0-07-05849-7, 2003.
6. "Teach Yourself UNIX Shell Programming in 14 days", Husain Kamran, Techmedia, ISBN: 81-7635-113-X, 1998.

MINORS

Structure, MINORS (Computer Engineering)

FF653, Issue No. 3, Rev 1, dt 02/04/2011

Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS29102	Principles of Programming Languages	2	0	0	3
	CS29302	Principles of Programming Languages	0	0	2	
S_2	CS39101	Computer Architecture & Operating Systems	3	0	0	
		OR				
	CS39103	Computer Graphics	2	0	0	3
	CS39303	Computer Graphics	0	0	2	
S_3	CS39102	Analysis of Algorithms	3	0	0	
		OR				
	CS39104	Data Structures	2	0	0	3
	CS39304	Data Structures	0	0	2	
S_4	CS49101	Software Engineering & Project Management	3	0	0	3
S_5	CS49102	Database Management Systems	2	0	0	3
	CS49302	Database Management Systems	0	0	2	
		Total	17	0	8	15

FF No. : 654

CS29102:: PRINCIPLES OF PROGRAMMING LANGUAGES

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites: C

Objectives:

- To understand the concept of Interfaces, Packages.
- To understand the concept of Exception Handling and Multithreading
- To understand the concept of Applets and AWT.
- Mapping with PEOs: II, III, (d).

Unit I **(5+1 Hrs)**

Introduction to Programming languages & OOP (Java)

A. Introduction: Role of programming languages, Necessity of studying programming languages, characteristics of a good programming language, Effects of Environments on languages (batch Processing, Interactive, Embedded, Programming Environment) Language design issues, Programming paradigms.

Introduction to JAVA: Classes & Objects – Constructors, Access Modifiers, Instance Methods, this & static keywords. Inheritance – Types of inheritance, Constructors in Derived Classes, Overriding & Hiding Fields& Methods,

B. Multilevel Inheritance, Hierarchical Inheritance.

Unit II **(5+1 Hrs)**

Extended Object Oriented Programming (Java)

A. Abstract Classes & methods, Final Classes & Final Methods, Interfaces & Packages - Interfaces, Putting Classes together. Exception Handling - built-in exceptions, checked & unchecked exceptions. Concurrent Issues with thread programming, Deadlock. Multithreading – Thread life Cycle thread Priority, Thread Methods.

B. User defined exception

Unit III **(5+1 Hrs)**

Java AWT & SWING

A. Graphical Programming - Applet, Event Handling. Abstract Windows Toolkit-Components and Graphics, Containers, Frames and Panels Layout Managers- Border

layout, Flow layout, Grid layout, Card layout AWT all components, Event delegation Model - Event source and handler, Event categories, Listeners, Interfaces.
B. Concurrent Issues with thread programming, Deadlock.

Unit IV **(5+1 Hrs)**
Java Database Connectivity

A. overview of JDBC, ODBC, creating DSN, connecting to database using JDBC: ODBC, prepared statement, handling record/result sets, using database on remote machine.
B. SQL injection

Unit V **(5+1 Hrs)**
Case Studies of Programming Languages

A. Overview of the building blocks of the language, procedures, control structures, their motivation(s), target user base, choice and paradigms of features, special features relevant to HTML-CSS-JavaScript, PHP-HTML, Matlab.
B. LISP /Haskell.

Text Books

1. "Programming Languages Design and Implementation", T. W. Pratt, M.V. Zelkowitz, Publications, ISBN 10: 0130276782, 4th Edition.
2. "Java: The Complete Reference", Herbert Schildt, TMG Publication, ISBN 9780070636774 , 7th Edition.

Reference Books

1. "HTML, CSS, Java Script, Perl, Python and PHP", Schafer Steven, Dreamtech India Pvt Ltd., ISBN 81-265-0620-2.

Additional Reading

1. "Programming Languages: Principles and Paradigms" A. B. Tucker, R. Noonan, McGraw-Hill, ISBN 0-07-048704-9.
2. "Programming Languages: Principles and Practice", K. C. Loudon, Thomson Publications, 981-243-130-6, 2nd Edition.
3. "MATLAB Programming for Engineers", Stephen J. Chamman, Thomson Learning Publication, ISBN 981-254-893-9, 3rd Edition.
4. "Programming In Prolog", Clocksin W F, Mellish C S, Narosa Pblishing House, ISBN 8185198552, 3rd Edition.
5. "Lex & Yacc", John R. Levine, Tony Mason, Doug Brown, Shroff Publishers, ISBN 81-7366-062-X, 2nd Edition.

6. "LISP", Patrick Henry Winston, Berthold, Pearson Educaation, ISBN 81-7808-155-5, 3rd Edition.
7. "Haskell: The Craft of Functional Programming", S. Thompson, Addison Wesley, ISBN 0201342758, 2nd Edition.

FF No. : 654

CS29302:: PRINCIPLES OF PROGRAMMING LANGUAGES

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: C

Objectives:

- To understand basic concepts of Object Oriented Programming.
- To understand inheritance, polymorphisms, templates, file handling.
- To understand the concept of Interfaces, Packages.
- To understand the concept of Exception Handling and Multithreading
- To understand the concept of Applets, AWT and SWING
- Mapping with PEOs: II, III, (d).

List of Practical

1. Write a simple JAVA program to implement the concept of Class & Object.
2. Write a simple JAVA program to implement the concept of Class, Constructor, instance variable & class variable.
3. Write a JAVA program to implement the concept of inheritance.
4. Write a JAVA program to implement the concept of interface.
5. Write a JAVA program to implement the concept of package.
6. Write a JAVA program to illustrate following exceptions
   a. Arithmetic Exception
   b. NullPointerException
   c. ArrayIndexOutOfBoundsException
   d. IllegalAccessException
7. Write a JAVA program to illustrate the use of abstract class
8. Write a JAVA program to implement the concept of multithreading.
9. Write a JAVA program for file handling.
10. Design a simple applet application with event handling.

Text Books

1. "Java: The Complete Reference", Herbert Schildt, TMG Publication, ISBN 9780070636774 , 7th Edition
2. "Core Java 2 Volume – I ",Cay S Horstmann, Gary Cornell, Pearson Education, ISBN 9788131719459, 8th Edition

Reference Books

1. "Core Java Volume .II " Cornell G, Horstmann C S , Sunsoft Press, ISBN 81-7808-018-4

FF No. : 654

CS39101:: COMPUTER ARCHITECTURE AND OPERATING SYSTEMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Nil.

Objectives:

- To understand the structure, function and characteristics of computer systems.
- To understand the design principle of the various functional units of digital computers
- To identify the role of operating systems and explain the different structures of operating systems.
- To understand OS support for processes/threads, virtual memory, I/O and file systems.
- To evaluate processes and/or threads synchronization mechanisms and explain deadlock conditions and different ways to resolve them.
- Mapping with PEOs: I, II, III,(b), (d).

Unit I **(8+1 Hrs)**

Structure of a Computer System & Processor Organization

A. Brief History of computers, Von Neumann Architecture, Functional Units, Data Types and Computer Arithmetic: Fixed and Floating point numbers, Signed numbers, Integer Arithmetic, 2's Complement arithmetic, multiplication.
CPU Architecture (8086), Register Organization, Instruction types, Instruction formats, Instruction cycles, Types of operands, Addressing Modes.
B. IEEE standards for Floating point representations.

Unit II **(8+1 Hrs)**

Control Unit & I/O Organization

A. Single Bus CPU, Control Unit Operation: Instruction Sequencing, Micro-operations. Hardwired Control: Multiplier CU. Micro-programmed Control: Basic concepts, Microinstruction-sequencing and execution, Micro-program control, Input/Output Systems, Synchronous, Asynchronous, Parallel and Serial I/O, Programmed I/O, Interrupt Driven I/O.
B. Applications of microprogramming, I/O channels

(8+1 Hrs)

Unit III
Introduction to OS & Process Management

A. Architecture, Goals & Structures of O.S., Hardware Abstraction layer, Basic functions, Types of OS: Batch, multiprogramming, multitasking, time sharing.
Processes: Process description & control: Process Concept, Process states, Process description, Process control, Threads.
Concurrency: Principles of Concurrency, Mutual Exclusion, Semaphores, Message Passing, Monitors
Classical Problems of Synchronization: Readers-Writers problem, Producer Consumer Problem, Dining Philosopher problem.
B. Sleeping Barber problem, Cigarette Smokers problem

Unit IV **(8+1 Hrs)**
Deadlock and CPU Scheduling

A. Deadlock: Principles of deadlock, Deadlock Prevention, Banker's algorithm for Deadlock Avoidance, Deadlock Detection, Deadlock Recovery.
Uniprocessor Scheduling: Types of scheduling: Preemptive, Non-preemptive, Long-term, Medium-term, Short-term. Scheduling Algorithms: FCFS, SJF, RR, and Priority.
Multiprocessor Scheduling: Granularity, Design Issues, Process Scheduling
B. Real Time Operating System.

Unit V **(8+1 Hrs)**
Memory Management

A. Memory Management requirements, Memory Partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, Worst Fit, Next Fit), Fragmentation, Swapping, Cache Memory.
Virtual Memory: Concepts, Segmentation, Paging, Address Translation, Page Replacement Policies (FIFO, LRU, Optimal), Thrashing, Demand paging.
B. Working Set model

Text Books

1. "Computer Organization and Architecture: Designing for Performance", W. Stallings William, Pearson Prentice Hall, 2006, ISBN 81-7758-993-8, 7th Edition
2. "Operating Systems", Stalling William, Pearson Education, ISBN 81-317-0304-5, 5th Edition.

Reference Books

1. "Computer Organization", C. Hamacher, V. Zvonko, S. Zaky, McGraw Hill,

ISBN 007-120411-3 , 5th Edition.

2. "Modern Operating Systems", Tanenbaum Andrew S, PHI, ISBN 81-203-0974-x, 2nd Edition, 2001.

Additional Reading

1. "Structured Computer Organization", A. Tanenbaum, Prentice Hall of India, ISBN 81 – 203 – 1553 – 7, 4th Edition.

FF No : 654

CS39103:: COMPUTER GRAPHICS

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites: Knowledge of C Programming and Basic Data Structures & Mathematics.

Objectives:

- To understand basics of computer graphics.
- To give more emphasis on implementation aspect of Computer Graphics Algorithm.
- To prepare the student for advance courses like multimedia / Image Processing.
- Mapping with PEOs: I, II, (b).

Unit I **(5+1 Hrs)**

Graphics Primitives and Scan Conversions

A. Introduction to computer graphics, Display Adapters, display modes, pixel, Frame Buffer, display file structure, display file interpreter. lines, line segments, Line generation, DDA and Bresenham's line drawing algorithms and circle drawing by Midpoint and Bresenhams algorithms, Aliasing and Antialiasing.

B. Interactive devices: Tablets, touch panels, mouse, joysticks, track balls, light pen etc.

Unit II **(5+1 Hrs)**

Polygon and Clipping

A. Types of Polygons, representation, Inside test of polygon, Polygon filling: Seed fill, Boundary fill, Scan line fill algorithm, Clipping: Introduction, viewing transformation, Line clipping : Cohen Sutherland algorithm, Polygon clipping : Sutherland Hodgeman algorithm, Generalized Polygon clipping, Text clipping.

B. Mid-Point Line Clipping algorithm.

Unit III **(5+1 Hrs)**

2D Transformations

A. Introduction, Scaling, Rotation, Translation, matrix representation of 2D transformation, homogeneous coordinates, Reflection Transformations, Rotation about an arbitrary point, Shear transforms. Numerical Problems on transformation

B. Normalized Device Coordinates.

Unit IV **(5+1 Hrs)**
3-D Transformations

A. Introduction, 3-D point representation, 3D Scaling and Translation, Matrix representation, Derivation of Rotation matrices along the main axis, Rotation about an arbitrary axis, Reflection along different axis, Numerical Problems on transformation.
B. Reflection along different Plane.

Unit V **(5+1 Hrs)**
Hidden lines and Curves

A. Hidden lines detection, Back-face removal algorithm, Depth Comparison, Z buffers, Painters algorithm. Curves and Fractals: Introduction, Curve generation, B-Splines and corners, Bezier curves, Fractals, Hilbert curve, fractal lines and Surfaces.
B. Warnock algorithm, Triadic Koch Curve.

Text Books

1. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
2. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson Education, 2002, ISBN 81 – 7808 – 794 – 4.

Reference Books

1. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6.
2. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2002, ISBN 0 – 07 – 048677 – 8.

FF No. : 654

CS39303:: COMPUTER GRAPHICS

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Knowledge of C Programming and Basic Data Structures & Mathematics.

Objectives:

- To understand basics of computer graphics.
- To give more emphasis on implementation aspect of Computer Graphics Algorithm.
- To prepare the student for advance courses like multimedia / Image Processing.
- Mapping with PEOs: I, II, (b).

<u>List of Practical</u>

1. Implementation of DDA Line Drawing Algorithm.
2. Implementation of Bresenham's Circle Drawing Algorithm.
3. Implementation of Scan Line polygon fill Algorithm.
4. Implementation of Cohen-Sutherland Line Clipping Algorithm.
5. Implementation of Sutherland-Hodgeman Polygon Clipping Algorithm.
6. Implementation of 2D Transformations.
7. Implementation of Triadic Koch Curve Algorithm.
8. Implementation of Fractal line and Surface Algorithm.

Marking Scheme: 70% for Continuous Assessment;
30% End Semester Practical Exam

Text Books

1. J. Foley, V. Dam, S. Feiner, J. Hughes, "Computer Graphics Principles and Practice", 2nd Edition, Pearson Education, 2003, ISBN 81 – 7808 – 038 – 9.
2. D. Hearn, M. Baker, "Computer Graphics – C Version", 2nd Edition, Pearson

Education, 2002, ISBN 81 – 7808 – 794 – 4.

Reference Books

1. S. Harrington, "Computer Graphics", 2nd Edition, McGraw-Hill Publications, 1987, ISBN 0 – 07 – 100472 – 6.
2. D. Rogers, J. Adams, "Mathematical Elements for Computer Graphics", 2nd Edition, Tata McGraw-Hill Publication, 2002, ISBN 0 – 07 – 048677 – 8.

FF No. : 654

CS39102:: ANALYSIS OF ALGORITHMS

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures

Objectives:

- Fundamental understanding of the mathematics used to analyze, evaluate, and design algorithms
- Develop the ability to assess the advantages and disadvantages of different types of algorithms.
- Understand methods for designing time and space efficient algorithms.
- Increased ability to design and implement efficient solutions to problems.
- Mapping with PEOs: III, (e).

Unit I **(8+1 Hrs)**
Unit 1: Overview of Time Complexity analysis, Divide and Conquer

A. Time Complexity notations, Stable matching problem. Overview of Brute Force algorithms (sorting/searching). Using Recurrence equations and Mathematical Induction to find Time Complexity and prove correctness of algorithms. Divide and Conquer: General Strategy, Exponentiation. Binary Search, Quick Sort and Merge Sort. Strassen's Matrix Multiplication, Finding median.
B. Finding Maximum and Minimum, Convex Hull problem.

Unit II **(8+1 Hrs)**
Greedy Strategy :

A. General Strategy, Knapsack problem, Job sequencing with Deadlines, Optimal merge patterns, Minimal Spanning Trees and Dijkstra's algorithm. Scheduling Algorithms.
B. Optimal Storage Problems.

Unit III **(8+1 Hrs)**
Dynamic Programming Strategy

A. General Strategy, Review of Multistage graphs, OBST and 0/1 Knapsack, Traveling Salesperson Problem, Shortest path in a Graph, Sequence Alignment problem,
B. String Editing Problem.

Unit IV **(8+1 Hrs)**
Backtracking and Branch & Bound

A. Backtracking: General Strategy, n Queen's problem, Graph Coloring, Hamiltonian Cycles, 0/1 Knapsack, Sum of Subsets
Branch and Bound: General Strategy, 0/1 Knapsack, Traveling Salesperson Problem
B. Postage stamp problem, n*n*n Queens problem.

Unit V **(8+1 Hrs)**
NP-Theory

A. Overview of Deterministic and Non Deterministic Algorithms, Complexity-intractability, Non-Deterministic Polynomial time (NP) Decision problems, Cooks Theorem implication. NP-Hard problems : Halting problem.
NP-Complete problems- Satisfiability problem, vertex cover problem, graph problems, scheduling, code generation problems, Dealing with NP completeness.
B. Simplified NP-Hard Problems.

Text Books

1. Horowitz, Sahani, "Fundamentals of computer Algorithms", Galgotia. 2nd Edition, 1998.ISBN 81-7515-257-5
2. Bressard, Bratley "Fundamentals of Algorithmics." ,PHI, 2nd Edition,1996, ISBN 81-203-1131-0

Reference Books

1. Jon Kleinberg, Eva Tardos "Algorithm Design", Pearson, 1st edition, 2005. ISBN 978-81-317-0310-6
2. Thomas H Cormen and Charles E.L Leiserson, "Introduction to Algorithm" ,PHI 2nd edition, 2001. ISBN 81-203-2141-3.

FF No. : 654

CS39104:: DATA STRUCTURES

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites: Computer Programming

Objectives:

- To introduce fundamental data structures, problem solving paradigms
- To introduce time complexity analysis of problems.
- To study the representation, implementation & applications of data structures.
- To compare alternative implementations of data structures.
- To choose the appropriate data structure for modeling a given problem.
- Mapping with PEOs: I, (a).

Unit I **(5+1 Hrs)**
Stack using Linear Data Structure

A. Polynomial representation using arrays, operations on polynomials like add, multiply, evaluate, Representation of sparse matrix, Addition of Sparse.
Stack: Fundamentals of stack, Representation and Implementation of stack using arrays, Applications of stack: Decimal to Binary Conversion, reversing a string, Parsing: Well-form parenthesis, Different expression conversions and evaluation, representation of multiple stacks, Simulating recursion using stack.
B. Expression Conversions and evaluation with respect to stack.

Unit II **(5+1 Hrs)**
Queue

A. Fundamentals of queue, Representation and Implementation of queue using arrays, Circular queue: representation and implementation, Applications of queue: Josephus Problem, Job Scheduling, Queue Simulation, Categorizing Data, Double Ended Queue, Priority queue.
B. Representation of multiple queues.

Unit III **(5+1 Hrs)**
Linked Representation

A. Dynamic Memory allocation, Array representation using dynamic memory allocation, Concept of linked organization, singly linked list, doubly linked list, circular linked list, Insertion, Deletion and traversal on above data structures. Displaying a Single Linked list in reverse way. Representation and manipulations of polynomials using linked lists.
B. Stack using Linked list.

Unit IV **(5+1 Hrs)**
Trees

A. Binary trees and its representation using sequential and linked organization, full and complete binary trees, Creation of a binary tree, binary tree traversals (recursive and non recursive), operations such as copy, equal etc. Binary search tree, creation of binary Search tree, finding height and counting leaf nodes of a binary search tree (with and without recursion), Finding mirror image of the binary search tree with and without recursion, Deletion of a node from a binary search tree. Printing a tree level wise and depth wise.
B. Heap sorting.

Unit V **(5+1 Hrs)**
Graph

A. Review of basic terminology, Representation of graphs using adjacency matrix, adjacency list, Traversals: Depth First and Breadth First, Kruskal's and Prim's algorithms for minimum spanning tree, Algorithm for shortest path- Dijkstra's algorithm.

B. Graph applications : Multistage Graph Problem.

Text Books

1. "Data structures using C and C++", Y. Langsam, M.J. Augenstein, A.M. Tenenbaum, Pearson Education, Second Edition, 2002, ISBN 81-7808-729-4.
2. "Fundamentals of Data Structures in C", E. Horwitz , S. Sahani, Anderson-Freed, Universities Press, Second Edition, 2008, ISBN 978-81-7371-605-8.

Reference Books

1. "Data structures and Algorithm Analysis in C++", M. Weiss, Pearson Education, 2nd Edition, 2002 ,ISBN-81-7808-670-0.
2. "An Introduction to data Structures with applications", J. Tremblay, P. soresan, TMH Publication, 2nd Edition, 1984, ISBN-0-07-462471-7.

Additional Reading

1. "Data Structures in C++", A. Drozdek, 2nd Edition, Thomson Brookes / COLE Books, 2002, ISBN 981 – 240 – 079 – 6.
2. "Fundamentals of Computer Algorithms", E. Horwitz , S. Sahani, S. Rajasekaran, Galgotia book source, New Delhi, 2005, ISBN 81-7515-257-5.

FF No. : 654

CS39304:: DATA STRUCTURES

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Computer Programming

Objectives:

- To introduce fundamental data structures, problem solving paradigms
- To introduce time complexity analysis of problems.
- To study the representation, implementation & applications of data structures.
- To compare alternative implementations of data structures.
- To choose the appropriate data structure for modeling a given problem.
- Mapping with PEOs: I, (a).

List of Practical

1. Write a C Program to represent single variable polynomial using array and perform addition, multiplication of them.
2. Write a C program to represent sparse matrix using array and perform sparse matrix addition.
3. Write a C program to convert infix expression to postfix and evaluate it using stack.
4. Write a C program to implement Circular Queue using array and perform add and delete operations on it.
5. Write a C Program to create a database (such as employee, student) using single linked list with options like Create, insert, delete, modify, search, print reverse, display etc.
6. Write a C program to accept binary numbers in doubly linked list & perform addition of them and store the result in another list.
7. Write a C Program to create two sorted singly linked lists, and Merge these two lists into third list without creating a new linked list.

8. Write a C program to create a binary search tree and its inorder, preorder and postorder traversal. Also perform insertion and deletion of a node in it.

9. Write a C program to create a binary search tree and find height & number of leaf nodes with and without recursion.

10. Write a C program to represent a given graph using adjacency array and find the shortest path using Dijkstra's algorithms.

11. Mini project which will make use of different data structures learnt in this subject.

Marking Scheme: 50% for Continuous Assessment;
20% for Mini Project;
30% End Sem. Practical Exam

Text Books

1. "Data structures using C and C++", Y. Langsam, M.J. Augenstein, A.M. Tenenbaum, Pearson Education, Second Edition, 2002, ISBN 81-7808-729-4.
2. "Fundamentals of Data Structures in C", E. Horwitz , S. Sahani, Anderson-Freed, Universities Press, Second Edition, 2008, ISBN 978-81-7371-605-8.

Reference Books

1. "Data structures and Algorithm Analysis in C++", M. Weiss, Pearson Education, 2nd Edition, 2002 ,ISBN-81-7808-670-0.
2. "An Introduction to data Structures with applications", J. Tremblay, P. soresan, TMH Publication, 2nd Edition, 1984. ISBN-0-07-462471-7.

Additional Reading

1. "Data Structures in C++", A. Drozdek, 2nd Edition, Thomson Brookes / COLE Books, 2002, ISBN 981 – 240 – 079 – 6.
2. "Fundamentals of Computer Algorithms", E. Horwitz, S. Sahani, S. Rajasekaran, Galgotia book source, New Delhi, 2005, ISBN 81-7515-257-5.

FF No. : 654

CS49101:: SOFTWARE ENGINEERING AND PROJECT MANGEMENT

Credits: 03 **Teaching Scheme: -** Theory 3 Hrs/Week

Prerequisites: Data Structures

Objectives:

- To learn the complete Software life cycle and understand its major activities such as software requirement analysis, design, testing, and implementation.
- Understanding and Experience in Writing Requirements and Specifications.
- To thoroughly understand the practices of analysis and design (OOA and OOD)
- To understand the relative merits of the different UML diagrams
- Transforming analysis into design and relate it to implementation model
- Mapping with PEOs: III, IV, (e), (f).

Unit I **(8+1 Hrs)**
Software Process Models and OO Methodologies

A. Overview of Software Engineering, Software Process Framework, Process Patterns, Personal and Team Process Models, Process Models: Code-and-Fix, Waterfall Model, Incremental Models, Evolutionary Models, Iterative Development, The Unified Process, Agile process, Extreme Programming, Cleanroom Methodology, CMMI, Impact of Processes and Outcomes, Process Selection and applicability, Software Engineering Principles and Practices, The importance of modeling, UML Building blocks: things, relationships and diagrams, Architectural views: use case, design, implementation, process and deployment, Levels of detail: visualization, specification and construction, Object properties: Abstraction, encapsulation, Modularity, Hierarchy
B. Overview of OO Methodologies: OOAD, OOSE, OMT, DSDM

Unit II **(8+1 Hrs)**
Requirement Engineering and Model Driven Development

A. Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain, Requirements Characteristics and Characterization, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization, Context Models, Behavioral Models, Data Models, Object Models, Structured Methods, Use Case Diagrams, Sequence Diagrams, State Chart Diagrams, Activity Diagrams
B. Case Studies on Requirement Engineering, Use Case Diagrams, Sequence Diagrams,

State Chart Diagrams, Activity Diagrams

Unit III **(8+1 Hrs)**
System Design Engineering

A. Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design, Architecture styles, Reference Architectures Architectural Design: Software Architecture, Data Design and Architectural Design, Design of Software Objects, Features and Methods, Cohesion and Coupling between Objects, Coupling and Visibility, Interfaces, Interfaces with Ball and Socket Notation, Templates, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control , Modeling associations and collections
B. User Interface Design: Rules, User Interface Analysis and Steps in Interface Design, Design Evaluation, Software Reuse, Component-Based Software Engineering

Unit IV **(8+1 Hrs)**
System Implementation and Project Management

A. Packages and interfaces: Distinguishing between classes/interfaces, Exposing class and package interfaces, Component and deployment diagrams: Describing dependencies, Deploying components across threads, processes and processors
Project Activities, Project Definition, Structures and Frameworks, Strategy and Project Management, Role of Teams, Types of Teams and Team Life Cycles, Teamwork, Project Planning, Project Scheduling, Project Cost Estimation, Risk analysis and Planning, Risk Estimation and Control, Classic Mistakes, Empirical Cost Estimation, COCOMO, Software Sizing, Software Scope Management, Introduction to Function Point Analysis

Unit V **(8+1 Hrs)**
Principles of Testing

A. Testing Concepts: Purpose of Software Testing, Testing Principles, Goals of Testing, Testing aspects: Requirements, Test Scenarios, Test cases, Test scripts/procedures, Strategies for Software Testing, Testing Activities, Mistakes, Faults & Failures, Planning Verification and Validation, Software Inspections, Automated Static Analysis, Verification and Formal Methods, Levels of Testing
White-Box Testing: Test Adequacy Criteria, Static Testing, Structural Testing, Code Complexity Testing, Mutation Testing, Data Flow Testing
Black-Box Testing: Test Case Design Criteria, Requirement Based Testing, Positive and Negative Testing, Boundary Value Analysis, Equivalence Partitioning State Based Testing, Domain Testing
B. Analysis of Flow Graphs, Complexity Measures and computations

Text Books

1. Ian Sommerville, 'Software Engineering', Addison-Wesley, 7th Edition ,2004.
2. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.

Reference Books

1. Roger S Pressman,'Software Engineering: A Practitioner's Approach', McGraw Hill, 6/e,2005,
2. William E. Perry, "Effective Methods for Software Testing", John Wiley and Sons, ISBN 9971-51-345-5

Additional Reading

1. Jim Arlow, Ila Neustadt, "UML 2 and Unified Process: Practical Object Oriented Analysis and Design. ", 2nd Edition, Addison- Wesley, ISBN – 0321321278.
2. Burnstein, "Practical Software Testing", Springer International Edition, ISBN 81-8128-089-X
3. Quality Software Project Management, Robert T. Futrell, Donald F. Shafer, Linda I. Shafer Publisher: Prentice Hall PTR; 1st edition (January 24, 2002ISBN-10: 0130912972 ISBN-13: 978-0130912978

FF No. : 654

CS49102:: DATABASE MANAGEMENT SYSTEMS

Credits: 02 **Teaching Scheme: -** Theory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- To understand use of MS Excel and Macro programming as a data management application
- To understand importance of Database Management System (DBMS) over traditional file processing system
- To understand design of entity relationship and relational model
- To use SQL to create database objects, populate tables, and retrieve data
- Study relational databases such as MS Access and Oracle
- Mapping with PEOs: II, III, (d).

Unit I (5+1 Hrs)
MS Excel for Data Handling and Macro Programming

A. Introduction to MS Excel: Handling a small database using MS Excel, Data Import and Export facility; Functions and Formulas: Formulas with Several Operators and Cell Ranges, Using AutoCalculate; Data Analysis and PivotTables: Creating a PivotTable, Creating Subtotals; What-If Analysis, Macro Programming, Visual Basic Code, Prompting for User Input, Using If Then-Else Statement.
B. Generate Reports and Charts, Mathematical, Database Functions.

Unit II (6+1 Hrs)
Introduction to DBMS and E-R Data Model

A. Data Storage: File Processing System, Disadvantages; DBMS: Definition, Need of DBMS, System Architecture of DBMS; ER Model: Entity, Entity Set, Attributes, Primary Key, Relationship, Types and Attributes of Relationship, Role, Cardinality Ratio, Participation Constraint.
B. Data Abstraction, EER features.

Unit III (5+1 Hrs)
Introduction to Relational Model

A. Relational Data Model: Relation, Schema, Attributes, Tuples, Primary Key and Foreign Key, Relational Model Constraints, ER to Relational Mapping.
B. Participation Constraints, Life Cycle of a Relational Database.

Unit IV **(6+1 Hrs)**
Structured Query Language (SQL)

A. SQL: Introduction, SELECT Queries: Simple and Nested Queries, Set Membership, Aggregate Functions, Group by, Having Constructs, Join queries; DML: Insert, Delete and Update Queries, TCL; DDL: Create, Drop various Database Objects (Table, Table Constraints); Using SQL in MS Access, Oracle.
B. Set Operations in SELECT, Alter various Database Objects (Table, Table Constraints).

Unit V **(5+1 Hrs)**
Introduction to MS Access

A. MS Access: Introduction to MS Access, Database Implementation, Defining keys, Schema Diagram, Query Builder, Designing Forms for data manipulation
B. Generating Reports in MS Access.

Text Books

1. "Database System Concepts", Silberschatz, Korth, Sudarshan, McGraw Hill International Edition, ISBN- 0-07-228363-7, 4th Edition.
2. "Computer Fundamentals With MS Office Applications", Saravanan N, Shanti D, Chennai, Scitech Publication, 2002, ISBN 81-87328-88-6

Reference Books

1. "SQL, PL/SQL", Bayross Ivan, B P B Publications, New Delhi, ISBN 81-7656-964-X, 3rd Edition.
2. "Learning MS Office XP", Wempen F, Fulton J, Weixel S, BPB Publications, New Delhi, ISBN 81-7656-547-4, 2002.

FF No. : 654

CS49302:: DATABASE MANAGEMENT SYSTEMS

Credits: 01 **Teaching Scheme: -** Laboratory 2 Hrs/Week

Prerequisites: Nil

Objectives:

- Use of MS Excel
- Database design using ER and Relational model
- Implementation of database system in MS Access, Oracle
- Use of SQL for data manipulation
- Mapping with PEOs: II, III, (d).

List of Practical

1. Use MS Excel for Data handling, apply Formula and Functions.
2. Generate Reports and Charts in MS Excel.
3. Implement Macro in MS Excel.
4. Draw an Entity-Relationship diagram for your proposed database.
5. Translate above E/R model to Relational model.
6. Create Database in MS Access.
7. Use Query Builder of MS Access.
8. Design Forms and Reports in MS Access.
9. Use SQL for Data manipulation and data retrieval in MS Access, Oracle.

Text Books

1. "Fundamentals of Database Systems", Elmasri and Navathe, Pearson Education, ISBN 81-297-0228-2, 4th Edition.
2. "SQL, PL/SQL", Bayross Ivan, BPB Publications New Delhi, ISBN 81-7656-964-X, 3rd Edition.

Reference Books

1. "Oracle: Applications Development", Bayross Ivan, BPB Publications, New Delhi, ISBN 81-7656-912-7.
2. "Learning MS Office XP", Wempen F, Fulton J, Weixel S, B P B Publication, ISBN 81-7366-606-7, 2002.

ACADEMIC INFORMATION

A) Mid Semester Examination

1. Students reporting in morning slot will have examination in morning slot. Those in evening slot will have examination in evening slot.
2. 20 multiple choice based questions to be attempted in 30 minutes x no. of theory courses i.e. 100 questions in 150 minutes for F.E., 80 questions in 120 minutes for S.E., T.E.,B.E.,M.E., 20 questions in 30 minutes for Honors, Minor, Fast Track, etc.
3. A scrambled mix of questions will be generated through software.
4. Mid Semester Examination will be based on Unit II & Unit III.
5. There will be one mark for each correct answer and (-) 0.25 marks for every wrong answer.
6. For a typical 3 hour Mid Semester Examination, first 15 minutes would be used for student attendance, record keeping, seat allocation, log in procedure if any, etc. Next 150 minutes for actual examination. A timer indicating time remaining to be provided by ERP. 15 minutes for processing & results.
7. A visual alarm / flash would be given 10 minutes before completion of 150 minutes as a warning. For auto generation of every theory course result out of 20 and dispatch of the marks on student mobile and mail ID as well as parent mail ID.
8. No repeat examination under any circumstances.

B) <u>Seminar – Conduct, Evaluation, etc.</u>

<u>Seminar– (T.E.- Semester I)</u>

1. Review – I: during Mid Semester Examination (Compulsory) as per the Academic Calendar.
2. Review – II : The last week of November (Optional)
3. For poor performing students identified by the examination panel, a second review to be taken. Review II optional for other students. For Review II, deduction of 10 marks will take place.
4. Seminar is an individual activity with separate topic and presentation.
5. Duration of presentation – 20 minutes

   Question and answer session – 10 minutes

<u>Seminar Evaluation Scheme</u> :

1. Attendance during Semester	– 10 marks
2. Attendance during Seminar presentation self & peer	– 10 marks
3. Relevance of Seminar topic	– 10 marks
4. Timely Abstract submission	– 10 marks
5. Literature review	– 10 marks
6. Technical contents	– 10 marks
7. Presentation	– 25 marks
8. Question & answer Session	– 15 marks
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	100 marks
	=========

C) Equivalence

For the courses belonging to 2008 structure counseling sessions for failure students will be arranged. The Head of Department will appoint faculty identified as subject experts as counselors. The previous examination scheme i.e.

Class Test – 10 marks
T.A. through Home assignment – 10 marks
A written paper MSE – 30 marks
A written paper ESE – 50 marks

Will be followed. The entire processing based on 2008 structure related coding scheme will be followed. Counseling + Administration + Examination charges will be the basis for fees considered for such students.

D) Extra Credits

A student planning to take extra credits may be considered under following categories :

(a) A student carrying a backlog and re-registering for the previous course – Re-registration charges as applicable. Consideration of all courses registered for during that Semester of Academic Year for SPI calculation.

(b) Student planning to take extra courses as a fast track opportunity – Administration, processing and examination charges will be considered. In any case the student has to pay the college fees for four years. This fast track facility would enable the student to undergo an industrial training, an exchange programme, research contribution in I.I.T. under scheme such as KVPY without any academic compromises for credit transfer. The phasewise development and completion of project activity cannot be considered at an accelerated pace under fast track scheme. The registration under fast track is subject to having a CPI 8.0 or above and no backlog for consideration of registration to an additional course.

(c) Students opting for earning extra credits by selection of courses in addition to the courses prescribed by respective BOS which are single Semester activities and not the part of Honors / Minor scheme. Such students will be expected to pay charges equivalent to re-registration (proportionate credit based payment). The registration for such courses is subject to permission given by the Chairman BOS of the Board in the purview of which the subject is identified. Such permissions will be given based on meeting with prerequisite subject.

1. In any case (a), (b) or (c) the candidate cannot register for more than 8 credits.
2. A suitable reflection of completion of the said course will be made in the candidate's Grade statement.

   For part (c) a separate grade & GPA will be calculated. That GPA will not be clubbed with the other regular courses for SPI, CPI calculation.

E) **Home Assignment**

A Home Assignment Calendar for Semester is prepared as under:

Week No.	Activity
1	No Home Assignments
2	No Home Assignments
3	No Home Assignments
4	S1 / S2 – HA1
5	S3 / S4 / S5* - HA1
6	S1 / S2 – HA2
7	S3 / S4 / S5* - HA2
8	S1 / S2 – HA3
9	S3 / S4 / S5* - HA3
10	S1 / S2 – HA4
11	S3 / S4 / S5* - HA4
12	S1 / S2 – HA5
13	S3 / S4 / S5* - HA5
14	No Home Assignments
15	No Home Assignments
16	No Home Assignments

The Home Assignments will be based on the self study component i.e. part B of every theory course syllabus. The Saturday or last working day will be the default deadline for submission of Home Assignment of that week. For example by the Saturday ending Week No. 9, Home Assignment No. 3 for subject S3/ S4/ S5 (if applicable) must be submitted.

1. *S5 can be OE1 / OE2 / OE3 / Honors/ Minor / Re-registration category (a) / Category (b) / Category (c).
2. For subjects S1, S2, S3, S4 & S5 (if any), the composition of the Teacher Assessment marks will be as follows :

	S1,S2 with Tutorial	**S3,S4,S5 without Tutorial**
Home Assignment	30 marks	30 marks
Tutorial	30 marks	
Test	30 marks	30 marks
Attendance : (a) > 90% (b) 75% to 90% (c) <75%	 10 marks 5 marks 0 marks	 10 marks 5 marks 0 marks
	100 marks converted to 15 marks	70 marks converted to 15 marks

Explanation :

1. Tutorials to be conducted with continuous assessment throughout the Semester. Final assessment out of 30 marks for Tutorial.
2. Class Test to be conducted during a regular theory class within the time period mentioned in the Academic Calendar.
3. Class Test marks are to be entered immediately as mentioned in Academic Calendar.
4. Attendance percentage to be calculated at the end of Semester after completing all lectures as per the lesson plan.

F) Mini Project

Teaching Scheme: Theory – 0 ; Tutorial – 0 ; Laboratory – 2 Hrs / week

For F.E., S.E. & T.E. students in every Semester a Mini Project be carried out. The objectives behind the Mini Project are:

1. Scope for creativity
2. Hands on experience
3. Academic occupancy

Mini Project will be based on all subjects of that Semester except GP.

1. The Semester Mini Project will be for a group of 3 to 5 students. Head of Department to appoint Mini Project Guides. 2 credits will be awarded to the candidate after the viva voce and project demonstration at the End of Semester.
2. Group formation, discussion with faculty advisor, formation of the Semester Mini Project statement, resource requirement, if any should be carried out in the earlier part of the Semester. The students are expected to utilize the laboratory resources before or after their contact hours as per the prescribed module.

The Assessment Scheme will be:

(a) Continuous Assessment	50 marks
(b) End Semester	50 marks
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	100 marks
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G) Project Stage I Evaluation

The project activity is broken in 3 stages:

The Project Stage I will be in T.E Semester II irrespective of student module. The evaluation of Project Stage I will be as follows:

Group formation & attendance / reporting to guide	20 marks
Topic finalization / Statement	20 marks
Literature Survey	20 marks
Abstract	20 marks
Presentation	20 marks

Project Stage II and Project Stage III evaluations will be based on Department specific norms.

H) Composition for Selection of 5 Credits for Honors / Minor Course (Applicable for B_{11} and A_{11} Patterns)

(A) Comprehensive Viva Voce – Compulsory at the end of Semester VIII – 1 Credit

(B) Elective Component

a. Laboratory courses – Maximum Credits - 2

(for award of 1 Credit the lab course would have a teaching scheme of 2 Hrs. / week and a plan of 12 practicals). The credit to be awarded as per the ISA and ESA guidelines for the compulsory lab courses.

b. Research publication – Maximum Credits – 1

(Research Publication in a Magazine / Transaction / Journal as decided by the honors / minor co-ordinator)

c. Seminar - Maximum Credits – 1

(Seminar to be given on a topic consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment and evaluation scheme would as per the guidelines used for Technical Seminar at UG level by respective Dept.)

d. Honors / Minors Project – Maximum Credits – 2

(Project Topic and Scope, its progress and final assessment consistent with the scope of the Honors or Minor. The topic Selection is to be approved by the honors / minor co-ordinator. The assessment would as per the guidelines and evaluation scheme used for Project Work at UG level by respective Dept.)

e. Industrial Training – Maximum credits – 4

(An Industrial Training in an Industry identified by the student, approved by the honors / minor co-ordinator & Head of Department. The assessment would as per the guidelines and evaluation scheme used for Industrial Training at UG level by respective Dept.)

Note :

a. 4 Credits would be awarded to the students for a complete 12 Week Industrial Training and meeting with the assessment and evaluation requirements

b. Provision can be made for the students unable to procure a 12 week Industrial Training. A 4 week or 8 week Industrial Training may also be offered. 2 credits will be awarded for 8 week Industrial Training and 1 Credit would be awarded to the students for a 4 Week Industrial Training, meeting with the assessment and evaluation requirements

c. No Industrial Training less than 4 weeks be considered for award of 1 Credit

d. No cumulative addition of Industrial Training period would be considered for award of credits

The student is expected to earn 1 Credit from Part (A) and remaining 4 Credits from Part (B)