Bansilal Ramnath Agarwal Charitable Trust's

Vishwakarma Institute of Technology

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

Structure & Syllabus of

B.E. (Information Technology)

Pattern 'A11'

Effective from Academic Year 2013-14

Prepared by: - Board of Studies in Information Technology

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

Signed by,

Chairman – BOS **Chairman – Academic Board**

Content

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! ***Please Refer F.Y. B.E. Syllabi Booklet***
@ ***Please Refer GP-PD-OE Structure & Syllabi Booklet***

Program Educational Objectives (PEO)
B.E. (Information Technology)

1. Program and Course Objectives

Programme Objectives:

PEOs :-	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 III

Structure, S.E. (Module III)

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Subject No.	Subject Code	Subject Name	Teaching Scheme (Hrs/week)			Credits
			Lect.	Tutorial	Practical	
S_1	CS20101	Data structures	3	0	0	3
S_2	CS20103	Applied Probability and Statistics	3	0	0	3
S_3	CS20105	Principles of Programming Languages	3	0	0	3
S_4	CS20107	Data Communication	3	0	0	3
T_1	CS20201	Data structures	0	1	0	1
T_2	CS20203	Applied Probability and Statistics	0	1	0	1
P_1	CS20301	Data Structures	0	0	2	1
P_2	CS20305	Principles of Programming languages	0	0	2	1
MP_3	CS27401	Mini Project	0	0	2	1
SD_3	CS24301 CS24303	VB.NET OR C#.NET	0	0	2	1
GP_3	GP_3	Elective –Soft Skills	0	0	2	1
CVV_1	CS20401	Comprehensive Viva Voce	Based on Courses S1, S3			1
$*OE_3$	CS26101 CS26102 CS26103 CS26109	Applied Electronics Analog Electronics Linear Circuit Analysis Electrical & Electronic Measurements and Instruments	2	0	0	2
		Total	**14**	**2**	**10**	**22**

FF No. : 654

CS26101 :: APPLIED ELECTRONICS

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

Prerequisites: Nil

Objectives:

- To study the basic components like diode, BJT, Op-Amps and their applications.
- To Study the basic working of active components and their implementation in electronic circuits.

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

A. Overview of semiconductor theory: Intrinsic, Extrinsic, doping. Formation of P-N Junction, working Principle, characteristics, Zener Diode working Principle, characteristics, Application as a voltage regulator. Rectifier: - Half wave rectifier, analyze these rectifiers w. r. t. ripple factor, efficiency, clipper and clamper circuits.
B. Full wave rectifier, Bridge rectifier and analyze these rectifiers w. r. t ripple factor, efficiency.

Unit II **(5+1 Hrs)**
Bipolar Junction Transistor

A. Introduction to BJT, BJT configuration, Characteristics of CE, Overview of Biasing, Fixed Bias, Collector to Base Bias, Self Bias, Stability factor for self bias, Applications of transistors:-Transistor as a switch and amplifier
B. Thermal Runaway, Bias Compensation.

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

A. Block Diagram of an OP-Amp, Direct Coupled Differential Amplifier Circuit, Level Shifter and the Output Stage. Op-Amp Parameters: - offset voltage; input bias current CMRR, slew rate, PSRR, gain bandwidth product, Definitions, Significance.

B. Typical parameter values of Op-Amp (IC-µA741)

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

OpAmp Applications

A. Adder, Precision Rectifier, Zero Crossing Detector, Schmitt Trigger, Waveform Generator (triangular), Integrator, Instrumentation Amplifier, Current to Voltage Circuits.

B. Subtractor, Differentiator, and Voltage to Current Circuits.

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

Power Devices and Power Supplies

A. Power Devices: - Characteristics and Principle of Operation of SCR, Applications: Half-wave and Full-wave Controlled rectifiers, Fan Regulator, UJT as relaxation oscillator. Power supplies: - Introduction to SMPS, types of SMPS: Buck, Boost, Buck-Boost SMPS, online UPS, off line UPS, Line interactive UPS

B. SCR Applications: Half-wave wave Controlled rectifiers, Introduction to DIAC and TRIAC.

Text Books

1. "Integrated Electronics Analog and Digital Circuits and Systems", J. Millman, C. Halkias, McGraw Hill, 1988, ISBN 0 – 07 – Y85493 –9, 2nd Edition.
2. "Op-Amp and Linear Integrated Circuits", R. Gaikwad, Prentice Hall of India, 2002, ISBN 81 – 203 – 2058 – 1, 4th Edition.

Reference Books

1. "Electronic Devices", Floyd, Pearson Education, 2001, ISBN 81– 7808–355-8, 5th Edition.
2. "Electronic Devices and Circuit Theory", R. Boylstad, L. Nashelsky, Pearson Education, ISBN 81 – 7808 – 590 – 9, 2002, 8th Edition.

Additional Reading

1. "Microwave Devices and Circuits", Liao, Prentice Hall of India, ISBN 81 – 203 – 0699 – 6, 3rd Edition.
2. "Integrated Circuits and Semiconductor Devices", G. Deboo, C. Burrous, Theory and Applications", McGraw Hill, 1987, ISBN 0 – 07 – 016246 – 8, 2nd Edition.

FF No. : 654

CS20101:: DATA STRUCTURES

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

Prerequisites: Computer Programming.

Objectives:

- To introduce, fundamental data structures and 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 **(9+2 Hrs)**
Stack and Queue using Linear Data Structures

A. Polynomial representation using arrays, operations on polynomials like add, multiply, evaluate, Representation of sparse matrix, simple and fast transpose.
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.
Queue: 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, representation of multiple queues, Priority queue.
B. Algorithm for sparse matrix addition, Expression Conversions and evaluation with respect to stack

Unit II **(8+2 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. Generalized Linked List, Representation of GLL, operations on GLL like Create, copy,

Equality.

B. Stack using Linked List, Queue using Linked List, Finding Depth of GLL

Unit III **(9+2 Hrs)**
Tree

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, Threaded binary trees, Creation and traversal of in-order, pre-order and post-order threaded binary tree, Insertion and deletion of nodes in threaded binary tree, AVL Trees. Applications of binary trees: Gaming, Expression tree, Heap sorting; OBST and
B. B- tree, B+tree, red-black trees.

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

A. Review of basic terminology, Representation of graphs using adjacency matrix, adjacency list, Traversals: Depth First and Breadth First, Connected components and spanning trees, Kruskal's and Prim's algorithms for minimum spanning tree, Algorithm for shortest path- Dijkstra's algorithm, Warshal's Algorithm.
B. Graph applications : Multistage Graph Problem

Unit V **(7+1 Hrs)**
Hashing and Files

A. Hash tables, Hash functions: Division, folding and Mid square methods, Collusion Resolution Strategies: Linear Probing, rehashing, Open addressing and Chaining, Chaining with and without replacement, Table Overflow, Extendible hashing.
Files: Definition and concepts, File organizations, File Operations, Processing of sequential, Index-sequential and direct files.
B. Open Addressing hashing, Quadratic Probing, Chaining with linked list.

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

CS20103 :: APPLIED PROBABILITY AND STATISTICS

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

Prerequisites: Elementary knowledge of 1) Numbers 2) Calculus 3)Basics of Algorithms

Objectives:

- To understand basic concepts of probability distributions and statistics.
- To learn how to design source compression codes to improve the efficiency of information transmission.
- To understand queuing theory and application of queuing models.
- Mapping with PEOs: I, (a).

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

A. Revision of Concept of probability, Conditional probability, Baye's Theorem, Hypergeometric, Exponential and Gamma distribution. Discrete and continuous bivariate random variables, joint and marginal probability distributions, expectation, variance, standard deviation, moments, covariance and correlation.
B. Law of large numbers, central limit theorem, Chebyshev's inequality, moment generating functions, Weibull distribution.

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

A. Sampling Theory, Population and sample, sampling distribution of Sample mean (σ known and unknown), Chi-square, t-distribution and F-distribution, Biased and unbiased estimation, point and interval estimates, statistical hypothesis, tests of hypothesis, one tailed and two tailed tests, type I and type II errors, level of significance, P value approach.
B. Chi square test for goodness of fit, power of a test, curve fitting and regression.

Unit III **(8 +1Hrs)**
Reliability Theory

A. Definition of reliability, failure models, fault tree analysis, event tree analysis, reliability block diagrams, system reliability, redundancy, component importance, markov analysis, reliability in design, reliability testing, accelerated life testing.

B. Electronic systems reliability, software reliability, maintainability, life data analysis.

Unit IV **(8+1 Hrs)**
Information theory

A. Information theory – Entropy and Uncertainty information content, Rate of a language, redundancy. Number theory -Modula arithmetic, Fermat's little theorem, Chinese remainder theorem., Factoring, Prime number generation, Random number generation on discrete probability, Introduction to data Compression Application, speech Compression, Telemetry Compression.
B. Software implementation of speech compression, techniques, telemetry characteristics, database compression, file compression.

Unit V **(8 +1Hrs)**
Queuing Theory

A. Introduction to Queuing System, Queue characteristics, Birth-Death process, Queuing Models- Poisson Arrival Model, Little's Theorem, M/M/1 Queues, M/M/m, M/M/∝, M/G/1 Systems, M/G/1 Queues with Vacations**,** Reservations and Polling.
B. M/M/m/m, and other Markov Systems**,** The m-Server Loss System**,** multidimensional Markov Chains- Applications in Circuit Switching, Priority Queuing, The D/D/1 Queue, properties and examples.

Text Books

1. "Probability, Statistics and Queuing theory", Allen, A.O., Academic Press.
3. **"**Probability and Statistics with reliability, Queuing, and Computer Science Applications", Kishor S Trivedi, Prentice Hall India New Delhi, (2005).
2. "Practical Reliability Engineering", Patrick D. T. O'Connor, Wiley Publications, 4th edition.
3. "Handbook of Applied Cryptography", Alfred Menezes, Paul Van Oorschot, Vanstone, CRC press,1997.
4. "The Data Compression Handbook", Mark Nelson, M&T book, 1995
5. "Data Networks," Bertsekas D. and Gallager R., 2nd Ed., Prentice-Hall, Englewood Cliffs, N.J., 1992.

Reference Books

1. "Probability and Statistics", William Mendenhall, Robert J. Beaver, Barbara M. Beaver, Cengage Learning India Pvt. Ltd.
2. "Probability and Statistics for Scientist and Engineers", Rao V. Dukkipati, New Age International Publishers.
3. "Probability and Statistics for Engineers", G. S. S. Bhishma Rao, SciTech Publications (India) Pvt. Ltd.

4. "Applied Cryptography; Protocols, Algorithms and Source Code in C", Bruce Schneider, John Wiley and Sons, Second Edition, 1995
5. "Data Compression Techniques and Applications", Thomas J. Lynch, Van No strand Reinhold Company, 1985.
6. "Introduction to Information Theory and Data Compression", Darrel Hankerson, Grey A. Harris, Peter D. Johnson Jr., Second Edition, CRC press, 2003.

Additional readings

1. "Probability, Reliability, and Statistical Methods in Engineering Design", Achintya Haldar, Sankaran Mahadevan
2. "Reliability Engineering and Risk Analysis: A Practical Guide", Mohammad Modarres, Mark Kaminskiy, Vasiliy Krivtsov, Second Edition (Quality and Reliability) CRC Press.
3. 'Introduction to probability & statistics for engineers & scientists', S. M. Ross, Academic Press, 3rd edition 2005.

FF No. : 654

CS20105::PRINCIPLES OF PROGRAMMING LANGUAGES

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

Prerequisites: Nil

Objectives:

- To learn the fundamental concepts of programming languages & the various programming paradigms.
- To increase the capacity to express ideas using a programming language.
- To learn to choose an appropriate programming language for a designed task.
- To learn the important features of different types of languages and their relevance
- To learn past the superficial differences in languages and recognize the commonalities in meaning.
- To develop the ability to quickly learn new programming languages.
- Mapping with PEOs :- II,III, (d).

Unit I **(8+1 Hrs)**
Introduction to Programming languages

A. Role of programming languages, Necessity of studying programming languages, characteristics of a good programming language, Effects of Environments on languages, Language design issues, Programming Paradigms – Imperative, Object Oriented, functional Programming , Logic Programming.
B. Comparison of different programming paradigms.

Unit II **(8+2 Hrs)**
Imperative & Procedural Programming

A. Imperative: Assignments, Mutable, Constants, Operators, Control Structures, Loops, And Conditionals, Data types: union, pointer and reference types. Memory leak, invalid pointer references.
Procedural: Blocks, Local variables, Scope, Activation Records, Procedure Calls, Function Calls, Recursion, Parameter passing methods, Static and Stack-Based Storage management. Heap based storage management.
B. Structure, Generic Templates in C++, Library Classes in C++.

Unit III **(8+2 Hrs)**
Object – Oriented Programming (Java)

A. Classes & Objects, Constructors, Access Modifiers, Instance Methods, this & static keywords. Inheritance, Types of inheritance, Constructors in Derived Classes, Overriding & Hiding Fields& Methods, Abstract Classes & methods, Final Classes & Final Methods. Interfaces & Packages - Interfaces, Putting Classes together. Exception Handling - built-in exceptions, checked & unchecked exceptions. Multithreading – Thread life Cycle thread Priority, Thread Methods. Inter-thread Communication. Java I/O – Introduction to Streams, File Management / Processing, primitive/ Object Data Processing. Graphical Programming - Applet, Event Handling.
B. User defined exception, Multilevel Inheritance, Hierarchical Inheritance, Concurrent Issues with thread programming, Deadlock.

Unit IV **(8+1 Hrs)**
Functional Programming (Language: Haskell)

A. Programming as Composition of Operations, Features of functional programming language, Absence of Mutable, Lambda Calculus, Absence of Control Structures, Types – values & operations, Ordered type, type checking, Expressions, Eager & lazy evaluation, Functions, Guarded Equations/ Commands, Optimized Implementation of Recursion, Applications
B. List transforming functions in Haskell, List & String Comprehensions in Haskell.

Unit V **(8+2 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, Prolog
B. LISP

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. "Haskell: The Craft of Functional Programming", S. Thompson, Addison Wesley, ISBN 0201342758, 2nd Edition
2. "Object Oriented Programming with C++", E. Balaguruswamy, Tata McGraw-Hill Publishing Company Ltd, ISBN 0 - 07 – 462038 - X

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. "The C++ Programming Language", B. Stroustrup, Addison-Wesley, 81-317-0521-8, 3rd Edition
4. "MATLAB Programming for Engineers", Stephen J. Chamman, Thomson Learning Publication, ISBN 981-254-893-9, 3rd Edition
5. "Programming In Prolog", Clocksin W F, Mellish C S, Narosa Pblishing House, ISBN 8185198552, 3rd Edition
6. "Lex & Yacc", John R. Levine, Tony Mason, Doug Brown, Shroff Publishers, ISBN 81-7366-062-X, 2nd Edition.
7. "HTML, CSS, Java Script, Perl, Python and PHP", Schafer Steven, Dreamtech India Pvt Ltd., ISBN 81-265-0620-2
8. "LISP", Patrick Henry Winston, Berthold, Pearson Educaation, ISBN 81-7808-155-5, 3rd Edition

FF No. : 654

CS20107 :: DATA COMMUNICATION

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

Prerequisites: Nil

Objectives:

- To understand the basics of signals, and modulation techniques.
- To understand multiplexing techniques.
- To understand the various transmission techniques.
- To understand basic concepts of computer networks.
- Mapping with PEOs :- I, II, (a),(b).

Unit I **(8+1 Hrs)**
Introduction to Electronic Communication

A. The importance of Communication, Elements of communication system, Types of electronics communication, Electromagnetic spectrum, Bandwidth, Signal Types, Noise: internal, External, Noise calculation, Shannon-Hartley theorem.
Introduction to Fourier series, Fourier Transform- DFT, IFT.
B. Survey of communication applications. Numerical based on Fourier transform properties.

(8+1 Hrs)
Unit II
Modulation Techniques

A. Principles of Amplitude Modulation, Modulation index and percentage of modulation, AM power distribution, Single sideband communication, AM transmitters and Receivers. Frequency modulation principles, sideband and modulation index, Phase modulation.
Receivers: Superheterodyne receiver, Frequency conversion, Intermediate frequency selection and Images.
B. FM vs. AM, FM vs. PM, AM vs. PM, Numerical based on AM, FM.

Unit III **(8+2 Hrs)**
Multiplexing and Communication

A. Introduction, FDM, TDM, WDM, CDMA, Pulse code modulation, Delta modulation, Adaptive delta modulation, Differential PCM, PAM, Sampling theorem, Modems, Null modems, ASK, PSK, FSK, QPSK, Line coding schemes.
Telephone System.
B. Frequency hopping spread spectrum, Direct sequence spread spectrum. Cellular Telephone System

Unit IV **(8+1 Hrs)**
Transmission and Propagation

A. Transmission modes, Antenna Fundamentals, Radio Frequency Wave propagation, Attenuation and distortion sources with examples.
Error detection and correction: CRC, Hamming code, Checksum, Block coding.
B. Transmission media wired and wireless

Unit V **(8+1 Hrs)**
Communication Networks

A. Types of Networks: LAN, WAN, MAN. Network Topology, Network Software: Protocol hierarchy, Design Issues for layers, Connection oriented and connectionless services, OSI and TCP/IP reference model, IP addresses
B. Comparison of OSI and TCP/IP reference model, overview of connecting devices: Repeater, Hub, Bridge, Router.

Text Books

1. "Electronic Communication Systems", by George Kennedy, Bernard Davis, Tata McGraw Hill Publication, ISBN 0-07-463682-0, Edition 4th
2. "Data Communications and Networking" by Behrouz Forouzan, McGraw Hill Publication, ISBN 0-07-063414-9, Edition 4th

Reference Books

1. "Communication Electronics- Principles and Applications", by Frenzel, Tata McGraw Hill Publication, ISBN 0-07-048398-1, Edition 3rd
2. "Principles of Communication Systems", by Herbert Taub and Donald Schilling, McGraw Hill Publication, ISBN 0-07-062955-2, Edition 2nd.

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.
3. "Digital and Analog Communication Systems", by Shanmugam K, John Wiley & Sons (Asia) Pvt. Ltd. ISBN 9971-51-146-0.

FF No. : 654

CS20201:: DATA STRUCTURES

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

Prerequisites: Computer Programming

Objectives:

- To introduce, fundamental data structures and 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 Contents

A TERM-WORK containing the record of the following:

1. Algorithm to implement single variable polynomial using array and perform addition, multiplication of them.

2. Algorithm to implement conversion of infix expression to prefix and evaluate it using stack.

3. Algorithm to implement Double Ended Queue using array.

4. Algorithm to implement doubly linked list.

5. Algorithm to implement creation of a binary tree and traverse it in preorder, postorder and inorder way, both by recursion and non-recursion.

6. Algorithm to implement creation of a binary Search tree and find its mirror image. Print original and mirror image level wise.

7. Algorithm to represent a graph using adjacency list and perform DFS and BFS.

8. Algorithm to implement Heap Sort.

9. Algorithm to implement creation of a hash table and handle the collisions using

linear probing with or without replacement.

10. Algorithm to implementation of sequential file and perform insertion of record, display, delete and modify, search operations on it.

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

CS20203 :: APPLIED PROBABILITY AND STATISTICS

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

Prerequisites: Elementary knowledge of 1) Numbers 2) Calculus 3)Basics of Algorithms and syllabus covered unit-wise in theory lectures.

Objectives:
Upon completion of this module students will be able to:

- Recognize mathematical structures in practical problems.
- Translate problems into mathematical language and analyze problems using methods from all the units.
- Mapping with PEOs :- I, (a).

List of Contents

In this module students will work on problems to practice and apply methods introduced in the lectures. Discussions of problems in small groups is always encouraged and facilitated and students are asked to submit weekly home work assignments and provide them immediate feedback and support materials.

Tutorial No. 1:	Summary on probability and conditional probability, Baye's Theorem, random variables, density functions and cumulative distribution functions.
Tutorial No. 2:	Probability distributions, Binomial, hypergeometric, Poisson, normal probability distributions and problems solving
Tutorial No. 3:	Sampling Theory, Population and sample, Chi-square, t-distribution and F-distribution.
Tutorial No. 4:	Tests of hypothesis, one tailed and two tailed tests, type I and type II errors, level of significance, P value approach, goodness of fit.
Tutorial No. 5	Failure models, fault tree analysis, event tree analysis, reliability block diagrams.
Tutorial No. 6:	System reliability, redundancy, component importance, markov analysis, reliability in design, reliability testing, accelerated life

	testing.
Tutorial No. 7:	Number theory -Modula arithmetic, Fermat's little theorem, Chinese remainder theorem
Tutorial No. 8:	Factoring, Prime number generation, Random number generation on discrete probability,
Tutorial No. 9:	Birth-Death process , Poisson Arrival Model, Little's Theorem, M/M/1 Queues, M/M/m, M/M/∝, M/M/m/m,
Tutorial No. 10:	M/G/1 Systems, M/G/1 Queues with Vacations**,** Reservations and Polling.
Tutorial No. 11:	Law of large numbers, central limit theorem, Chebyshev's inequality, moment generating functions
Tutorial No. 12:	Curve fitting and Regression.

Text Books

1. "Probability, Statistics and Queuing theory", Allen, A.O., Academic Press.
2. **"**Probability and Statistics with reliability, Queuing, and Computer Science Applications", Kishor S Trivedi, Prentice Hall India New Delhi, (2005.
4. "Practical Reliability Engineering", Patrick D. T. O'Connor, Wiley Publications, 4th edition.
5. "Handbook of Applied Cryptography", Alfred Menezes, Paul Van Oorschot, Vanstone, CRC press, 1997.
5. "The Data Compression Handbook", Mark Nelson, M&T book, 1995
6. "Data Networks," Bertsekas D. and Gallager R., 2nd Ed., Prentice-Hall, Englewood Cliffs, N.J., 1992.

Reference Books

1. "Probability and Statistics for Engineers", G. S. S. Bhishma Rao, SciTech Publications (India) Pvt. Ltd.
2. Bruce Schneider, "Applied Cryptography; Protocols, Algorithms and Source Code in C", John Wiley and Sons, Second Edition, 1995

FF No. : 654

CS20301:: DATA STRUCTURES

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

Prerequisites: Computer Programming

Objectives:

- To introduce, fundamental data structures and 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 sparse matrix using array and perform sparse matrix addition, simple & fast transpose.

2. Write a C program to check the parenthesis validity of the given expression using stack.

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 represent multivariable polynomial as a circular linked list and using menu perform addition, multiplication and evaluation.

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 Generalized Linked List and perform copy and equality operations on it.

9. 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.

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

11. Write a C program to create an inorder threaded binary tree and perform inorder traversals.

12. Write a C program to implement Hufffman's algorithm.

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

14. Write a C program to represent a given graph using adjacency list and generate a minimum spanning tree using Prims/ Kruskal's algorithm.

15. Write a C program to create a hash table and handle the collisions using chaining with or without replacement.

16. Write a C program for implementation of simple index file and perform insertion of record, display, delete and modify operations on it.

17. Write a C program for implementation of direct access file – Insertion and deletion of a record from a direct access file chaining with or without replacement.

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

Note: All the assignments should be implemented in LINUX environment only. Faculty members should frame any 14 assignments from first 17 assignments.

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

CS20305::PRINCIPLES OF PROGRAMMING LANGUAGES LABORATORY

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 and AWT
- Mapping with PEOs :- II, III, (d).

List of Practical

1. Write a C++ program to implement the concept of inheritance.
2. Write a C++ program to implement the concept of function/operator overloading.
3. Write a C++ program to implement the concept of virtual function.
4. Write a C++ program to implement the concept of friend function / class.
5. Design and implement a reusable collection class (templates), creation and manipulation of files.
6. Write a C++ program to implement the concept of exception handling.
7. Write a JAVA program to implement the concept of Class, Constructor, instance variable & class variable.
8. Write a JAVA program to implement the concept of inheritance, interface & package.
9. Write a JAVA program to implement the concept of multithreading.

10. Write a JAVA program for file handling.

11. Design a simple applet application with event handling.

12. Mini project.

Text Books

1. "Object Oriented Programming with C++", E. Balaguruswamy, Tata McGraw-Hill Publishing Company Ltd, New Delhi ISBN 0 - 07 - 462038 – X, 4th Edition
2. "Java: The Complete Reference", Herbert Schildt, TMG Publication, ISBN 9780070636774 , 7th Edition

Reference Books

1. "The Waite Group's Object oriented Programming in C++",R. Lafore, Galgotia Publications, ISBN 81-7515-269-9, 3rd Edition
2. "Core Java 2 Volume – I " ,Cay S Horstmann, Gary Cornell, Pearson Education, ISBN 9788131719459, 8th Edition

Additional Reading

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

FF No. : 654

CS24301 ::VB.NET

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

Prerequisites: C, C++ programming.

Objectives:

- To learn the fundamental concepts of VB.NET programming languages.
- To learn to windows application development using VB.NET .
- To learn to Device application development using VB.NET.
- To learn to Web application development using VB.NET.
- To learn to database application development using VB.NET.
- Mapping with PEOs :- 3

List of Practical

1. Design a simple VB.net windows application.
2. Design a simple VB.net device application.
3. Design a simple VB.net web application.
4. Design a simple VB.net application for notepad/word pad using menu editor.
5. Design a simple VB.net application for calculator.
6. Design user interface controls.
7. Design Database application.
8. Publishing and Deployment of windows/web application in VB.net.
9. Designing AJAX application.
10. Designing Windows presentation framework application.
11. Mini project.

Text Books

1. "Beginning VB.NET 2003", Thearon Willis, Jonathan Crossland, Richard Blair, Wrox Publication, ISBN: 978-0-7645-5658-6, April 2004.
2. "Programming VB.Net 2005", Julia Case Bradley,Anita Millspaugh, Mc Graw Hill Publication, ISBN: 9780073304274, August 2010.

Reference Books

1. "Ajax: The Complete Reference", Thomas Powell, Mc Graw Hill Publication, Edition 1, ISBN: 9780070248496, 20-MAR-08.
2. "Beginning VB.NET Databases", Thearon Willis, Wrox publication, ISBN: 978-0-7645-6800-8, October 2004.

FF No. : 654

CS24303 ::C#.NET

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

Prerequisites: C, C++ programming.

Objectives:

- To learn the fundamental concepts of C# programming languages.
- To learn to windows application development using C#.
- To learn to Device application development using C#.
- To learn to Web application development using C#.
- To learn to database application development using C#.
- Mapping with PEOs :- II, III, (c).

List of Practical

1. Design a simple C#.net windows application.
2. Design a simple C#.net device application.
3. Design a simple C#.net web application.
4. Design a simple C#.net application for notepad/word pad using menu editor.
5. Design a simple C#.net application for calculator.
6. Design user interface controls.
7. Design Database application.
8. Publishing and Deployment of windows/web application in C#.net.
9. Designing AJAX application.
10. Designing Windows presentation framework application.
11. Mini project.

Text Books

1. "Programming in C#", E Balagurusamy, Mc Graw Hill Publication, Edition 3, ISBN:9780070702073, 29-JUN-10.
2. "C# 4.0 The Complete Reference", Herbert Schildt, Mc Graw Hill Publication, Edition 1, ISBN: 9780070703681, 07-MAY-10.

Reference Books

1. "C# 3.0: A Beginner's Guide", Herbert Schildt, Mc Graw Hill Publication, Edition 2, ISBN: 9780070248946, 25-SEP-08.
2. "Ajax: The Complete Reference", Thomas Powell, Mc Graw Hill Publication, Edition 1, ISBN: 9780070248496, 20-MAR-08.

MODULE IV

Structure, S.E. (Module IV)

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_5	CS21102	Microprocessor and Interfacing	3	0	0	3
S_6	CS21104	Mathematical Transforms and Applications	3	0	0	3
S_7	CS21106	Digital Electronics and Logic Design	3	0	0	3
S_8	CS20108	Computer Organization	3	0	0	3
T_3	CS21202	Microprocessor and Interfacing	0	1	0	1
T_4	CS21204	Mathematical Transforms and Applications	0	1	0	1
P_3	CS21302	Microprocessor and Interfacing	0	0	2	1
P_4	CS21306	Digital Electronics	0	0	2	1
MP_4	CS27402	Mini Project	0	0	2	1
SD_4	CS24302 CS24304	ASP.NET OR Python	0	0	2	1
GP_4	GP	Elective – Hobby/Health	0	0	2	1
CVV_2	CS20402	Comprehensive Viva Voce	Based on Courses S5, S7			1
**OE_3	CS26101 CS26102 CS26103 CS26109	Applied Electronics Analog Electronics Linear Circuit Analysis Electrical & Electronic Measurements &Instruments	2	0	0	2
		Total	14	2	10	22

FF No. : 654

CS21102:: MICROPROCESSOR AND INTERFACING

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

Prerequisites: Nil

Objectives:

- To explore internal architecture of microprocessor, signal and interface with memory and I/O devices.
- Mapping with PEOs :- I,II, (b).

Unit I **(8+1 Hrs)**
8086 Microprocessor

A. Introduction to 80x86 microprocessor, Internal Architecture, Generation of physical address, Minimum & Maximum Mode, Ready and Reset pin significance ,study of 8086 supporting chips 8282(Latch), 8284(Clock Generator), 8286(Transreceiver), 8288(Bus Controller). Timing Diagram Read Write Machine Cycles, Real Mode, General Purpose Instructions :
B. Instruction Set

Unit III **(8+1 Hrs)**
Assembly Language Programming & Interrupt Structure

A. Address Translation,Addressing Modes, Introduction to Assembly Language Programming, Examples on Programming. Interrupt Structure , Interrupt service Routine, Interrupt Vector Table, Hardware and Software Interrupts, INTR ,NMI , Interrupt Response, Execution of an ISR, Priority of Interrupts.
B. Examples on Assembly Language Programming

Unit IV **(8+1 Hrs)**
Interfacing with 8086 – I

A. Programmable peripheral interface (8255)-block diagram, control word, interfacing ADC, DAC, Programmable Interval timer/counter (8253/8254)-block diagram, control word & interfacing, Mode0, Mode1, Mode3 of timer, Keyboard debouncing ,display refreshing cycle, Keyboard display interface (8279)-Block Diagram , encoded & decoded mode, Interfacing & programming.
B. Interfacing of stepper motor, seven segment display, (8255), Mode2, Mode4, Mode5 of 8253, Programming of 8279

Unit IV **(8+1 Hrs)**
Introduction to Pentium microprocessor

A. Historical evolution of 80286, 386, 486 processors. Pentium features and Architectures, Pentium RISC features, Pentium super-scalar architecture - Pipelining, Pipeline stages. Instruction paring rules,
Init & Configuration, Bus Operations-RST, Bus Operations-RST, Mem/IOOrganisation, Data Transfer Mechanism , 8/16/32 bit Data Bus, Instruction and Data caches
B. Branch prediction examples , Instruction in Pipelines, Cache design.

Unit V **(8+1 Hrs)**
Protected Mode Architecture

A. Segmentation, support registers, related instructions, descriptors, descriptor Tables memory management through segmentation, logical to linear address translations, protection by segmentation, privilege-level, protection, related instructions, inter-privilege level, transfer control, Paging-support registers, related data structures ,linear to physical address translation ,TLB ,page level protection.
B. Switching from Real to protected mode .

Text Books

1. "Microprocessors and Interfacing", Douglas Hall, Tata McGraw Hill Publications, ISBN 0-07-025742-6, 2nd Edition.
2. "The Pentium Microprocessor", James Antonakos 2004, Pearson Education, ISBN – 81-7808-545-3

Reference Books

1. "Advanced MS DOS Programming", Ray Duncan, BPB Publications ISBN 0 – 07 – 048677 – 8, 2nd Edition.
2. "Microprocessor and Peripheral Handbook", INTEL –VOL I

Additional Reading

1. "Assembly Language Programming", Peter Abel, Pearson Education Publications, ISBN 10:013030655, 5th Edition
2. Intel Pentium Manual

FF No. : 654

CS21104 :: MATHEMATICAL TRANSFORMS AND PPLICATIONS

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

Prerequisites: Engineering Mathematics- I and Engineering Mathematics - II

Objectives:

- To understand the linear differential equations and apply it for computer engineering.
- To understand various transformations like Laplace, Fourier, Z-transform.
- To understand concepts of vector differentiation and integration theorems.
- Mapping with PEOs :- I, II, (a).

Unit I **(08 +1Hrs)**
Linear Differential equations of higher order

A. Homogeneous Linear Differential Equations of Second Order, Higher Order Homogeneous & Non Homogeneous Linear Differential Equations with Constant Coefficients, Complementary solution, particular integral by short cut methods, undetermined coefficients and Variation of Parameters method, Euler – Cauchy Equation, Legendre equation and its solution.
B. Application of system of ordinary differential equations.

Unit II **(08+1 Hrs)**
Complex Variables

A. Complex differentiation, Analytical functions, Cauchy-Riemann equations, Complex Integration, Cauchy's Integral Theorem and formula, Residue Theorem and applications to Engineering Problems, Power series, Taylor series, Laurent series, Radius of convergence.
B. Bilinear Transformations and Conformal mapping.

Unit III **(08 +1Hrs)**
Fourier Transform and Z Transform

A. Complex Fourier series and frequency spectrum, Fourier integrals, Fourier cosine and sine transforms, Fourier transforms. Application of Fourier transform to Engineering Problems. Discrete Fourier Transforms – Properties and Applications. Introduction to Z Transform, properties of Z-Transform, Inverse Z-Transform, application of Z-transform to difference equations.

B. Solutions of Partial Differential equations by the use of Fourier transform, Introduction to Discrete Fourier transform. Definition, properties and its inverse. Introduction to Fast Fourier transform.

Unit IV **(08+1 Hrs)**
Laplace Transform

A. Introduction to Laplace Transform and its properties. Laplace Transform of Unit step function, Delta function and periodic function. Inverse Laplace Transform and its evaluation. Laplace Transforms of Special Functions. Application of Laplace Transform to Engineering Problems.

B. Application of Laplace transform to simultaneous differential equations.

Unit V **(08+1 Hrs)**
Vector Analysis

A. Vector differentiation, gradient, curl, divergence, directional derivative, line integral independent of path and Conservative vector field, green's theorem, stoke's theorem, gauss divergence theorem.

B. Applications of vectors, maxwell's equations.

Text Books

1. "Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley and sons, inc.
2. "Advanced Engineering Mathematics", R.K. Jain, S.R.K. Iyengar, Narosa Publications.
3. "Higher Engineering Mathematics", B. S. Grewal, Khanna Publishers.
4. "Vector Analysis", Schaum's Outline Series, Murray R Spiegel, Seymour Lipschutz, Dennis Spellman

Reference Books

1. "Mathematical Techniques for Engineers & scientists", Larry C., Andrews &Ronald L. Philips, PHI Pvt. Ltd., New Delhi.
2. "Signals and Linear Systems", Robert A. Gabel, Richard A. Roberts, John Wiley & sons.
3. "Advanced Engineering Mathematics", Dennis G. Zill and Michael R. Cullen, CBS New Delhi.

FF No. : 654

CS21106:: DIGITAL ELECTRONICS AND LOGIC DESIGN

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

Prerequisites: Nil

Objectives:

- To learn basics of digital electronics and its practical application.
- Mapping with PEOs :- I,II, (b).

Unit I **(8+1 Hrs)**
Number system and Codes

A. Introduction, Binary number System, Sign-Magnitude representation, One's and Two's complement representation, Binary arithmetic, 2's complement arithmetic, Octal number System, Hexadecimal number System, BCD code, Excess-3 code, Gray code. Code conversion, Boolean algebra: Basic theorems and properties, K-Map: Representation of truth-table, SOP form, POS form, Simplification of logical functions, Minimization of SOP forms using K- Map.
B. Minimization of POS forms using K- Map, Quine-McCluskey Method, Half adder and subtractor, full adder and subtractor.

Unit II **(9+1 Hrs)**
Combinational & Sequential logic circuits

A. Design examples- multiplexers: code converter, demultiplexers, encoder: Priority encoders, decoders: 74138, BCD adder and subtractor, parity generator and checker, Digital comparator: 7485.
Introduction of flip-flop (F.F), 1 bit memory cell, clocked S-R F.F., J-K F.F. race around condition, M/S J-K F.F, flip-flop truth table, excitation table, flip-flop conversion, flip-flop characteristics. T and D F.F, Design of 4 – bit UP-Down ripple counter using J-K flip-flop, Design of Synchronous 3 bit up/down counter, mod-n counters (IC -7490, 7493).
B. ALU 74181, BCD-to-7-segment Decoder, adder with look ahead carry generator.

Unit III **(8+1 Hrs)**
Design of sequential circuits

A. Moore/Mealy M/c's: representation techniques, state diagrams, state tables, state reduction, state assignment, implementation using flip-flops. Applications like sequence generator and detector. Shift register (modes of operation), 4 bit bi-directional universal shift register, application of shift registers (Ring counter, Sequence generator, Johnson's counter.)ASM charts, notations, design of simple controller, multiplexer controller method, RTL notations and implementation.
B. Examples on ASM, RTL.

Unit IV **(8+1 Hrs)**
Logic Families

A. Characteristics of Digital ICs: Speed, Power dissipation, fan-out, current and voltage parameters, noise margin, operating temperature etc., TTL: Operation of TTL NAND gate, Standard TTL, TTL Characteristics, Active pull-up, Wired-AND, totem pole, open collector, Unconnected Inputs. CMOS Logic: CMOS Inverter, CMOS NAND and NOR, CMOS characteristics. Wired-logic, Unconnected Inputs, Open-Drain Outputs, Comparison of TTL and CMOS, interfacing TTL to CMOS
B. Interfacing CMOS to TTL, Tri-state logic: tri-state buffers, inverters, Study of Data sheets of 7400 Series ICs: (Basic and Universal logic gates)

Unit V **(8+1 Hrs)**
Programmable Logic Devices

A. Programmable Logic array: Input, Output Buffers, AND, OR, Invert/Non-Invert Matrix, Programming the PLA, Applications of PLAs to implement combinational and sequential logic circuits Introduction to :FPGA, CPLD.
Introduction to VHDL: Modeling Digital systems, modeling languages, modeling
B. Comparison of FPGA and CPLD, VHDL Programs.

Text Books

1. "Modern Digital Electronics", R.P. Jain, Tata McGraw-Hill, 2003, ISBN 0 - 07 - 049492 – 4, 3rd Edition.
2. "A VHDL Primer", J. Bhaskar, Englewood Cliffs, Prentice Hall, 1994, ISBN-13: 978- 0131814479, 2nd Edition.

Reference Books

1. "Digital Design", M. Mano, Pearson Education, 2002, ISBN - 81 - 7808 - 555 – 0, 3rd Edition.
2. "Digital Principles and Applications", A. Malvino, D. Leach, Tata McGraw Hill, 2003, ISBN 0 - 07 - 047258 – 05, 5th Edition.

FF No. : 654

CS20108:: COMPUTER ORGANIZATION

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 understand concepts of Parallel Processing.
- Mapping with PEOs :- I, II, (b).

Unit I **(8+1 Hrs)**
Structure of a Computer System

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, Booth's Algorithm, Flow Chart and Implementation of Booth's Algorithm, Division, Restoring algorithms, IEEE standards for Floating point representations (Single Precision Format).
B. Implementation of Modified Booth's Algorithm, Non Restoring algorithm, IEEE standards for Floating point representations (Double Precision Format).

Unit II **(8+1 Hrs)**
Processor Organization (CPU)

A. CPU Architecture, Register Organization, Instruction types, Instruction formats, Instruction cycles, Types of operands, Addressing Modes, ALU organization: 8086 CPU, 8086 instruction types, addressing modes and address translation, RISC Processors: RISC- Features, Superscalar Processors : Overview.
B. CISC Features, Comparison RISC , CISC

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

A. Machines instructions and addressing modes, Single Bus CPU, Control Unit Operation: Instruction Sequencing, Micro-operations. Hardwired Control: examples: Multiplier CU. Pipelining, Micro-programmed Control: Basic concepts, Microinstruction-sequencing and execution, Micro-program control,
B. Applications of microprogramming, Pipelining Hazards

Unit IV **(8+1 Hrs)**
Memory Organization

A. Need, Hierarchical memory system, Characteristics, Size, Access time, Read cycle time and address space Main Memory Organization: ROM, RAM, EPROM, EEPROM, DRAM (example of 64kb memory using 8kb chips)
Cache Memory Organization: Address mapping, Replacement Algorithms, Cache Coherence, MESI protocol.
Virtual Memory: Segmentation, Paging, Interleaved memories.
B. Secondary Storage: Magnetic Disk, Optical memory, CDROM, RAID.

Unit V **(8+1 Hrs)**
Multiprocessor Configurations

A. Multiprocessor Configurations: Closely coupled and loosely coupled multiprocessor architectures, Coprocessor and I/O Processor, Programmed I/O, Interrupt Driven I/O, I/O channels Bus structures, Bus controller, Bus Arbitration, System Bus.
Introduction to parallel processing: Trends towards parallel processing, Parallelism in Uniprocessor systems, Architectural classification schemes, Flynn's classification Parallel computer structures: pipeline, vector, array and multiprocessing, Parallel processing applications.
B. Buses and standard Interfaces: PCI, SCSI and USB Ports.

Text Books

1. "Computer Organization and Architecture: Designing for Performance", W. Stallings William,Pearson Prentice Hall Publication, ISBN 81-7758-993-8,7th Edition.
2. "Computer Organization", C. Hamacher, V. Zvonko, S. Zaky, Tata McGraw Hill Publication, ISBN 007-120411-3,5th Edition.

Reference Books

1. "Computer Architecture and Parallel Processing", Hwang and Briggs, Tata McGraw Hill Publication ISBN 13: 9780070315563.
2. "Structured Computer Organization", A. Tanenbaum, Prentice Hall Publication, ISBN 81 – 203 – 1553 – 7, 4th Edition.

FF No. : 654

CS21202:: MICROPROCESSOR AND INTERFACING

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

Prerequisites: : Nil

Objectives:

- To study interfacing of 8086, assembly language programming, DOS commands.
- Mapping with PEOs :- I, II, (b).

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

1. Understanding of different Memory Models
2. List various assembler directives,
3. Understand concepts of editor, assembler, linker, loader.
4. 8086 assembly language programming, to understand the basic concepts of various functions(01,02,08,09,0A) of INT 21h
5. List various debugging commands.
6. Interface 8086 microprocessor with 4KB RAM in minimum mode. Apply memory banking. Draw memory address map and explain address decoding logic.
7. Interface 8086 microprocessor with 16KB ROM in maximum mode. Draw memory address map and explain address decoding logic.
8. Design specified time delay (delay time calculation).
9. Near, Far procedures (string example).

10. Use of string instructions

11. Study of Mother Board

Note: Students should perform vi & vii assignments on drawing sheet

Text Books

1. "Microprocessors and Interfacing", Douglas Hall, Tata McGraw Hill Publications, ISBN 0-07-025742-6, 2nd Edition.
2. "Assembly Language Programming", Peter Abel, Pearson Education Publications, ISBN 10:013030655, 5th Edition

Reference Books

1. "Advanced MS DOS Programming", Ray Duncan, BPB Publications ISBN 0 – 07 – 048677 – 8, 2nd Edition.
2. "Microprocessor and Peripheral Handbook", INTEL –VOL I

FF No. : 654

CS21204 :: MATHEMATICAL TRANSFORMS AND APPLICATIONS

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

Prerequisites: : Syllabus covered unit-wise in theory lectures.

Objectives:
Upon completion of this module students will be able to:

- Recognize mathematical structures in practical problems
- Translate problems into mathematical language and analyze problems using methods from all the units
- Mapping with PEOs :- I, II, (a).

List of Contents

In this module students will work on problems to practice and apply methods introduced in the theory lectures. Discussions of problems in small groups is always encouraged and facilitated. Students are asked to submit weekly home work assignments and provide them immediate feedback and support materials.

Tutorial No. 1:	Summary on higher order linear differential equations, solution of homogeneous and non homogeneous equations, complementary solution, particular solution by short cut methods,
Tutorial No. 2:	Summary on particular solution by method of variation by parameters Method of undetermined coefficients and problems solving.
Tutorial No. 3:	Summary on Euler – Cauchy and Legendre Equation, simultaneous equations and problems solving.
Tutorial No. 4:	Summary on Functions of complex variables, Differentiation of functions of complex variables, Analytic functions, Harmonic functions, Harmonic conjugate.
Tutorial No. 5	Summary on Integration of functions of complex variables, integration along a path, Cauchy's theorem, Cauchy's integral formula, Cauchy's residue theorem and problems solving.

Tutorial No. 6:	Summary on Fourier series, Complex form of Fourier series, Fourier integral representation, Sine and Cosine representations and problems solving,
Tutorial No. 7:	Summary on Fourier transform, Sine transform, Cosine transform and corresponding inverse and problems solving.
Tutorial No. 8:	Summary on Summary on Z transform, properties of Z transform, inverse Z transform, methods of solution and problems solving, solution of difference equation by Z transform.
Tutorial No. 9:	Summary on Laplace transform, Laplace transform of standard functions, Properties of Laplace and problems solving.
Tutorial No. 10:	Summary on Properties of Laplace transform, Laplace transform of Unit step function, Dirac Delta function, Periodic functions and problems solving.
Tutorial No. 11:	Summary on Inverse Laplace transform, properties of inverse Laplace transform, solution of differential equations by Laplace transform method and problems solving.
Tutorial No. 12:	Summary on Vector Differentiation, problems on gradient, curl, divergence and directional derivative.
Tutorial No. 13:	Summary on Vector Integration, Problems on Line Integral, Green's Theorem.
Tutorial No. 14:	Problems on Stoke's theorem, Gauss Divergence theorem and applications of vectors.

Text Books

1. "Advanced Engineering Mathematics", Erwin Kreyszig, John Wiley and sons, inc.
2. "Advanced Engineering Mathematics", R.K. Jain, S.R.K. Iyengar, Narosa Publications.
3. "Higher Engineering Mathematics", B. S. Grewal, Khanna Publishers.
4. "Vector Analysis", Schaum's Outline Series, Murray R Spiegel, Seymour Lipschutz, Dennis Spellman

FF No. : 654

CS21302:: MICROPROCESSOR AND INTERFACING

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

Prerequisites: Nil

Objectives:

- To study programming model of 8086 and assembly language programming.
- Mapping with PEOs :- I, II, (b).

List of Practical

Group A: - (Any 6)

1. Study of 8086 Architecture and Execution of sample programs.

2. Write 8086 Assembly language program to access marks of 5 subjects stored in array and find overall percentage and display grade according to it.

3. Write 8086 ALP to perform block transfer operation. (Don't use string operations) Data bytes in a block stored in one array transfer to another array.Use debugger to show execution of program.

4. Write 8086 ALP to find and count negative number from the array of signed number stored in memory.

5. Write 8086 Assembly language program (ALP) to arrange the numbers stored in the array in ascending as well as descending order. Assume that the first location in the array hold the number of elements in the array and successive memory location will have actual array elements. Write a separate subroutine to arrange the numbers in ascending and descending order. Accept a key from the user.
   a. If user enters 0, Arrange in ascending
   b. If user enters 1, Arrange in descending

6. Write 8086 Alp to convert 2_digit HEX number into equivalent BCD number.

7. Write 8086 ALP to convert 2_digit BCD number into equivalent HEX number.

Group B: - (Any 6)

8. Write 8086 Assembly language program (ALP) for following operations on the string entered by the user.
   a. Concatenation of two strings
   b. Find number of words, characters

9. Write 8086 ALP to convert an analog signal in the range of 0V to 5V to its corresponding digital signal using successive approximation ADC.

10. Write 8086 ALP to interface DAC & generate following waveforms on oscilloscope. Comment on types of DAC's and write detailed specifications of the DAC used
    i) Square wave -- Variable Duty Cycle & frequency.
    ii) Stair case wave
    iii) Triangular wave

11. Write 8086 ALP to rotate a stepper motor for
    a. one clockwise rotation
    b. one anti clockwise rotation

Write routines to accelerate and de-accelerate the motor
Modify your program to rotate stepper motor for given angle and given direction.

12. Write 8086 ALP to program 8253 in Mode 0 . Generate a square wave with a pulse of 10 mS.

13. Write 8086 ALP to initialize 8279 & to display characters in right entry mode. Provide also the facility to display "SECOMP"/.
    a. Character in left entry mode
    b. Rolling Display
    c. Flashing Display

14. Perform an experiment to establish communication between two USART's. Initialize USART-A in asynchronous transmitter mode and interface USART-B by initializing it in asynchronous receiver mode.

Note: - Students should perform any 6 assignments from group A and any 6 assignments from group B

Text Books

1. "Microprocessors and Interfacing", Douglas Hall, Tata McGraw Hill Publications, ISBN 0-07-025742-6, 2nd Edition.
2. "Assembly Language Programming", Peter Abel, Pearson Education Publications, ISBN 10:013030655, 5th Edition

Reference Books

1. "Advanced MS DOS Programming", Ray Duncan, BPB Publications ISBN 0 – 07 – 048677 – 8, 2nd Edition.
2. "Microprocessor and Peripheral Handbook", INTEL –VOL I

FF No. : 654

CS21306:: DIGITAL ELECTRONICS

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

Prerequisites: Nil

Objective:

- To build and verify simple combinational and sequential circuits.
- Mapping with PEOs :- I, II, (b).

List of Practical

I Combinational Logic Design

1. Verification of Logical Gates and Boolean Algebra.
2. Code converters, e.g. Excess-3 to BCD and vice versa using logical gates.
3. Multiplexer - e.g. 16:1 Mux using 4:1 Mux (IC 74153).
4. Decoder – e.g. 2 bit comparator (IC 74138).
5. BCD adder –using IC 7483

II Sequential Circuit Design (Any six)

1. Conversion of flip-flops. e.g. JK to D, T.
2. Ripple (asynchronous) mod –N counter using J-K F-F.
3. Ripple (asynchronous) mod –N counter using IC 7490.
4. Synchronous 2 bit Up /down counter using JK flip-flop.
5. Sequence generator using JK flip-flop
6. Pseudo random number generator using 74194.(universal shift register)
7. Sequence detector (Moore ckt) using JK flip-flop

8. Sequence detector (Mealy ckt) using JK flip-flop

III ASM (Any one)

1. Simple ASM using multiplexer controller method using Simulator.
2. Design of simple combinational circuit: half adder and subs tractor using VHDL language.

Text Books

1. "Modern Digital Electronics", R.P. Jain, Tata McGraw-Hill, 2003, ISBN 0 - 07 - 049492 – 4, 3rd Edition.
2. "A VHDL Primer", J. Bhaskar, Englewood Cliffs, Prentice Hall, 1994, ISBN-13: 978- 0131814479, 2nd Edition.

Reference Books

1. "Digital Design", M. Mano, Pearson Education, 2002, ISBN - 81 - 7808 - 555 – 0, 3rd Edition.
2. "Digital Principles and Applications", A. Malvino, D. Leach, Tata McGraw Hill, 2003, ISBN 0 - 07 - 047258 – 05, 5th Edition.

Additional Reading

1. J. Bignell, R. Donovan, "Digital Electronics", DELMAR Thomson Learning, 4th Edition, 2001, ISBN 981 - 240 - 352 – 3.

FF No. : 654

CS24302:: ASP.NET

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

Prerequisites: C#.NET or VB.NET

Objectives:

- To learn the fundamental concepts of ASP.NET.
- To learn to Web application development using ASP.NET.
- To learn to on line database application development.
- To learn to apply security to web applications.
- Mapping with PEOs :- II,III,(c).

List of Practical

1. Design simple web application using ASP.NET.
2. Design web application with different validations.
3. Design on line database application.
4. Design data report application.
5. Design web application for uploading files on web.
6. Design AJAX application.
7. Design localized web application.
8. Design WPF browser application.
9. Authentication and authorization in asp..
10. Deployment and publishing web sites.
11. Mini project.

Text Books

1. "Beginning ASP.NET 3.5: In C# and VB", Imar Spaanjaars, Wrox publication, ISBN: 978-0-470-18759-3, March 2008.
2. "ASP.NET 3.5: A Beginner's Guide", William Sanders, McGraw Hill Publication, ISBN: 007159194X / 9780071591942, September 2008.

Reference Books

1. "ASP.NET AJAX Programmer's Reference: with ASP.NET 2.0", Shahram Khosravi, Wrox Publication, ISBN: 978-0-470-10998-4, Sept.2007.
2. "Professional ASP.NET 2.0", B. Evjen, S.Hanselman, F.Muhammad, S. S. Sivakumar, D. Rader, Wrox Publication, ISBN: 978-0-7645-7610-2, Nov. 2005.

FF No. : 654

CS24304:: Python

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

Prerequisites: C, C++ programming.

Objectives:

- To learn the fundamental concepts of python languages.
- To learn to GUI application development using python languages.
- To learn to use regular expression for text processing in python language.
- Mapping with PEOs :- II, III, (c)

List of Practical

1. Design a Simple Python Script.
2. Design a Simple Python Script using conditional / loop constructs.
3. Create an empty address book using Python Script.
4. Design a Simple Python Script using modules & functions.
5. Design a Simple Python Script for file handling.
6. Design a Simple Python Script with exception handling.
7. Design a Simple Python Script using regular expressions.
8. Design a Simple Python Script to explore object oriented features.
9. Design a Simple GUI application using Python.
10. Design a Simple Python Script with event handling.
11. Mini Project

Text Books

1. "Exploring Python", Timothy Budd, Mc Graw Hill Publication, ISBN:

9780073523378, August 2010.
2. "Beginning Python", Peter C. Norton, Alex Samuel, Dave Aitel, Eric Foster-Johnson, Leonard Richardson, Jason Diamond, Aleatha Parker, Michael Roberts SBN: 978-0-7645-9654-4, August 2005.

Reference Books

1. "Python: Create - Modify – Reuse", James O. Knowlton, Wrox Publication, ISBN: 978-0-470-25932-0, July 2008.
2. "Professional Python Frameworks: Web 2.0 Programming", Dana Moore, Raymond Budd, William Wright, Wrox Publication, ISBN: 978-0-470-13809-0, October 2007.

MODULE V

Structure, T.E. (Module V)

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	CS30101	Operating Systems	3	0	0	3
S_2	CS30103	Computer Networks	3	0	0	3
S_3	CS30105	Theory of Computation	3	0	0	3
S_4	CS30109	Web Technologies	3	0	0	3
T_1	CS30201	Operating Systems	0	1	0	1
T_2	CS30203	Computer Networks	0	1	0	1
P_1	CS30301	Operating Systems & Computer Networks	0	0	2	1
P_2	CS30309	Web Technologies	0	0	2	1
MP_5	CS37401	Mini Project	0	0	2	1
* PD_1	PD_1	Institute Level Elective	0	0	2	1
CVV_3	CS30401	Comprehensive Viva Voce	Based on Courses S1, S2			1
SM_1	CS37301	Seminar(T.E. Semester I) Irrespective of Module	0	0	2	2
		Total	12	2	10	21

FF No. : 654

CS30101:: OPERATING SYSTEMS

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

Prerequisites: Data Structures and Algorithms, Computer Organization.

Objectives:

- Identify the role of operating systems and explain the different structures operating systems.
- Describe OS support for processes/threads, and virtual memory, I/O and file systems.
- Evaluate processes and/or threads synchronization mechanisms and explain deadlock conditions and ways to resolve them.
- Identify the different design and implementation concepts for Unix/Linux
- Use Inter-Process Communication techniques under Unix/Linux.
- Mapping with PEOs :- II, III, (d).

Unit I **(8+1 Hrs)**
Introduction to OS

A. Architecture, Goals & Structures of O.S., Hardware Abstraction Layer, Basic functions, Interaction of OS and Hardware Architecture, System Calls & OS Services, Batch, Multiprogramming, Multitasking, Time sharing, Parallel, Distributed & Real-time OS.
Overview of 386 programming model, Introduction to Mobile OS: Architecture& Mobile OS Layered Model of Mobile OS.
Examples of OS: Linux, MS-Windows 2000.
B. Variants of Linux

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

A. Process Description & Control: Process Concept, Process States, Process Description, Threads, SMP & Microkernels: Processes and Threads, Symmetric Multiprocessing, Microkernels.
Concurrency: Principles of Concurrency, Mutual Exclusion: S/W approaches, H/W Support, Semaphores, Monitors, Classical Problems of Synchronization: Readers-Writers

problem, Producer Consumer problem, Dining Philosopher problem.
OS Services layer in the Mobile OS: Generic Services.
B. Message Passing, Sleeping Barber problem.

Unit III **(8+1 Hrs)**
Scheduling and Deadlock

A. Uniprocessor Scheduling: Types of Scheduling: Preemptive, Non-preemptive, Long-term, Medium-term, Short-term. Scheduling Algorithms: FCFS, SJF, RR, Priority
Multiprocessor Scheduling: Granularity, Design Issues, Process Scheduling
Deadlock: Principles of deadlock, Deadlock Avoidance, Deadlock Detection, Deadlock Recovery, Deadlock Prevention.
OS Services layer in the Mobile OS: Comms Services.
B. Thread Scheduling, Real Time Scheduling.

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

A. Memory Management requirements, Memory Partitioning: Fixed and Variable Partitioning, Memory Allocation: Allocation Strategies (First Fit, Best Fit, and Worst Fit), Fragmentation, Swapping.
Virtual Memory: Concepts, Segmentation, Paging, Address Translation, Page Replacement Policies (FIFO, LRU, Optimal, Other Strategies), Thrashing.
OS Services layer in the Mobile OS: Multimedia and Graphics Services, Connectivity Services.
B. Demand paging, Working Set Model.

Unit V **(8+1 Hrs)**
I/O Devices, Files & Shell Programming

A. I/O management & Disk scheduling: I/O Devices, Operating System design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), RAID.
File Management: Concepts, File Sharing, File Organization, File Directories, Record Blocking, Free Space management, Security Issues.
Shell and Command Programming, AWK Programming.
B. Organization of I/O functions, Disk Caches, Secondary Storage Management.

Text Books

1. "Operating Systems", Stalling William, Pearson Education, ISBN: 0-13-031999-6, 4th Edition.
2. "Operating System Concepts", Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.

Reference Books

1. "Modern Operating Systems", Tanenbaum Andrew S., Prentice Hall India, ISBN: 81-7808-447-3, 2nd Edition.
2. "Unix Concepts and Applications", Das Sumitabha, Tata McGraw Hill, ISBN: 0-07-053475-6, 3rd Edition.

Additional Reading

1. "Operating System Principles", Silberschatz A., Galvin P., Gagne G, John Wiley and Sons, ISBN: 9812-53-176-9, 7th Edition.
2. "Design of the Unix Operating System", Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6 , 1st Edition.
5. "The Symbian OS Architecture Sourcebook: Design and Evaluation of a Mobile Phone OS", Ben Morris, John Wiley & Sons, ISBN: 978-0-470-01846-0, 2007.

FF No. : 654

CS30103:: COMPUTER NETWORKS

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

Prerequisites: Data Communication.

Objectives:

- To understand some of the common data link layer protocols.
- To learn various routing algorithms.
- To understand various protocols used at different layers.
- Mapping with PEOs :- II, III, (d).

Unit I **(8+1 Hrs)**
Data Link Layer

A. Overview of protocol suite: OSI and TCP/IP, infrastructure network, ad-hoc network. Design Issues, Error Detection and correction, Examples on Checksum, Stop-and-Wait protocol, Sliding Window protocols, HDLC.
Point-to-Point-Access (PPP): Frame format, Transition states, PPP Stack: LCP, NCP,
B. SLIP, SONET, MPLS.

Unit II **(8+1 Hrs)**
Medium Access Control

A. Channel allocation: Static and Dynamic allocation, Multiple Access Protocols: ALOHA, CSMA, Collision-free and limited-contention protocols, WDMA.
Ethernet: Cabling, MAC sub-layer protocol, Logical link control, Wireless LAN, Broad band wireless, Bluetooth.
B. Switched, fast and Gigabit Ethernet.

Unit III **(9+2 Hrs)**
Network Layer

A. Design Issues, Packet switching, Connectionless and Connection-oriented Services, Virtual Circuit and Datagram Subnets. Autonomous system.
Routing Algorithms: Optimality principle, shortest path routing, flooding, Distance Vector routing, link state routing, hierarchical routing.
Congestion Control and QOS: General Principles, Congestion prevention policies, Load shading, Jitter Control, Quality of Service, Internetworking.

Network layer Protocols: ARP, RARP, IP protocol, IPV6, ICMP, Unicast Routing Algorithms: RIP, OSPF, BGP, Multicast Routing: IGMP, Mobile IP.

B. Routing Algorithms: Broadcast routing, Multicast routing, Routing for mobile hosts.

Unit IV **(8+1 Hrs)**
Transport Layer

A. Services and service primitives, Elements of Transport protocol: Addressing, Connection establishment and release, flow control and buffering, Multiplexing, Crash recovery, UDP: Introduction, TCP: Introduction, Model, protocol, header, connection establishment and release, connection management, Transmission policy, congestion control, timer management, RPC, Transport layer in Mobile network.

B. Sockets and Socket programming in Linux and Windows.

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

A. Domain Name System (DNS) and DNS servers, MIME, SMTP, Mail Gateways, Remote login, File Transfer Protocol, SNMP.
Cloud computing: Architectures, working principle.
B. Electronic Mail: Architecture and services, World Wide Web, Wireless Web.

Text Books

1. "Computer Networks", by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,
2. "Data Communications and Networking", by Forouzan B. A, Tata McGraw-Hill Publications, 2006, ISBN-0-07-063414-9, 4th edition.

Reference Books

1. "Computer Networking- a top-down approach featuring the internet", by James F. Kurose, Person Education, ISBN- 0321227352, 2nd Edition.
2. "Communication Networks- Fundamental Concepts and Key Architectures", by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. "Computer Networks and Internet", by Comer D., Pearson Education, ISBN-81-297-0330-0, 2nd Edition.
2. "Computer Networks- A Systems Approach", by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, ISBN-978-81-312-1045-1, 4th Edition.
3. "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud", George Reese, O'Reilly Publication, 2009, ISBN 978-0-596-80163-2. 1st Edition.

FF No. : 654

CS30105:: THEORY OF COMPUTATION

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

Prerequisites: Data Structures.

Objectives:

- Study abstract computing models (FA, PDA, PM, TM) their languages, grammar, applications, limitations and relevance to modern day computing.
- Learn about the theory of computability and complexity.
- Mapping with PEOs :- I, II, (b).

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

A. Introduction to Finite Automata, Structural Representations, Automata and Complexity, Central Concepts to Automata Theory: Alphabets, Strings, Languages and Problems, Deterministic finite Automata (DFA)-Formal Definition, Simplified notation: State transition graph, Transition table, Language of DFA, Nondeterministic finite Automata (NFA), NFA with epsilon transition, Language of NFA, Equivalence and Minimization of Automata, Conversion of NFA with epsilon to DFA Equivalence of Moore and Mealy Machine. Applications and Limitation of FA.
B. FA with output: Moore and Mealy machine.

Unit II **(8+1 Hrs)**
Regular Expressions (RE) and Languages

A. Regular expression (RE), Definition, Operators of regular expression and their precedence, Algebraic laws for Regular expressions, Kleen's Theorem, Regular expression to DFA, DFA to Regular expression, Arden's Theorem, Non Regular Languages, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Applications of RE: Regular expressions in Unix, GREP utilities of Unix, Lexical analysis and finding patterns in text.
B. Decision properties of Regular Languages.

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

Context Free Grammars (CFG) and Languages

A. Definition, Examples, Derivation, Languages of a Grammar, Derivation trees, Ambiguity in Grammar, Ambiguous to Unambiguous CFG, Inherent ambiguity, Simplification of CFGs, Normal forms for CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs: Emptiness, Finiteness and Membership, Pumping lemma for CFLs, Chomsky Hierarchy. Regular Grammar: definition, left linear and right linear Regular Grammar, Regular Grammar and Finite Automata.

B. FA to RG and RG to FA. Context Sensitive grammar

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

Push Down Automata

A. Description and definition, Instantaneous Description, Language of PDA, Acceptance by Final state, Acceptance by empty stack, Deterministic PDA, Equivalence of PDA and CFG, CFG to PDA and PDA to CFG. Introduction to Post Machines.

B. Application of CFG: Parser, Markup languages, XML and Document Type Definitions.

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

Turing machines and Undecidability

A. Basic model, definition and representation, Instantaneous Description, Language acceptance by TM, TM as Computer of Integer functions, Universal TM, Church's Thesis, Recursive and recursively enumerable languages, Halting problem, Post Correspondence Problem, Introduction to Undecidability.

B. Comparison between FA, PDA, Post Machine and TM.

Text Books

1. "Theory of Computer Science: Automata, Languages and Computation", K.L.P. Mishra and N.Chandrasekaran, PHI, ISBN 978-81-203-2968-3, Third Edition.
2. "Introduction to Automata Theory, Languages and Computation", Hopcroft J, Motwani R, Ullman ,Addison-Wesley, ISBN 81-7808-347-7, Second Edition .

Reference Books

1. "Introduction to Languages and the Theory of Computation", J. Martin, Tata McGraw-Hill, ISBN 0-07-049939-x, Third edition, 2003.
2. "Introduction to Computer Theory", Cohen D., Wiley Publications, 0-471-51010-6, Second Edition.

Additional Reading

1. "Elements of The theory of Computation", H.R.Lewis, C.H.Papadimitriou, Pearson Education, ISBN 81-7808-487-2, Second Edition.

FF No. : 654

CS30109 :: WEB TECHNOLOGIES

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

Prerequisites: Principles of Programming Languages.

Objectives:

- To understand different web technologies like XML, XSL, DOM, Servlet, AJAX, Web 2.0, Web 3.0 etc.
- To understanding the Servlet model.
- To designing and developing Servlet using session management.
- To understanding the java server pages (JSP) technology model.
- Mapping with PEOs :- IV, (i).

Unit I **(8 Hrs)**
HTML and Client Side Technologies

A. Introduction to web, HTML, HTML formatting Tags, Tables, Frames, Introduction to VBScript, JavaScript, JavaScript Objects, JavaScript Cookies, JavaScript Browser Functions.
B. Use of Timing and Dynamic objects in JavaScript

Unit II **(8 Hrs)**
The Document Object Model

A. Defining the Document Object Model , DOM Core Level I, Creating Document Objects, Node Interface, NodeList and NamedNodeMap, Document Interface, Element Interface, Attribute Interface, Additional Interfaces, Creating DOM Elements, DOM Level II, The DOM Core Defined.
B. Referring DOM using VBScript /JavaScript.

Unit III **(8 Hrs)**
XML, Style sheet (XLS) & CSS
A. Introduction to XML, Components of XML; Parsing XML: Parsing Methodologies, DTD, SAX API, The Java API for XML parsing (JAXP), Overview, XSLT, Referring XLS style sheet, CSS.
B. X-Path, X-query.

Unit IV **(9 Hrs)**
Java Servlet and JSP

A. Servlet Architecture, Servlet Interface, Servlet HTTP Interface, Request Processing, Response Generation, Session Management, Servlet Deployment, Servlet Configuration, Servlet Service Management. JSP Overview, JSP Language Basics, JSP Translation and Compilation Directives, Java Scripting from JSP, Java Abstraction of JSP, Standard Java Objects from JSP, Standard Java Action from JSP, JSP Configuration and Deployment, Custom Java Actions and Tags from JSP.
B. Session and Cookies management in Servlet and JSP.

Unit V **(7 Hrs)**
Emerging Trends in Web Technology

A. AJAX Fundaments, PHP, Designing Dynamic GUI using SVG. Introduction to HTML 5.0, MathML, Introduction to web 2.0, web 3.0, RSS Feeds.
B. Design Social networks/Blogs web site.

Text Books

1. "J2EE: The complete Reference" by James Edward Keogh, Jim Keogh, McGraw-Hill Osborne Media, ISBN: 007222472X, September 2002.
2. "HTML & XHTML: The Complete Reference", Thomas Powell, Tata McGraw Hill publication, ISBN: 007222942-X, Fourth edition, 2004.

Reference Books

1. "Learning XML" by Erik T. Ray, O'Reilly & Associates, Inc., ISBN: 9780596004200, Sept. 2003.
2. "Beginning Java Server Pages" by Vivek Chopra, Jon Eaves, Rupert Jones, Sing Li, John T. Bell, Wrox Publication, ISBN: 978-0-7645-7485-6, February 2005.

Additional Reading

1. "DOM Level 1 Specifications" online at www.w3.org/TR/REC-DOM-Level-1/

FF No. : 654

CS30201:: OPERATING SYSTEMS

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

Prerequisites:: Data Structures and Algorithms, Computer Organization.

Objectives:

- Understand Operating System concepts.
- Be familiar with Basic and Advance Unix commands.
- Be able to write Shell and AWK scripts.
- Understand and solve problems involving process control, mutual exclusion, deadlock and synchronization.
- Shell programming in Unix.
- Mapping with PEOs :- II, III, (d).

List of Contents

A TERM-WORK containing the record of the following:

1. Execution of Advance Unix commands.
2. Write a shell program to sort an array of numbers using any sort method.
3. Execution of AWK related commands.
4. Solve the Readers-Writers problem using Threads and Mutex.
5. Solve the Producer-Consumer problem using Threads and Mutex.
6. Solve the Producers-Consumers problem using Threads and Semaphores.
7. Design a solution to the Sleeping Barber problem.
8. Draw the Gantt charts and compute the finish time, turnaround time and waiting time for the following algorithms:
    a. First come First serve
    b. Shortest Job First (Non-Preemptive)

9. Calculate the number of page faults for a reference string for the following page replacement algorithms:
    a. Optimal
    b. FIFO

10. Calculate the total distance traversed by the disk arm to satisfy the pending requests for the following disk scheduling algorithms:
    a. FCFS
    b. C-SCAN

Text Books

1. "Operating Systems", Stalling William, Pearson Education, ISBN: 0-13-031999-6, 4th Edition.
2. "Operating System Concepts", Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.

Reference Books

1. "Modern Operating Systems", Tanenbaum Andrew S., PHI, ISBN: 81-7808-447-3, 2nd Edition.
2. "Unix Concepts and Applications", Das Sumitabha, TMH, ISBN: 0-07-053475-6, 3rd Edition.

Additional Reading:

1. "Operating System Principles", Silberschatz A., Galvin P., Gagne G, John Wiley And Sons, ISBN: 9812-53-176-9, 7th Edition.
2. "Design of the Unix Operating System", Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6, 1st Edition.

FF No. : 654

CS30203:: COMPUTER NETWORKS

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

Prerequisites: : Nil

Objectives:

- To understand the analysis of network
- Understand the design of network.
- Mapping with PEOs :- II, III, (d).

List of Contents

A TERM-WORK containing the record of the following:

A. Assignments :
   i. Study of web Server.
   ii. PC-to-PC communication using RS-232.
   iii. Install two LAN Cards in one of the machine. Install and study router.
   iv. Introduction to NS-2/NS-3/OMNET
   v. Study of System Socket Calls.

B. Mathematical Analysis
   i. Problems on propagation delay
   ii. Problems on transmission delay
   iii. Problems on latency using queuing theory.
   iv. Problems on performance of network.

Text Books

1. "Computer Networks", by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,
2. "Data Communications and Networking", by Forouzan B. A, Tata McGraw-Hill Publications, 2006, ISBN-0-07-063414-9, 4th edition.

Reference Books

1. "Computer Networking- a top-down approach featuring the internet", by James F. Kurose, Person Education, ISBN- 0321227352, 2nd Edition.
2. "Communication Networks- Fundamental Concepts and Key Architectures", by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. "Computer Networks and Internet", by Comer D., Pearson Education, ISBN-81-297-0330-0, 2nd Edition.
2. "Computer Networks- A Systems Approach", by Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, ISBN-978-81-312-1045-1, 4th Edition.

FF No. : 654

CS30301:: OPERATING SYSTEMS AND COMPUTER NETWORKS

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

Prerequisites: Data Structures and Algorithms, Computer Organization

Objectives:

- Be familiar with implementation of a multiprogramming operating system.
- Be familiar with implementation of paging, scheduling.
- Understand the design of computer network.
- Student must be able analyze the packets and write the socket programming.
- Mapping with PEOs :- II,III, (d).

List of Practical
Part A:

1. Implementation of a multiprogramming operating system:
    a. Stage I:
        i. CPU/ Machine Simulation
        ii. Supervisor Call through interrupt
    b. Stage II:
        i. Paging
        ii. Error Handling
        iii. Interrupt Generation and Servicing
        iv. Process Data Structure
    c. Stage III:
        i. Multiprogramming

ii. Virtual Memory

iii. Process Scheduling and Synchronization

iv. Inter-Process Communication

v. I/O Handling, Spooling and Buffering

Part B:

1. Study of existing LAN and understand the design and various components. Set up a small network of 3 to 4 computers and Hub/Switch as directed by the instructor. Use Lan Card, UTP Cables and Connectors. Install LAN Cards and Crimp the connectors. Assign unique IP addresses and share C drive on each machine. Test the network by using PING command. Use protocol analyzer Software.

2. Study any protocol analyzer software (eg. LanExplorer) to learn and use its important features, Study of network monitoring software like ETHREAL software. Assignment to examine TCP/IP and non-TCP/IP protocols (IPX/SPX) and capture them using protocol analyzer Software.

3. Program to implement sliding window protocol

4. TCP Socket programming in Linux

5. UDP Socket programming in Linux

6. Mini Project.

Text Books

1. "The Logical Design of Operating Systems", Shaw, Alan C, Prentice Hall, 1974.
2. "Computer Networks", by Tanenbaum A. S., Pearson Education , 2008, ISBN-978-81-7758-165-2, 4th Edition,

Reference Books

1. "Operating System Concepts", by Silberschatz A., Galvin P., Gagne G., John Wiley and Sons, ISBN: 9971-51-388-9, 6th Edition.
2. "Communication Networks- Fundamental Concepts and Key Architectures", by Leon-Garcia-Wadjaja, Tata McGraw-Hill Publications, ISBN-978-0072463521.

Additional Reading

1. "Operating System Principles", Silberschatz A., Galvin P., Gagne G, John Wiley and Sons, ISBN: 9812-53-176-9, 7th Edition.

2. "Design of the Unix Operating System", Bach Maurice, Pearson Education, ISBN: 81-7808-731-6, 1st Edition.
3. "Unix Shell Programming", Yashavant Kanetkar, BPB Publications, ISBN: 81-7029-753-2, 1st Edition.
4. "Unix And Shell Programming", Forouzan B. A., Gilberg R. F., Australia, Thomson Brooks Cole, ISBN: 981-243-127-6 , 1st Edition.
5. "Modern Operating Systems", Tanenbaum Andrew S., PHI, ISBN: 81-7808-447-3, 2nd Edition.
6. "Unix Concepts and Applications", Das Sumitabha, TMH, ISBN: 0-07-053475-6, 3rd Edition.
7. "Computer Networks- A Systems Approach", By Larry L. Peterson and Bruce S. Davie, Morgan Kaufmann, 4th Edition, ISBN-978-81-312-1045-1.

FF No. : 654

CS30309 ::WEB TECHNOLOGIES

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

Prerequisites: Principles of Programming Languages

Objectives:

- To understand different web technologies like XML, XSL, DOM, Servlet etc.
- To understanding the Servlet model.
- To designing and developing Servlet using session management.
- To understanding the java server pages (JSP) technology model.
- Mapping with PEOs :- IV, V, (i).

List of Practical

1. Design HTML forms.
2. Design dynamic web page with DOM and client side script.
3. Design a XML database with DTD.
4. Design a Simple Servlet application.
5. Design a Simple Servlet application with database.
6. Design a Simple JSP application.
7. Design a Social Networking web application.
8. Design a Blog application with RSS feeds.
9. Design an AJAX application with SVG graphics.
10. Design an Web service for any application.
11. Mini Project

Text Books

1. "J2EE: The complete Reference" by James Edward Keogh, Jim Keogh, McGraw-Hill Osborne Media, ISBN: 007222472X, September 2002.
2. "HTML & XHTML: The Complete Reference", Thomas Powell, Tata McGraw Hill publication, ISBN: 007222942-X, Fourth edition, 2004.

Reference Books

1. "Learning XML" by Erik T. Ray, O'Reilly & Associates, Inc., ISBN: 9780596004200, Sept. 2003.
2. "Beginning JavaServer Pages" by Vivek Chopra, Jon Eaves, Rupert Jones, Sing Li, John T. Bell, Wrox Publication, ISBN: 978-0-7645-7485-6, February 2005.

MODULE VI

Structure, T.E. (Module VI)

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_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	CS30110	Management Information Systems	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	1
* 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	21

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.
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
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

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
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

CS30110:: MANAGEMENT INFORMATION SYSTEMS

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

Prerequisites: Nil

Objectives:

- To identify and analyze the role of computer based information systems in the successful management of organizations.
- Elaborate the major types of information systems in organizations and their role in managing the organization.
- To recognize the moral dimensions of information systems problems and apply specific ethical principles to determine an appropriate course of action.
- Mapping with PEOs :- III, IV, (f).

Unit I **(9+1 Hrs)**
Foundations of Information Systems

A. Introduction, Why Information Systems (IS)? IS Framework, System Concepts, Components of IS, Major Roles of IS, Trends in IS, Major Types of IS– Transaction Processing Systems (TPS), MIS, Decision Support Systems (DSS), etc, Organization Basic, Features of Organizations, Models of Organizations, Competitive Strategy Concepts, Strategic Uses of Information Technology, The Value Chain.
B. Selection of a Domain: Banking, Healthcare, Hotel, Telecom, Education, Agriculture, Shopping Mall, Automobile, Food Industry etc.

Unit II **(7+1 Hrs)**
Manufacturing and Service Systems

A. Functional Levels in Manufacturing Systems, Personnel Management, Financial Management, Production Management, Material Management, Marketing Management, MIS for Manufacturing Sector, Service Sector, Distinctive Services, Service Vs. Product, Service Process Cycle and Analysis, Customer Service Design, MIS for Service Sector, Insurance and Airline

B. Identification of Functional Levels, Services and Products in Selected Domain.

Unit III **(8+2 Hrs)**
e-Business

A. Enterprise Resource Planning (ERP), Benefits and Challenges of ERP, Trends in ERP, Supply Chain Management (SCM), The Role of SCM, Benefits and Challenges of SCM, Trends in SCM, Customer Relationship Management (CRM), The Three Phases of CRM, Benefits and Challenges of CRM, Trends in CRM, Electronic Commerce (e-Commerce), Scope of e-Commerce, Essential e-Commerce Processes, Electronic Payment Processes, B2C e-Commerce, B2B e-Commerce.
B. Study of Process to accommodate e-Business Approach in Selected Domain.

Unit IV **(8+2 Hrs)**
Information Systems for Decision Support

A. Business and Decision Support, Decision Making Process, Components of DSS, MIS, Difference between DSS and MIS, Online Analytical Processing, Types of DSS, Using DSS, What-if analysis, Sensitivity analysis, Goal-seeking analysis, Optimization analysis, Data Mining for Decision Support, Executive Information Systems, Knowledge Management Systems, Group Decision Support Systems (GDSS), Components of GDSS, Overview of a GDSS Meeting, Expert Systems.
B. Identify Decision-making Aspects in a Selected Domain with Appropriate Examples.

Unit V **(8+2 Hrs)**
Challenges Ahead

A. Introduction to Security and Ethical Challenges, Ethical Responsibility of Business Professionals, Computer Crime, Hacking, Cyber Theft, Unauthorized Use at Work Software Piracy, Piracy of Intellectual Property, Computer Viruses and Worms, Security Management, Tools, Encryption, Firewalls, e-Mail Monitoring, Biometric Security, Disaster Recovery, Fault Tolerant Systems, etc, Global Management of Information Technology, Cultural, Political and Geo-economic Challenges, Global Business/IT Strategies.
B. Study of Cybercrimes and Preventive Measures w. r. t. Selected Domain.

Text Books

1. "Management Information Systems: Managing Information Technology in the Business Enterprise", James O'Brien, Tata McGraw-Hill Publishing Company Limited, ISBN 0-07-058739-6, 6th Edition.
2. "Management Information Systems", Jawadekar Waman S, Tata McGraw-Hill

Publishing Company Limited, ISBN 0-07-044575-3, 2nd Edition.

Reference Books

1. "Management Information Systems: Managing the Digital Firm", Kenneth C. Laudon, and Jane P. Laudon, Prentice-Hall of India, ISBN 81-203--2908-2, 9th Edition.
2. "Management Information Systems", Oz Effy, Singapore, Thomson, ISBN 81-315-0174-4, 5th Edition.

Additional Reading

1. "Management Information Systems", Shajahan S, Priyadharshini R, New Age International, ISBN 81-224-1549-0.
2. "Management Information Systems", Arora Ashok, Bhatia Akshaya, Excel Pub, ISBN 81-7446-188-4.
3. "Information Systems A management Perspective", Alter Steven, Addison Wilsey, ISBN 0-201-35109-9, 3rd Edition.
4. "Information Systems For Modern Management", Murdick R G, Ross J E, Claggett J R, Prentice Hall Of India, ISBN 81-203-0397-0, 3rd Edition.

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:

B. 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).

<u>List of Practical</u>

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.
  Transforming analysis into design and relate it to implementation model
- 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.

MODULE VII

Structure, B.E. (Module VII)

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	CS40101	Human Computer Interaction	3	0	0	3
S_2	CS41105	Data Acquistion Systems	3	0	0	3
S_3	 CS42104 CS42103 CS42105 CS42102	ELECTIVE I Neural Networks Parallel Computing on GPU Mobile Computing Image Processing	3	0	0	3
S_4	 CS42120 CS42112 CS42117 CS42119 CS42121 CS42123	ELECTIVE II Data Mining and Warehousing Distributed Systems Artificial Intelligence Information Retrievel Computer Architecture Business Intelligence	3	0	0	3
T_1	CS40201	Human Computer Interaction	0	1	0	1
T_2		ELECTIVE II	0	1	0	1
P_1	CS41305	Data Acquistion Systems	0	0	2	1
P_2		Elective I	0	0	2	1
PS_2	CS47303	PROJECT STAGE 2 (B.E. Semester I) Irrespective of Module	0	0	6	4
		Total	12	2	10	20

FF No. : 654

CS40101:: HUMAN COMPUTER INTERACTION

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

Prerequisites: Nil

Objectives:

- To understand the influence of the human factors on the interface design and development of application software.
- To study the methods and techniques for user-centered design and task analysis-based structural design of the interactions.
- To provide the concepts and strategies for making design decisions for user interface.
- Mapping with PEOs :- II, III, (c).

Unit I **(7+1 Hrs)**
Introduction

A. Human, Input-Output Channels, Human Memory, Thinking, Emotions, Computer, Input-Output Devices, Definition of HCI, Usability, Interface, Goals of System Engineering, Goals of User Interface Design, Motivations for Human Factors in Design, Paradigms for Interaction.
B. Selection of Product/System with Interface and Study of Its Usability.

Unit II **(9+2 Hrs)**
Principles, Models & Guidelines

A. Principle 1: Recognize the Diversity, Principle 2: Use the Eight Golden Rules of Interface Design, Principle 3: Prevent Errors, Guidelines for Data Display, Guidelines for Data Entry, Conceptual, Semantic, Syntactic and Lexical Model, GOMS and Keystroke-Level Model, Stages of Action Models, Linguistic Models, BNF, Task Action Grammar.
B. Specialized Users and Their Relevance to Selected Product/System.

Unit III **(8+2 Hrs)**
Design Process and Interaction Styles

A. Design, Three Pillars of Design, Process of Design, Ethnographic Observations, Participatory Design, LUCID, Scenarios, Navigation Design, Screen Design and Layout, Specification Methods, Interaction Styles, Direct Manipulation Systems, Menu Selection,

Form-Fillin, Natural Language, Command Language, Dialog Design Notations.

B. Web/Interface Design for Selected Product/System.

Unit IV **(8+2 Hrs)**
Evaluation Techniques and Implementation support

A. Usability Testing, Heuristic Evaluation, Expert Reviews, Usability Surveys, Semiotic Analysis, Acceptance Tests, Evaluation During Active Use, Elements of Windowing Systems, Individual Window Design, Multiple Window Design, Coordination by Tightly-Coupled Windows, Image Browsing by Tightly-Coupled Windows.
B. Usability Evaluation of Selected Product/System.

Unit V **(8+1 Hrs)**
Documentation and Groupware

A. Classification of Documents, Printed Manuals, Online Facilities, Error Messages, Groupware, Goals of Co-operations, Asynchronous Interactions, Synchronous Distributed, Face to Face, Applying CSCW to Leaning, Social Networks, Social Networking Sites.
B. Documentation Design for Selected Product/System.

Text Books

1. "Human-Computer Interaction", Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Pearson Education, ISBN 81- 297-0409-9, 3rd Edition.
2. "Designing the User Interface", Ben Shneiderman, Pearson Education, ISBN 81-7808-262-4, 3rd Edition.

Reference Books

1. "The Elements of User Interface Design", Theo Mandel, John Wiley & Sons, Inc, ISBN 0-471-16267-1.
2. "The Essentials of User Interface Design", Alan Cooper, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0213-4.

Additional Reading

1. "The Design of Everyday Things", Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. "The Essential Guide to User Interface Design", Wilbert O. Galitz, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0280-0, 2nd Edition.
3. "Human-Computer Interaction in the New Millennium", John M. Carroll, Pearson Education, ISBN 81-7808-549-6.

FF No. : 654

CS41105::DATA ACQUISITION SYSTEMS

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

Prerequisites: Nil

Objectives:

1. To logically translate Process Control functions into Control Instrumentation
2. To select the adequate data acquisition method for data input and find the necessary data sources.
3. Mapping with PEOs :- II, III, (c).

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

Systems and Measurements

A. Introduction to data acquisition system(DAS), Block Diagram of DAS, Generalized measurement system, Characteristics of measuring devices, accuracy, precision, errors, linearity, hysteresis, threshold, repeatability, reliability calibration., Basic concepts of feedback control system:- open loop and closed loop, Introduction to Continuous and discontinuous control systems.
B. Case study Proportional control system.

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

Transducers and sensors

A. Basic principle and characteristics of following sensors and transducers :- Thermal(RTD, Thermocouple), Displacement(LVDT), optical(optocoupler, LDR)
Signal conditioning: Types (analog and digital),Application of OpAmp in signal conditioning as -amplifier, adder, sub tractor, Low pass filter, high pass filter, I-V converter, integrator, differentiator.
B. Design of signal conditioning circuits for above sensors and transducers.

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

Microcontroller for Data Acquisition

A. Architecture, block diagram, pin diagram, clock and oscillator, Reset Circuit and Timing Details, programming model, special function registers, PSW, stack, port Structure, I/O interfacing concepts. Instruction set, addressing modes. assembly language programming, Timer/ Counter programming, Serial communication: basics of serial communication

B. RS-232 and programming

Unit IV

(7+1 Hrs)

Controls and Networks

A. Digital controls: Simple alarms, two position controls, Multi Variable alarms, Attenuators,
Interfacing Buses: RS 485, I^2C, SPI ,CAN

B. Interfacing Buses:- IEEE 488

Unit V **(8+1 Hrs)**
Programmable Logic Controls.

A. Relay Controllers, Relay Sequencers,
PLC : Design, PLC Operation: I/O scan mode, execution mode, PLC Software Functions: Timer, accumulated timer, counters. Elements of Ladder Diagrams (limit, pressure, level, thermal, mechanical switch) and Examples based on ladder diagram. Data Loggers.

B.SCADA, Case Studies of Data Acquisition Systems.

Text Books

3. "Process control instrumentation", C.D. Johnson, Pearson education, ISBN-81-7758-410-3, seventh edition.
4. "Opamp and linear integrated circuits", Ramakant Gaikwad, PHI publication, ISBN-9780132808682, 4th edition.

Reference Books

1. "Instrumentation Devices and System", Rangan, G .R. Sarma, V.S.V. Mani, Tata McGraw-Hill, ISBN-0-07-463350-3, 2nd Edition.
2. Microcontroller Handbook

FF No. : 654

CS42104:: NEURAL NETWORKS

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

Prerequisites: Nil

Objectives:

- To focus on the foundations of neural network theory and the application of neural network models in engineering, cognitive science, and artificial intelligence.
- To introduce the neural networks as means for computational learning.
- To present the basic network architectures for classification and regression.
- Mapping with PEOs :- III, IV, (f)

Unit I **(8+2 Hrs)**
Introduction

A. Introduction and Role of Neural Network (NN), Fundamentals of Biological Neural Networks, Basic Principles of ANN and their early Structures, Design of NN, NN models.
B. Learning Rules, Supervised, Unsupervised learning.

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

A. Basic Structure, Single-Layer Perceptron, Multilayer Perceptron, Adaline and Madaline, Derivation of BP algorithm, BP Case Study: Character Recognition, EXOR (XOR) Problem,
B. Perceptron Case Study

Unit III **(8+2 Hrs)**
Hopfield Networks

A. Binary Hopfield Networks, Bidirectional Associative Memory Principle, Walsh Functions, Network Stability, Continuous Hopfield Models, Continuous Energy
B. Hopfield Network Case Study: Character Recognition, Traveling Salesman Problem.

(8+1 Hrs)

Unit IV

Adaptive Resonance Theory(ART)

A. The ART Network Structure, Network Operation, Properties of ART, ART-1 Network, ART-1 Case Study: Character Recognition.
B. Case Study: Speech Recognition

Unit V **(8+2 Hrs)**
Training & Recurrent Networks

A. Cognitron and Neocognitron, Statistical Training, annealing Methods, Cauchy Training of NN, Boltzman training of weights, Recurrent Back Propagation Network, Recurrent/Discrete time Networks, Fully Recurrent Networks.
B. Recurrent Back Propagation Network Case Study: Character Recognition..

Text Books

1. "Principles of Artificial Neural Networks", Daniel Graupe, World Scientific Publishing, ISBN 13-978-981-270-624-9, 2nd Edition.
2. "Artificial Neural Networks", B. Yegnanarayana, PHI Learning Private Limited, ISBN 978-81-203-1253-1, 2010 Edition.

Reference Books

1. "Introduction to Artificial Neural Systems", Jacek M. Zurada, Jaico Publishing House, ISBN81-7224-650-1, 2006 Edition.
2. "Neural Networks a Comprehensive Foundation", Simon Haykin, Pearson Education, ISBN 81-7808-300-, 2nd Edition.

Additional Reading

1. "Neural Networks a Classical Approach", Satish Kumar, Tata McGraw-Hill Publishing Company Limited, ISBN 0-07-048292-6, 2004 Edition.
2. "Neural Networks for Pattern Recognition", Christopher M. Bishop, OXFORD University Press, ISBN 0-19-566799-9.

FF No. : 654

CS42103:: PARALLEL COMPUTING ON GPU

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

Prerequisites: Nil

Objectives:

1. Students will be able to detect parallelism in a given problem
2. Students can design parallel algorithm for a given problem for GPU
3. Students will be able to write parallel programs to execute on GPU
4. Mapping with PEOs: II, III, (c).

Unit I **(8+1 Hrs)**
Parallel programming basics

A. Parallel programming definition, motivation, Types and levels of parallelism, Different grains of parallelism, data dependence graph, data parallelism, functional parallelism, Flynn's classification of multi-processors, Motivation for heterogeneous programming, Definition of thread and process, programming parallel computers- extend a compiler, extend a sequential programming language, add a parallel programming layer, create a parallel language.
B. multiprocessor and multicomputer systems, interconnection networks

Unit II **(8+1 Hrs)**
Introduction to GPU, architecture and parallel algorithms

A. Introduction to GPU computing, motivation, Modern GPU architecture case study: NVIDIA Fermi Tesla C2050/Kepler K20, GPU memories- global, shared, texture memory and their properties and uses, roles of CPU and GPU in parallel computing,
GPU computing domain areas and success. Parallel algorithm design. Speedup and scalability.
B. parallel algorithm design for data clustering, theory of locality of reference

Unit III **(8+1 Hrs)**
Compute Unified Device Architecture (CUDA)

A. CUDA Architecture, CUDA programming model, execution model, thread organization: Concept of grid, block and thread, thread index generation, warp; memory model: Introduction to global, shared, local memories, usage of cache, texture cache, constant memory, memory banks and bank conflicts, memory coalescing,. CUDA structure and API details. CUDA example programs (Vector dot product, Vector-Matrix multiplication and etc).

B. atomic operations in CUDA

Unit IV **(8+1 Hrs)**
Problem solving using GPUs

A. Single vss double precision, solving problems that involves Vectors, Matrices, Binomial coefficients, Bernstein coefficients and etc. Instructor will choose the problems from several domains.
B. Study problems given by instructor

Unit V **(8+1 Hrs)**
Parallel reduction and Tools

A. Reduction operation using prefix sum example. Performance issues in algorithms-deciding parallelization of a part of algorithm and selecting the highest parallelism, Need of profilers, Introduction to CUDA Tools: MemCheck and & Visual Profiler.

B. Memory leaks and associated problems

Text Books

1. CUDA: Programming Massively Parallel Processors: A Hands-On Approach. Authors: David Kirk, Wen-mei Hwu © ELSEVIER Inc.
2. CUDA by Example: An Introduction to General-Purpose GPU Programming by Jason Sanders and Edward Kandrot
3. Parallel Programming in C with MPI and OpenMP by Michael J. Quinn, Tata McGraw-Hill Edition
4. Advanced computer architecture by Kai Hwong, Tata McGraw-Hill Edition, 2001

References:

http://developer.nvidia.com/
www tutorials on introduction to parallel computing
Other references suggested by instructor

FF No. : 654

CS42105:: MOBILE COMPUTING

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

Prerequisites:

- Communication Engineering
- Computer Network

Objectives

- To understand various wireless networks and their working characteristics.
- To understand characteristics of local and wide area network technologies such as Bluetooth, 802.11 and GSM.
- Distributed systems platforms for mobile computing, including proxy based architectures and service discovery and interaction platforms.
- Mapping with PEOs :- I, V, (j).

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

A. Introduction, Generations (1G,2G,3G,4G), Why cellular networks? Basic cellular system, Frequency allocation, System capacity and frequency re-use, Concept of frequency reuse channels, Co-channel interference and its reduction factor. Types of non co-channel interference, Cell splitting.
B. Signal and signal propagation, IEEE 802.11standard, 802.11a,b,g, 802.15, 802.16.

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

A. System Architecture: GSM Radio subsystem, Interfaces, Network and switching subsystem, Operation subsystem. GSM channels, GSM protocol architecture, Location tracking and call setup, Security, Data services N/W signaling, GSM mobility management, Administration and maintenance.
Handoff- Initialization of handoff, Delaying handoff, Forcing handoff, Power different handoff. Mobile assisted handoff, Intersystem handoff.
B. Survey of GSM network, Hard, Soft Handoff.

Unit III **(9+1 Hrs)**
GSM Bearer Services

A. SMS architecture protocol, Hierarchy, VOIP services for mobile networks.
WAP: model and architecture, Gateway, protocol stack.
Telecommunication system: GPRS, wireless in local loop, DECT, EDGE, UMTS, Paging systems, CDPD.
B. Wireless application environment, Bluetooth.

Unit IV **(8+1 Hrs)**
Mobile Network and Transport layer

A. Mobile Network layer: Mobile IP, Mobile node, IP packet delivery, Agent discovery, Registration, Tunneling and encapsulation, Mobile ad-hoc networks.
Mobile Transport layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/recovery, Transmission/time-out freezing, Selective retransmission, Transaction-oriented TCP.
B. TCP over 2.5/3G wireless networks.

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

A. Database hoarding, Data caching, Data cache and web cache maintenance in mobile environments, Client-Server computing and adaptation, Query processing, Data recovery process, Issues relating to quality of service, Digital audio broadcasting: DAB System, DAB objects, Object transfer protocol, DVB: DVB system.
B. Mobile Billing

Text Books

1. "Mobile Communications", Jochen Schiller, 2nd edition, Pearson education, ISBN-81-297-0350-5
2. "Mobile Communication", G.K.Behera, Lopamudra Das, Scitech publications,ISBN -9788183711791

Reference Books

1. "Wireless and Mobile Network Architectures", Yi-Bing Lin, Imrich Chlamtac, Wiley publication, ISBN-9971-51-366-8
2. "Mobile Computing", Raj Kamal, Oxford University press, ISBN 978-0-19-568677-7

FF No. : 654

CS42102:: IMAGE PROCESSING

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

Prerequisites: Nil

Objectives:

- To explore several different image processing techniques, and learn to improve images with them.
- To get familiarized to image enhancement and compression.
- Mapping with PEOs :- II, III, (c)

Unit I **(8+1 Hrs)**
Introduction to image processing

A. Components of image processing system, Scenes and Images, Vector Algebra, Orthogonal Transform, Human Visual System, color vision color model: RGB, HVS, YUV, CMYK, and some basic relationships between pixels, linear and non linear operations.
B. Application of different color models in Image processing.

Unit II **(8+1 Hrs)**
Image Formation and Digitization

A. Geometric Model, Photometric Model, Sampling, Digitization, Elements of Digital Geometry, Image Properties, Representation
B. Overview of application of Image processing.

Unit III **(8+1 Hrs)**
Image Processing

A. Basic gray level transformations, histogram processing, enhancement using logical and arithmetic operations Image Enhancement - Contrast Intensification, Smoothening, Sharpening Image Restoration -- Square Error Restoration Techniques, Singular Value
B. Image Compressing - Basic - Lossy Compression, Loss-Less Compression.

(8+1 Hrs)

Unit IV
Image transform

A. Introduction to two dimensional orthogonal and unitary transforms, properties of unitary transforms one-two dimensional discrete Fourier Transform (DFT), Wavelet transforms. Cosine, sine transforms.
B. Slant, KL, affine transforms. Applications of transforms in Image processing.

Unit V **(8+1 Hrs)**
Compression fundamental

A. File format (bmp, tiff, pcx, gif, jpeg.) Compression fundamentals, image compression models, error free compression: LZW coding, Bit plane Coding, Lossless Predictive Coding, lossy compression: lossy Predictive Coding, Transform, vector Quantization, image compression standard: Binary Image, Continuous Tone Still Image,
B. Elements of information theory, error free compression: VLC, JPEG compression standards Factral.

Text Books

1. "Digital Image Processing", Rafael Gonzalez & Richard Woods, Pearson publications, ISBN 0132345633, 3rd Edition.
2. 2." Fundamental of Digital Image Processing", Anil K. Jain, PHI publication, ISBN 13: 9780133361650, 5th Edition.

Reference Books

1. "Digital Image Processing", Pratt, Wiley Publication, ISBN 0-471-37407-5, 3rd Edition.
2. "Digital Image Processing",K.R. Castleman, Prentice Hall: Upper Saddle River, NJ, 3, ISBN 0-13-211467 -4, 3rd Edition.

FF No. : 654

CS42120:: DATA MINING AND WAREHOUSING

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

Prerequisites: Database Management Systems.

Objectives:

- Know the basics of data warehousing, dimensional design
- Understand different dimensional models and other related issues
- Understand OLAP, its operations and types
- Mapping with PEOs :- III, (e)

Unit I **(8+2 Hrs)**
Introduction to DWH and OLAP

A. Decision Support System: Introduction to Decision Support System (DSS), DSS Components, Decision Types; Data warehouse (DWH): Need, Definition, Advantages of DWH, OLTP Vs DWH, 3-tier Architecture, DWH Design Process, ETL Process, DWH Back-end Tools and Utilities, Metadata Repository, Models of DWH: Enterprise Warehouse, Data Mart, Virtual Warehouse, Comparison; OLAP: Data Cube and OLAP, Concept Hierarchies, OLAP Operations: Drill-Down, Roll-Up and Extreme Roll-Up, Slice-Dice and Pivot, OLAP Types, OLAP Query Processing, Computation of Data Cube.
B. ETL Tools, Commercial DWH Vendors/ Tools and their Comparison, Project Failure Reasons, Data Analytics, Business Intelligence, SAS Software.

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

A. Dimensional Modeling: Dimensional Model Vs ER Model, DWH Schemas: Star, Snowflake, Fact Constellation, their Comparison, Techniques to Handle Changing Dimensions, Aggregation, Families of Fact Tables, Fact Less Fact Tables; Data Warehouse Indexing: Factors used to select an Indexing Technique, Properties of a Good Indexing Technique for DWH, Indexing Techniques: Projection Index, Bitmap Index (Pure and Encoded), Join Index and their Comparison.
B. Case Studies of Data Warehouse Applications in various Industry Segments.

Unit III **(8+2 Hrs)**
Data Mining and Functionalities

A. Introduction: Need of Data Mining, Knowledge Discovery in Database (KDD), Architecture of Data Mining System, Data Mining on Different kind of Data, Data Mining Functionalities; Data Preprocessing: Need, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation; Cluster Analysis: Categories of Clustering methods, Partitioning methods: k-Means, k-Medoids ; Prediction: Numerical Prediction, Linear, Non-Linear Regression; Outlier Analysis: Applications, Techniques.
B. Data Mining Task Primitives, Query Language, System Classification, Data Mining Issues.

Unit IV **(9+2 Hrs)**
Classification

A. Classification: Decision Tree Classifier, Rule Based Classification, Bayesian Classification, Neural Network Classification: Back Propagation Algorithm, Lazy Learner: kNN Classifier, Case-Based Reasoning, Other: Fuzzy Set Approach, Classifier Accuracy Measures, Techniques for Evaluating Classifier Accuracy; Frequent Itemset Mining: Interesting Item Set Mining: Market Basket Analysis, APriori Algorithm, Generating Association Rules, Types of Association Rules, Correlation Analysis.

B. Support Vector Machine, Associative Classification, other Classification Techniques: Genetic Algorithm, Rough Set, Constraints Based Association Mining.

Unit V **(7+1 Hrs)**
Data Mining on different Databases

A. Multimedia Data Mining, Web Mining, Text Mining, Spatial Data Mining, Mining on Social Networks, Multirelational Data Mining.
B. Data Mining Applications, Trends/ Challenges of Data Mining, Mining Sequence Patterns in Transactional Database, Graph Mining, Data Mining Tools- Dbminer/ WEKA/ Oracle DM Tools/ OLE DB/ Ida.

Text Books

1. "The Data Warehouse Lifecycle Toolkit", Kimball, Reeves, Ross, Thornthwaite, John Wiley, ISBN 9971-51-415-X, 2002 Edition.
2. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. "Decision Support and Data Warehouse Systems", Mallach Efrem G, Tata McGraw Hill, ISBN 978-0070486843, 2009 Edition.
2. "Mastering Data Mining: The art and science of customer relationship management", M Berry and G. Linoff, John Wiley, ISBN 9971-51-369-2, 2001 Edition.

Additional Readings

1. "Building A Data Warehouse For Decision Support", Poe Vidette, Klauer Patricia, Brobst Stephen, Prentice Hall Inc., ISBN 0-13-769639-6, 2nd Edition.
2. "Data Mining : Theory and Practice" , Soman K P, Diwakar Shyam, Ajay V, New Delhi, Prentice Hall Of India, ISBN 81-203-2897-3, 2006 Edition.

FF No. : 654

CS42112:: DISTRIBUTED SYSTEMS

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

Prerequisites: Operating Systems.

Objectives:
To study the different design issues of Distributed Operating Systems.

- Create an awareness of the major technical challenges in distributed systems design and implementation.
- Expose students to current technology and distributed infrastructure software.
- Expose students to past and current research issues in the field of distributed systems.
- Provide experience in the implementation of typical algorithms used in distributed systems.
- Mapping with PEOs :- II, III, (c)

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

A. Introduction to Distributed Systems, Examples of Distributed Systems, Hardware and Software Concepts, Design issues.
System models: Introduction, Architectural Model, Fundamental Models.
B. Distributed Systems Goals, Distributed Computing System models.

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

A. Interprocess Communication: Message Oriented Communication, Stream Oriented Communication.
RPC: RPC Model, Transparencies in RPC, Implementation, Stub Generation, RPC Messages, Server Management, Call Semantics, Communication Protocols, Distributed Objects: Remote Method Invocation.
B. LRPC, Events and Notifications.

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

A. Time and Global States: Clock Synchronization, Logical Clocks, Global State, Event Ordering.
Distributed Deadlock Algorithms for Avoidance, Prevention, and Detection: Centralized Approach, Hierarchical Approach, WFG Based Fully Distributed, Deadlock Recovery.
Co-ordination: Election Algorithm: Bully Algorithm, Ring Algorithm, Mutual Exclusion: Centralized Approach, Distributed Approach (Ricart and Agrawala).
Distributed Transaction: Transaction Model, Classification, Implementation, Concurrency Control: 2 Phase Locking, Strict 2 PL.
B. Distributed Deadlock Algorithms for Detection: Probe Based Fully Distributed Approach, Mutual Exclusion: Token-Passing Algorithm.

Unit IV **(8+1 Hrs)**
Fault Tolerance

A. Introduction to Fault Tolerance, Failure Models, Failure Masking by Redundancy: Triple Modular Redundancy.
Process Resilience: Design Issues, Failure Masking and Replication, Agreement in Faulty Systems: Two Army Problem, Byzantine Generals Problem.
Reliable Client Server Communication, Reliable Group Communication.
Distributed Commit: 2 Phase Commit.
B. Distributed Commit: 3 Phase Commit and Comparison of 2PC and 3PC, Distributed Recovery.

Unit V **(8+1 Hrs)**
Distributed File Systems and Distributed Shared Memory

A. Name Services: Name Entities, Name Resolution: Linking, Mounting, Iterative and Recursive Algorithms, Case Study: DNS Directory, X.500 Distributed Naming Service
Distributed File Systems: SUN NFS, CODA.
Distributed Shared Memory: Introduction, Architecture of DSM Systems
Design and Implementation Issues of DSM: Granularity, Structure of Shared Memory Space, Consistency Models, Replacement Strategies, Thrashing, Heterogeneous DSM.
Case Studies: Mach, Amoeba.
B. Distributed File Systems: SFS, xFS, Plan 9, Comparison of different DSF, Distributed Shared Memory: Grid, Clusters.

Text Books

1. "Distributed Systems Principles and Paradigms", Andrew S. Tanenbaum & Maarten Van Steen, Prentice Hall India, ISBN 81-7808-789-8, 1st Edition.
2. "Distributed Operating Systems Concepts and Design", Pradeep K. Sinha, Prentice Hall India, ISBN: 81-203-1380-1, 1st Edition.

Reference Books

1. "Distributed Systems – Concepts and Design", George Coulouris, Jean Dollimore & Tim Kindberg, Addison-Wesley, ISBN: 0-201-61918-0, 3rd Edition.
2. "Distributed Operating Systems", Andrew S. Tanenbaum, Addison Wesley Longman, ISBN: 81-7808-294-2, 1995.

Additional Reading

1. "Advanced Concepts In Operating Systems", Mukesh Singhal, Niranjan G. Shivaratri, McGrawHill, ISBN: 0-07-113693-2, 1994.
2. "Distributed and Parallel Systems: From Cluster to Grid Computing", Peter Kacsuk, Thomas Fahringer, Zsolt Nemeth, Springer, ISBN: 978-0-378-69857-1, 2007.
3. "Distributed Computing: Principles, Algorithms, and Systems", Kshemkalyani, Singhal, Cambridge University Press, ISBN-13: 978-0-521-87634-6, 1st Edition.
4. "Distributed Computing: Principles and Applications", M. L. Liu, Addison-Wesley, ISBN-10: 0201796449, 2004.

FF No. : 654

CS42117:: ARTIFICIAL INTELLIGENCE

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

Prerequisites: Nil

Objectives:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To provide a basic exposition to the goals and methods of Artificial Intelligence
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To learn and understand the knowledge representation techniques for knowledge base
- Mapping with PEOs :- III,IV, (f)

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

A. Introduction, A.I. Representation, AI Techniques, Representation of Knowledge, Knowledge Base Systems, State Space Search, Production Systems, Problem Characteristics, types of production systems, Intelligent Agents and Environments, concept of rationality, the nature of environments, structure of agents, problem solving agents, problem formulation
B. Criteria for Success, Turing Test.

Unit II **(8+1 Hrs)**
Heuristics Search Techniques

A. Depth First Search, Breadth First Search, Generate & test, Hill Climbing, Best First Search, A* and AO* Algorithm, Constraint satisfaction, Means-Ends Analysis. Game playing: Minimax Search, Alpha-Beta Cutoffs, Waiting for Quiescence, Secondary search.
B. Applications Minimax Algorithm.

Unit III **(8+1 Hrs)**
Predicate Logic

A. Using predicate logic: Predicate Calculus, Predicate and arguments, ISA Hierarchy, Frame notation, Resolution, Natural Deduction.
Representing simple facts in Logic - Logic Programming, Computable functions in predicates, resolution, unification, Forward and backward reasoning, Expert System, Basics of PROLOG.

B. Propositional Logic, Case study of Expert system in PROLOG.

Unit IV **(8+1 Hrs)**
Structured Knowledge Representation

A. TMS (Truth maintenance system),Statistical and probabilistic reasoning ,Associative Networks, Semantic Nets, Frames Structures, Learning – Concept of Learning – Learning Automata, Genetic Algorithm, Learning by induction
Planning: Block world, strips, Implementation using goal stack, Non linear planning, Hierarchical planning, and least commitment strategy.

B. Conceptual Dependency & Scripts, Various types of learning.

Unit V **(8+1 Hrs)**
Natural Language Processing

A. Introduction, Syntactic processing, Semantic analysis and representation structures. Grammers and Parsers, Discourse and Pragmatic processing.

B. Augmented Transition Network, Understanding.

Unit VI
Consist of part B of Unit I to Unit V

Text Books
1. "Artificial Intelligence", Eiaine Rich and Kerin Knight,Tata McGraw Hill,ISBN 0-07-460081-8.
2. "Artificial Intelligence : A Modern Approach", Stuart Russell & Peter Nerving Pearson Education, 2nd Edition.

Reference Books
1. "Prolog Programming For Artificial Intelligence" , Ivan Bratko , 2nd Edition Addison Wesley, 1990.
2. "Introduction to Artificial Intelligence.", Eugene, Charniak, Drew Mcdermott, Addison Wesley

Additional Reading

1. "Introduction to AI and Expert Systems", Patterson,PHI
2. "Principles of Artificial Intelligence", Nilsson,Morgan Kaufmann.
3. "Artificial Intelligence and Intelligent Systems", N.P. Padhy, OXFORD, 2005

FF No. : 654

CS42119:: INFORMATION RETRIEVAL

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

Prerequisites: Data Communication.

Objectives:

- To understand some of the common data link layer protocols.
- To learn various routing algorithms.
- To understand various protocols used at different layers.
- Mapping with PEOs :- III, (a)

Unit I **(9 Hrs)**
Introduction

A. Introduction to Information retrieval, A Taxonomy of Information Retrieval Models, Retrieval: Ad Hoc and Filtering, A Formal Characterization of IR Models, Classic Information Retrieval, Set Theoretic Models, Fuzzy Set Model, Algebraic Models, Probabilistic Models, Structured Text Retrieval Models.
B. Models for Browsing
SLIP, SONET, MPLS.

Unit II **(8 Hrs)**
Retrieval Evaluation and Querying

A. Recall and Precision, Alternative Measures, Reference Collections, Keyword Based Querying, Pattern Matching, Structural Queries, User Relevance Feedback.
B. Automatic Local Analysis, Automatic Global Analysis.

Unit III **(8 Hrs)**
Indexing and Searching

A. Inverted Files, Suffix Trees and Suffix Arrays, Signature Files, Boolean Queries, Sequential Searching, Pattern Matching, String Matching Allowing Errors, Regular Expressions and Extended Patterns, Pattern Matching using Indices, Structural Queries.
B. Compression.

Unit IV **(8 Hrs)**
Web Searching

A. Characterizing the Web, Search Engines, Browsing, Metasearchers, Searching using Hyperlinks, Parallel IR, Distributed IR,
B. Web Issues.

Unit V **(7 Hrs)**
Multimedia IR

A. Data Modeling, Query Languages, A Generic Multimedia Indexing Approach, One Dimensional Time Series , Two Dimensional Color Images , Automatic Feature
B. Image features and similarity functions.

Text Books

1. "Modern Information Retrieval", by Ricardo Baeza-Yates, Berthier Ribeiro-Neto, Addison Wesley Longman Publishing Co. Inc, ISBN:020139829X, 1999.
2. "Introduction to Information Retrieval", by Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. ISBN: 0521865719, 2008.

Reference Books

1. "Information Retrieval", C. J. Van Rijsbergen, Information Retrieval Group, University of Glasgow, online at http://www.dcs.gla.ac.uk/Keith/Preface.html.
2. "Information Retrieval Data Structures & Algorithms" by Bill Frakes, Ricardo Baeza-Yates, Prentice-Hall, ISBN 0-13-463837-9, 1999.

FF No. : 654

CS42121:: COMPUTER ARCHITECTURE

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

Prerequisites: Computer Organization ,Operating Systems ,Microprocessors

Objectives: :

- To understand the concept of Parallel Processing and Parallel Architectures
- Mapping with PEOs :- I,II, (b)

Unit I **(8+1 Hrs)**
Overview of Parallel Processing

A. Necessity of high performance, Constraints of conventional architecture, Parallelism in Uniprocessor system, Evolution of parallel processors, Architectural Classification, Flynn's, Fengs , handlers classification. Pipeline, Vector, Array and Multiprocessors architecture basics, Bernstein's' condition for parallelism, dependence graphs. Parallel Programming Models Shared memory, Message passing model concepts
Performance metrics and Measures, Minsk's conjecture Speedup performance Laws, Amdahl's & Gustafson's laws.
B. Applications of Parallel Processing

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

A. Principles and implementation of Pipelining, Classification of pipelining processors, Arithmetic and Instruction pipelining, Instruction level parallelism (ILP) Pipelining hazards and resolving techniques, Data forwarding. register renaming pipeline reservation table, sequencing and collision, Branch problem, branch penalty .prediction. Delayed branching Branch target buffer Advanced pipelining techniques, loop unrolling techniques, br Superscalar pipelining, speedup, in order, out of order execution, VLIW processor software scheduling, Software pipelining.
B. EPIC IA 64, Predicated execution, speculative loading, Register stack engine, Case study: Super scalar Architecture- Pentium

Unit III **(8+1 Hrs)**
Vector and Array Processor

A. Basic vector architecture, Issues in Vector Processing, Vector Instructions Register to

Register and Memory to Memory Architectures Vector performance, Vector Chaining ,Vector loops and recurrence vectorizers and optimizers, Cray I Cray Y-MP
SIMD Computer Organization**:** Distributed & shared memory model Processing Element (PE) Masking and Data Routing Inter PE Communication
Interconnection networks of SIMD, Static Vs Dynamic network, Permutations, Shuffle exchange, Bit reversal hyper cube ,mesh network, Iliac, omega, blocking, non blocking networks.
Compute Unified Device Architecture (CUDA) Hardware , Memory, Thread model
Parallel Algorithms For Array Processors**:** Matrix Multiplication. Sorting on mesh, hypercube and CUDA Vectorization and Parallelization methods
B. Systolic Architecture ,CM-2,Cyber 205, Illiac Architecture

Unit IV **(8+1 Hrs)**
Multiprocessor Architecture

A. UMA, NUMA, COMA MPP Processor. Loosely and Tightly coupled multiprocessors, characteristics of multiprocessors & multiprocessing, Inter Processor communication network, Time shared bus, Crossbar switch, Interleaved memories S access, C access.
Cache coherency and bus snooping and directory based protocols. Massively Parallel Processors (MPP), Inter Processor Communication and Synchronization.
Multithreaded Architecture Latency hiding techniques, Principles of multithreading, Issues and solutions. Multithreaded processors model, context switching policies. Blocked multithreading, Interleaved multithreading, simultaneous multithreading.
Software multithreading, thread concept, lightweight process (LWP), bounded, unbounded threads, thread management : thread scheduling & control by thread library & kernel (State transition diagram)
B. Cluster and grid computing concepts.

Unit V **(8+1 Hrs)**
Parallel Software Issues

A. Operating systems for multiprocessors systems, software issues for multiprocessors Message Passing Interface (MPI) Principles of Parallel Algorithm design: Decomposition, tasks and Dependency graphs. Parallel language constructs. Programming using message passing and shared memory paradigms (Sorting, searching, matrix problems)
Parallel programming languages POSIX thread, Java threads
B. Writing parallel programs, analytical modeling of parallel programs

Text Books

1. Kai Hwang, "Advanced Computer Architecture", Tata McGraw-Hill ISBN 0-07-113342-9
2. Kai Hwang, Faye A. Briggs, "Computer Architecture and Parallel Processing" McGraw-Hill international Edition ISBN 007-066354-8
3. V. Raja Raman, L Siva ram Murthy, "Parallel Computers Architecture and Programming", PHI ISBN 81-203-1621-5

Reference Books:

1. Dezso Sima, Fountain, Kacsuk " Advanced Computer Architecture " Pearson Education Asia ISBN 981-4053-74-0
2. Culler, Jasvinder Pal Singh , Gupta "Parallel Computer Architecture " Morgan Kaufman (ELSVIER) ISBN 81-8147-189-X
3. Grama ,Gupta , Karypis, Vipin Kumar : Introduction to Parallel Computing " Pearson learning ISBN 978-81-317-0807-1

FF No. : 654

CS42123:: BUSINESS INTELLIGENCE

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

Prerequisites: Database Management Systems.

Objectives: :

- To understand the technology and processes associated with Business Intelligence framework.
- To demonstrate understanding of Data Warehouse implementation methodology and project life cycle.
- To understand how to identify the metrics, indicators and make recommendations to achieve the business goal for a business scenario.
- Mapping with PEOs: IV, V, (h), (i).

Unit I **(8+1 Hrs)**
Introduction to Business Intelligence

A. Introduction to OLTP and OLAP, BI Definitions & Concepts, Business Applications of BI, BI Framework, Role of Data Warehousing in BI, BI Infrastructure Components- BI Process, BI Technology, BI Roles & Responsibilities.
Data Warehouse versus Data Marts, Data Warehouse Architecture. Introduction to SAS.
B. Illustrating the dependability and integration of ERP, SCM and E-commerce with BI.
Commercial BI vendors / and their comparison

Unit II **(8+1 Hrs)**
Introduction to Multi-Dimensional Data Modeling

A. Introduction to Data and Dimension Modeling, Multidimensional Data Model, ER Modeling vs. Multi Dimensional Modeling, Concepts of Dimensions, Facts, Cubes, Attribute, Hierarchies, Star and Snowflake Schema, Introduction to Business Metrics and KPIs, Creating Cubes using SSAS.
OLAP operations
B. Techniques to handle changing dimensions, families of fact tables, fact less fact table.

Unit III **(8+1 Hrs)**
Data Cube Computation

A. OLAP Query processing, Indexing techniques bitmap, join index and their comparison

Efficient methods for Data cube computation: cube materialization, multiway array aggregation ,BUC, Star cubing.
Further development of data cube and OLAP technology
B. Attribute oriented induction for data generalization and concept description.

Unit IV **(8+1 Hrs)**
Basics of Data Integration (Extraction Transformation Loading)

A. Concepts of data integration need and advantages of using data integration, introduction to common data integration approaches, introduction to ETL using SSIS, Introduction to data quality, data profiling concepts and applications.
B. Data Cleaning , Reduction and Transformation operators. Commercial ETL tools.

Unit V **(8+1 Hrs)**
Basics of Enterprise Reporting

A. Introduction to Enterprise Reporting, Concepts of Dashboards, Balanced Scorecards, introduction to SSRS Architecture, enterprise reporting using SSRS.
Explaining the technique for performance management by observing dashboards , assessing key performance indicators and using scorecard.
B. Types of Enterprise Reports, Components of Reporting System.

Text Books

1. "Business Intelligence", David Loshin, Morgan Kaufman, ISBN 978-1-55860-916-7, 2003 Edition.
2. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. "Business Intelligence for the Enterprise", Mike Biere, Pearson Education, ISBN 0-13-141303-1, 2003 Edition.
2. "Business intelligence Roadmap", Larissa Terpeluk Moss, Shaku Atre, Pearson Education, ISBN 0201784203, 2003 Edition.

FF No. : 654

CS40201:: HUMAN COMPUTER INTERACTION

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

Prerequisites: : Nil

Objectives:

- To identify and incorporate key social, cognitive and physiological factors that influence user perceptions, understandings and usages of Information Technology.
- To motivate students for interviews and field-work with users for improved practical approach in interface/interaction design.
- Mapping with PEOs :- II, III, (c)

List of Contents

A TERM-WORK containing the record of the following:

1. Design user persona for the users of selected product/system.
2. Perform GOMS analysis for selected product/system.
3. Conduct a contextual inquiry for selected product/system.
4. Design an interface prototype for selected product/system.
5. Evaluate an interface using usability testing / evaluation technique.

Text Books

1. "Human-Computer Interaction", Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, Pearson Education, ISBN 81- 297-0409-9, 3rd Edition.
2. "Designing the User Interface", Ben Shneiderman, Pearson Education, ISBN 81-7808-262-4, 3rd Edition.

Reference Books

1. "The Elements of User Interface Design", Theo Mandel, John Wiley & Sons, Inc, ISBN 0-471-16267-1.
2. "The Essentials of User Interface Design", Alan Cooper, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0213-4.

Additional Reading

1. "The Design of Everyday Things", Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. "The Essential Guide to User Interface Design", Wilbert O. Galitz, Wiley-dreamtech India (P) Ltd., ISBN 81-265-0280-0, 2nd Edition.
3. "Human-Computer Interaction in the New Millennium", John M. Carroll, Pearson Education, ISBN 81-7808-549-6.

FF No. : 654

CS42220:: DATA MINING AND WAREHOUSING

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

Prerequisites: Database Management Systems.

Objectives:

- Study different functionalities of data mining, various algorithms, and get an overview of significant data mining applications
- Mapping with PEOs :- III, (e)

List of Contents

A TERM-WORK containing the record of the following:

1. Design a star / snowflake schema for a data warehouse for an organization.
2. Use ETL tool for extract-transform-load operations
3. OLAP Data cube implementation and operations
4. Data mining: Implement clustering algorithms
5. Classification algorithms
6. Association rule mining
7. Prediction, Linear Regression
8. Outlier analysis

Text Books

1. "The Data Warehouse Lifecycle Toolkit", Kimball, Reeves, Ross, Thornthwaite, John Wiley, ISBN 9971-51-415-X, 2002 Edition.
2. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. "Decision Support and Data Warehouse Systems", Mallach Efrem G, Tata McGraw Hill, ISBN 978-0070486843, 2009 Edition.
2. "Mastering Data Mining: The art and science of customer relationship management", M Berry and G. Linoff, John Wiley, ISBN 9971-51-369-2, 2001 Edition.

Additional Readings

1. "Building A Data Warehouse For Decision Support", Poe Vidette, Klauer Patricia, Brobst Stephen, Prentice Hall Inc., ISBN 0-13-769639-6, 2nd Edition.
2. "Data Mining : Theory and Practice" , Soman K P, Diwakar Shyam, Ajay V, New Delhi, Prentice Hall Of India, ISBN 81-203-2897-3, 2006 Edition.

FF No. : 654

CS42212:: DISTRIBUTED SYSTEMS

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

Prerequisites: Operating Systems.

Objectives:

- To study the different design issues of Distributed Operating Systems.
- To study various methods of communication in Distributed Operating Systems.
- To analyze Distributed File System.
- Mapping with PEOs :- II, III, (c)

List of Contents

A TERM-WORK containing the record of the following:

1. Implement Remote Method Invocation.
2. Simulate Cristian's or Berkeley's algorithm for clock synchronization.
3. Simulate Lamport's algorithm for clock synchronization using counters or physical clock.
4. Simulate the Ring or Bully election algorithm.
5. Simulate the Ricart Agrawala's distributed algorithm for mutual exclusion.
6. Problem solving of Wait-die and Wait –wound scheme for deadlock prevention.
7. Simulate Wait for Graph based Centralized or Hierarchical or Distributed algorithm for deadlock detection.
8. Simulate Recursive or Iterative name resolution algorithm.
9. Simulate the Byzantine General's Problem.
10. Simulate any one of the Consistency models.

Text Books

1. "Distributed Systems Principles and Paradigms", Andrew S. Tanenbaum & Maarten Van Steen, Prentice Hall India, ISBN 81-7808-789-8, 1st Edition.
2. "Distributed Operating Systems Concepts and Design", Pradeep K. Sinha, Prentice Hall India, ISBN 81-203-1380-1, 1st Edition.

Reference Books

1. "Distributed Systems – Concepts and Design", George Coulouris, Jean Dollimore & Tim Kindberg, Addison-Wesley, ISBN: 0-201-61918-0, 3rd Edition.
2. "Distributed Operating Systems", Andrew S. Tanenbaum, Addison Wesley Longman, ISBN: 81-7808-294-2, 1995.

Additional Reading:

1. "Advanced Concepts in Operating Systems", Mukesh Singhal, Niranjan G. Shivaratri, McGrawHill, ISBN: 0-07-113693-2, 1994.
2. "Distributed and Parallel Systems: From Cluster to Grid Computing", Peter Kacsuk, Thomas Fahringer, Zsolt Nemeth, Springer, ISBN: 978-0-378-69857-1, 2007.
3. "Distributed Computing: Principles, Algorithms, and Systems", Kshemkalyani, Singhal, Cambridge University Press, ISBN-13: 978-0-521-87634-6, 1st Edition.

"Distributed Computing: Principles and Applications", M. L. Liu, Addison-Wesley, ISBN-10: 0201796449, 2004.

FF No. : 654

CS42217 :: ARTIFICIAL INTELLIGENCE

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

Prerequisites: : Nil

Objectives:

- To provide a strong foundation of fundamental concepts in Artificial Intelligence
- To provide a basic exposition to the goals and methods of Artificial Intelligence
- To enable the student to apply these techniques in applications which involve perception, reasoning and learning.
- To learn and understand the knowledge representation techniques for knowledge base.
- Mapping with PEOs :- III, IV, (f)

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

i. Implement Tic-tack-toe problem using heuristic functions.
ii. Implement A* Algorithm with any example
iii. Implement AO* algorithm
iv Implement mini-max search to solve at least two game problems
iv. Implement the concept of constraint satisfaction problem
v. Implement the concept of Resolution in knowledge Representation.
vi. Implement Goal stack planning
vii. Implementation of truth maintenance system using prolog
viii. Development of mini-expert system using prolog

Text Books

1. "Artificial Intelligence", Eiaine Rich and Kerin Knight,Tata McGraw Hill,ISBN 0-07-460081-8.
2. "Artificial Intelligence : A Modern Approach", Stuart Russell & Peter Nerving Pearson Education, 2nd Edition.

Reference Books

1. "Prolog Programming For Artificial Intelligence" , Ivan Bratko , 2nd Edition Addison Wesley, 1990.
2. "Introduction to Artificial Intelligence.", Eugene, Charniak, Drew Mcdermott, Addison Wesley

Additional Reading

1. "Introduction to AI and Expert Systems", Patterson,PHI
2. "Principles of Artificial Intelligence", Nilsson,Morgan Kaufmann.
3. " Artificial Intelligence and Intelligent Systems", N.P. Padhy, OXFORD, 2005

FF No. : 654

CS42219:: INFORMATION RETRIEVAL

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

Prerequisites: Data Communication.

Objectives:

- To understand some of the common data link layer protocols.
- To learn various routing algorithms.
- To understand various protocols used at different layers.
- Mapping with PEOs :- III, (e)

List of Contents

A TERM-WORK containing the record of the following:

A. Assignments :

1. Write a program for text retrieval using fuzzy set model.
2. Write a program for text retrieval using probabilistic model.
3. Write a program for keyword based text retrieval.
4. Write a program for text retrieval using pattern matching.
5. Write a program for creating inverted index file.
6. Study of multimedia retrieval.
7. Study of search engine architecture.

Text Books

1. "Modern Information Retrieval", by Ricardo Baeza-Yates, Berthier Ribeiro-Neto, Addison Wesley Longman Publishing Co. Inc, ISBN:020139829X, 1999.
2. "Introduction to Information Retrieval", by Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Introduction to Information Retrieval, Cambridge University Press. ISBN: 0521865719, 2008.

Reference Books

1. "Information Retrieval", C. J. Van Rijsbergen, Information Retrieval Group, University of Glasgow, online at http://www.dcs.gla.ac.uk/Keith/Preface.html.
2. "Information Retrieval Data Structures & Algorithms" by Bill Frakes, Ricardo Baeza-Yates, Prentice-Hall, ISBN 0-13-463837-9, 1999.

FF No. : 654

CS42221:: COMPUTER ARCHITECTURE

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

Objectives:

1. To build analytical thinking
2. To understand the practical implementation of parallelism with problem solving.
3. To study Compute Unified Device Architecture and implement parallel algorithms
4. Mapping with PEOs :- I, II, (b)

Course Instructor will assign problems relevant to Units I to V. Students will implement the assignments in laboratory. Group of 2-3 students will be given different problems and will have to present it for assessment

1. Problems from Chapters 1 , 2 , 3 (Text book 1.)
2. Problems from Chapters 6 , 7 , 8 (Text book 1.)
3. Simulate a SIMD Machine with programmable PE s and solve Sorting problems.
4. Implement prefix , dot product computation in CUDA
5. Matrix operations in CUDA and simulation on Hypercube.
6. Case Studies of current supercomputers.

FF No. : 654

CS42223:: BUSINESS INTELLIGENCE

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

Prerequisites: : Database Management Systems.

Objectives:

- To understand the technology and processes associated with Business Intelligence framework.
- To demonstrate understanding of Data Warehouse implementation methodology and project life cycle.
- To understand how to identify the metrics, indicators and make recommendations to achieve the business goal for a business scenario.
- Mapping with PEOs: IV, V, (h), (i).

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

1. Design a multi dimensional data model using star/ snowflake schema technique for any business fact corresponding to a department of an organization.
2. Implement the designed schema and create cubes using SSAS.
3. Create two distinct data sources (e.g. text file, relational database and Excel, etc) and apply ETL process using SSIS to load data in the created cube.
4. Use SSRS functionalities to generate reports analyzing the designed cube.

Text Books

1. "Business Intelligence", David Loshin, Morgan Kaufman, ISBN 978-1-55860-916-7, 2003 Edition.
2. "Data Mining: Concepts and Techniques", Jiawei Han and Micheline Kamber, Morgan Kaufman, ISBN 978-81-312-0535-8, 2nd Edition.

Reference Books

1. "Business Intelligence for the Enterprise", Mike Biere, Pearson Education, ISBN 0-13-141303-1, 2003 Edition.
2. "Business intelligence Roadmap", Larissa Terpeluk Moss, Shaku Atre, Pearson Education, ISBN 0201784203, 2003 Edition.

FF No. : 654

CS41305 :: DATA ACQUISTION SYSTEMS

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

Prerequisites:

Objectives:

- To study programming model of MCS-51 and
- I/O interfacing of sensors with MCS-51.
- Mapping with PEOs :- II, III, (c)

List of Practical

1. Introduction of MCS-51 training kit
2. Interfacing of I/O devices with MCS-51
    a. switches
    b. LED's etc.
3. Write MCS-51 program to use timer in interrupt mode.
4. OpAmp applications I
    a. i OpAmp as amplifier (inverting and non inverting)
    b. ii. OpAmp as adder and subtractor
5. OpAmp applications II
6. Integrator and differentiator
7. High pass filter and Low pass filter
8. Interface LCD with MCS-51.
9. Interface sensors (thermal, optocoupler etc.)with MCS-51.
10. Interface sensors (magnetic)with MCS-51.
11. Interface R_2R ladder with MCS-51.
12. Assignment based on PLC.

Text Books

1. "The 8051 Microcontroller and embedded systems", Mazidi M., Gillispie J., Pearson ISBN - 81-7808-574-7S, second education.
2. "Process control instrumentation", C.D. Johnson, Pearson education, ISBN-81-7758-410-3, seventh edition.

Reference Books

1. "Instrumentation Devices and System", Ranjan, G .R. Sarma, V.S.V. Mani, Tata McGraw-Hill, ISBN-0-07-463350-3, 2nd Edition.
2. "Opamp and linear integrated circuits", Ramakant Gaikwad, PHI publication, ISBN- 9780132808682, 4th edition.

FF No. : 654

CS42304:: NEURAL NETWORKS

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

Prerequisites:

Objectives:

- To give design methodologies for artificial neural networks.
- To demonstrate neural network applications on real-world tasks.
- Mapping with PEOs :- III, IV, (f)

List of Practical

1. Implement any classification problem using Single Layer Perceptron.
2. Design a Perceptron Network for handwritten digit recognition.
3. Design a Backpropogation Network for any real time application.
4. Design a Kohonen network for any real time application.
5. Implement the concept of Associative memory using Hopfield Network.
6. Implement the concept of ART.
7. A Mini Project using ANN.

Text Books

1. "Principles of Artificial Neural Networks", Daniel Graupe, World Scientific Publishing, ISBN 13-978-981-270-624-9, 2nd Edition.
2. "Artificial Neural Networks", B. Yegnanarayana, PHI Learning Private Limited, ISBN 978-81-203-1253-1, 2010 Edition.

Reference Books

1. "MATLAB Programming for Engineers", Stephen J. Chapman, Thomson Learning, ISBN981-254-893-9, 3rd Edition.
2. "Introduction to Artificial Neural Systems", Jacek M. Zurada, Jaico Publishing House, ISBN81-7224-650-1, 2006 Edition.

FF No. : 654

CS42303:: PARALLEL COMPUTING ON GPU

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

Prerequisites: Nil

Objectives:

1. Students will be able to detect parallelism in a given problem
2. Students can design parallel algorithm for a given problem for GPU
3. Students will be able to write parallel programs to execute on GPU
4. Mapping with PEOs: II, III, (c).

List of Practical

1. Parallel GPU implementation of vector-vector operations
2. Parallel GPU implementation of vector-Matrix operations
3. Parallel computation of binomial coefficient matrix
4. Parallel GPU implementation of Matrix-Matrix operations
5. Assignment focusing on optimization of data transfer between CPU and GPU:using page locked host memory and to avoid the data transfer
6. Assignment focusing on memory optimization: use of GPU shared, constant and texture memory.
7. Parallel GPU implementation involving kernel looping.
8. Parallel computation of set of multi-indices on GPU.

Text Books

5. CUDA: Programming Massively Parallel Processors: A Hands-On Approach. Authors: David Kirk, Wen-mei Hwu © ELSEVIER Inc.
6. CUDA by Example: An Introduction to General-Purpose GPU Programming by Jason Sanders and Edward Kandrot
7. Parallel Programming in C with MPI and OpenMP by Michael J. Quinn, Tata McGraw-Hill Edition
8. Advanced computer architecture by Kai Hwong, Tata McGraw-Hill Edition, 2001

References:

1. http://developer.nvidia.com/
2. www tutorials on introduction to parallel computing
3. Other references suggested by instructor

FF No. : 654

CS42305 :: MOBILE COMPUTING

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

Prerequisites: Computer Networks

Objectives:

- Understand the basic of mobile communication.
- Understand the gaming applications on mobile.
- Understand the transfer of files in mobile network.
- Mapping with PEOs :- I,V, (j)

List of Practical

Assignments should be implemented on android operating systems.

1. Design simple GUI application with activity and intents e.g. calculator.
2. Design an application to handle address book and call log.
3. Design an application to display map with current location.
4. Design an application to send SMS and emails.
5. Design a client server application to communicate with database server.
6. Design an application for voice calling over IP.
7. Design an application for sending files.
8. Design a gaming application.
9. Design GSM network of 5 nodes and implement handoffs.
10. Design a GSM network and access the channel using ALOHA.

Text Books

1. "Beginning Android Application Development", Wei-Meng Lee, Wrox publication, ISBN: 978-1-118-01711-1, March 2011.
2. "Mobile Communications", Jochen Schiller, 2nd edition, Pearson education, ISBN- 81-297-0350-5.

Reference Books

1. "Wireless and Mobile Network Architectures", Yi-Bing Lin, Imrich Chlamtac, Wiley publication, ISBN-9971-51-366-8.
2. "Mobile Computing", Raj Kamal, Oxford University press, ISBN 978-0-19-568677-7

FF No. : 654

CS42302:: IMAGE PROCESSING

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

Prerequisites: Nil

Objective:

List of Practical

All the assignments should be done using 'MATLAB '.
Optional support of 'C 'may be used.

1. Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP.
2. Study of statistical properties- mean, standard deviation, profile, variance and Histogram Plotting.
3. Histogram equalization & modification.
4. Gray level transformations such as contrast stretching, negative, power law transformation etc.
5. Spatial Domain filtering- smoothing & sharpening filters.
6. DCT/IDCT of given image.
7. Edge detection using Sobel, Prewitt and Roberts operators.
8. Morphological operations- erosion, dilation, opening & closing on binary image.
9. Pseudo coloring.
10. Creating noisy image and filtering using MATLAB.

Text Books

1. "Digital Image Processing", Rafael Gonzalez & Richard Woods, Pearson publications, ISBN 0132345633, 3rd Edition.
2. "Fundamental of Digital Image Processing", Anil K. Jain, PHI publication, ISBN 13: 9780133361650, 5th Edition.

Reference Books

1. "Digital Image Processing", William Pratt, Wiley Publication, ISBN 0-471-37407-5, 3rd Edition.
2. "Introduction to Matlab 7 for Engineering", William J.Palm, McGraw Hill Publication, ISBN 0072922427, 2nd Edition.

CS47303 :: PROJECT STAGE 2

Credits: 04 **Teaching Scheme: -** 6 Hrs/Week

Aim

This course addresses the issues associated with the successful management of a software development project. The course emphasizes project life cycle phases requirement engineering, system analysis and system design. A further aim is for students to heighten personal awareness of the importance of developing strategies for themselves and their career. The Project Work can lead to:

a. Transform existing systems into conceptual models.
b. Transform conceptual models into determinable models.
c. Use determinable models to obtain system specifications.
d. Select optimum specifications and create physical models.
e. Apply the results from physical models to create real target systems.

Objectives

1. To provide an understanding of the project planning process and problem scoping
2. To define roles and work with cross functional teams
3. To establish clear project objectives and milestones
4. To create effective and deliverable project plans
5. To perform rigorous analysis and design activities for solution planning
6. To select appropriate technology for implementation and testing
7. Mapping with PEOs :- – III, IV, (f)

Overview of the Course:

1. The Student Project Group is expected to make a survey of situation for identifying the requirements of selected Technological Problem. The Student Project Group will be monitored by Internal Guides and External Guides (if any).
2. The project requires the students to conceive, design, implement and operate a mechanism (the design problem). The mechanism may be entirely of the student's own design, or it may incorporate off-the-shelf parts. If the mechanism incorporates off-the-shelf parts, the students must perform appropriate analysis to show that the parts are suitable for their intended purpose in the mechanism.
3. The project must be open-ended – meaning that there is not a known correct answer to the design problem. Students are expected to apply their creativity (simply copying or re-creating something that already exists is not acceptable).

4. The project must have an experimental component. Students must conceive, design, implement and operate an appropriate experiment as part of the project. The experiment might be to collect data about some aspect of the design (i.e., to verify that the design will work as expected). Alternatively, the experiment could be to verify that the final mechanism performs as expected.
5. Upon receiving the approval, the Student Project Group will prepare a preliminary project report consisting Requirement Definition Document, Feasibility Study Document, System Requirement Specification, System Analysis Document, Preliminary System Design Document. All the documents indicated will have a prescribed format.
6. The Project Work will be assessed jointly by a panel of examiners having more than Five Years experience. The Project Groups will deliver the presentation of the Project Work which will be assessed by the panel.
7. The Student Project Group needs to actively participate in the presentation. The panel of examiners will evaluate the candidate's performance based on presentation skills, questions based on the Project Work, understanding of the Project, analysis and design performed for the project.
8. The Student Project Groups are expected to work on the recommendations given by the panel of examiners. In no case any variation in Project Theme will be permitted.

Assessment Scheme

Sr. No.	Content	Marks
1	System Requirement Specification	20
2	Feasibility Study	10
3	System Analysis	30
4	System Design	30
5	Presentation of the Project Work	10

Outcomes:

Upon completion of the course, the students will be to:

1. Identify major issues in complex situations; and know how to prepare alternative solutions and make decisions.
2. Becoming aware of the need to think and act in an entrepreneurial manner by developing the ability to: critically and creatively understand innovations and development, work independently and collaboratively.

Note:
The student needs to identify a technological problem in the area of Computer Engineering or Information Technology of their choice and address the problem by formulating a solution for the identified problem. The project work needs to be undertaken by a group of maximum FOUR and minimum of THREE students. The Project work will be jointly performed by the project team members.
The Project Group will prepare a synopsis of the project work which will be approved by the concerned faculty member. The project should not be a reengineering or reverse engineering project. In some cases, reverse engineering projects will be permissible based on the research component involved in it. The project work aims at solving a real world technical problem. Hence ample literature survey is required to be done by the students. Application-oriented projects will not be acceptable. Low-level custom User Interface development and its allied mapping with a particular technology will not be accepted.
Following is the list of recommended domains for Project Work:

Computer Networks	Image Processing
Operating Systems	Artificial intelligence
Network Security	Expert Systems
Digital Signal Processing	Object Oriented Systems
Systems Programming	Modeling and Design
Real Time Systems	System Testing
Embedded systems	Storage Management
Cluster Computing	Client-Server Computing
Mobile &Wireless Communications	Cloud Computing
Multimedia Systems	Protocol Engineering

MODULE VII

Structure, B.E. (Module VIII)

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_5	CS40104	Software Testing & Quality Assurance	3	0	0	3
S_6	CS40108	Network Secuirty	3	0	0	3
S_7	 CS42107 CS42101 CS42108 CS42110	ELECTIVE III Software Design and Architecture Advanced Computer Graphics Systems Programming Multimedia Systems	3	0	0	3
S_8	 CS42113 CS42114 CS42116 CS42118 CS42122 CS42124	ELECTIVE IV Digital Signal Processing Product Design Convergence Technologies Geographical Information Systems Design and Analysis of Algorithms Algorithmic Number Theory and Algebra	3	0	0	3
T_3	CS40204	Software Testing & Quality Assurance	0	1	0	1
T_4		ELECTIVE IV	0	1	0	1
P_3	CS40308	Network Secuirty	0	0	2	1
P_4		ELECTIVE III	0	0	2	1
PS_3	CS47308	PROJECT STAGE 3 (B.E. Semester II) Irrespective of Module	0	0	8	6
		Total	12	2	12	22

FF No. : 654

CS 40104:: SOFTWARE TESTING & QUALITY ASSURANCE

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

Prerequisites: Software Engineering

Objectives:

- To understand Software Measurement Theory and Software Test Automation
- To practice Software Testing Techniques and Strategies
- Understand the fundamental concepts, approaches, and methodologies in software quality management and assurance.
- Understand the framework and general approach of several Quality System Standards and Total Quality Management (TQM).
- Mapping with PEOs :- III ,(e).

Unit I **(7+1 Hrs)**
Software Measurement

A. Measurement Theory and Why to Measure the Software, Measurement and Models, Measurement Scales, Classification of Software Measures, Measurement Framework, Aspects of Software Size, Software Length and Reuse, Software Functionality and Complexity, Types of Structural Measures, Control Flow Structures, Halstead's Software Science, Product Quality Metrics, In-Process Quality Metrics, The Rayleigh Model, Exponential Distribution and Reliability Growth Models

B. SRE process, Reliability Concepts: Hardware and Software, Deploying SRE

Unit II **(9+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

Unit III **(8+1 Hrs)**
Functional Testing

A. Test Plan, Test Management, Test Execution and Reporting, Test Specialist Skills, Tester's Workbench and Tool Categories, Test Maturity Model and Test Process Assessment**,** Debugging & Root Cause Analysis, Software Items, Component & Units, Test Bed, Traceability and Testability, Attributes of Testable Requirements, Test Matrix, Benefits of Formal Test Documentation, Types of Testing Documentation, Verification Testing, Validation Testing, Integration Testing, System and Acceptance Testing, GUI Testing, , Regression Testing
B. Software Defects: Origins of Defects, Defect Classes, Defect Repository / Test Design, Developer/Tester Support for Defect Repository, Need for Testing

Unit IV **(9+1 Hrs)**
Higher Order Testing

A. Specification Based Testing, Performance Testing, Ad-hoc Testing, Usability and Accessibility Testing, Risk-based Testing, Exploratory Testing, Scenario-based Testing, Random Testing Compatibility Testing, User Documentation Testing, Client –Server System Testing, RAD Testing, Configuration Testing, Testing internal Controls, Multiplatform Environment Testing, Security Testing, Web-based System Testing, Testing VS Test Automation, Tool evaluation and selection, Automation team roles, Architectures, Planning and implementing test automation process
B. IEEE Standards Related to Testing, ISO 12207 & IEEE/EIA Std12207on Testing, ISO 9000:2000 on Testing, ISO 9003, IEEE Std 1012, IEEE Std 1028

Unit V **(7+1 Hrs)**
Software Quality Assurance

A. Quality Concepts, Software Quality Assurance, Planning for SQA, Six Sigma Principles, Malcolm Baldridge Assessment, Edward Deming's Principles, Total Quality Management, Product Quality Metrics, In-Process Quality Metrics, Ishikawa's Seven Basic Tools, Using Agile Methods to Improve Software Testing, Building Agility into the Testing Process, Software Maintenance, Purpose of Inspection, Cost of Inspections, Defect Detection and Prevention, Feedback, Feed-forwards and Control, Flow of Inspection Process, Activities of Inspection, Economics of Inspections
B. Software Benchmarks and Baselines, Key Factors for Software Assessment and Benchmark Studies, Identifying Software Best and Worst Practices

Text Books

1. Fenton, Pfleeger, "Software Metrics: A Rigourous and practical Approach", Thomson Brooks/Cole, ISBN 981-240-385-X.
2. Desikan, Ramesh, " Software Testing: principles and Practices", Pearson Education, ISBN 81-7758-121-X.

Reference Books

1. Burnstein, "Practical Software Testing", Springer International Edition, ISBN 81-8128-089-X
2. William E. Perry, " Effective Methods for Software Testing", John Wiley and Sons, ISBN 9971-51-345-5

Additional Reading

1. Nina Godbole, "Software Quality Assurance: Principles And Practice",Alpha Science International, Ltd (August 1, 2004) ISBN-10: 1842651765 ISBN-13: 978-1842651766
2. Ronald Radice, "Software Inspections", Tata McGraw Hill, ISBN 0-07-048340-X
3. Capers Jones," Software Assessments, Benchmarks, and Best Practices" ,*Burlington, Vermont* Publisher: Addison-Wesley Professional 2000 ISBN-10: 0201485427 ,ISBN-13: 9780201485424.

FF No. : 654

CS40108 :: NETWORK SECURITY

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

Prerequisites: Computer Networks.

Objectives:

- To understand various attacks in the network.
- To learn various cryptographic techniques.
- To understand authentication techniques.
- Mapping with PEOs :- IV,V,(i).

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

A. Protocol Vulnerabilities: DoS and DDoS, session hijacking, ARP spoofing, Pharming attack, and wireless LAN vulnerabilities.
Software vulnerabilities: Phishing, buffer overflow, formatted string attack, Cross-site scripting attack. Virus and Worm Features, Internet Scanning Worms.

B. Protocol analyzer (Wireshark), Spoofing tool.

Unit II **(8+2 Hrs)**
Private key cryptography

A. Mathematical background for cryptography: modulo arithmetic, GCD (Euclids algorithm), algebraic structures (Groups, Rings, Fields, Polynomial Field). Data Encryption Standard: Fiestel structure, round function, modes of operation. Message authentication code (MAC), Attacks on DES, linear cryptanalysis.
B. Chinese remainder theorem, Elementary Ciphers (Substitution, Transposition and their Properties).

Unit III **(8+2 Hrs)**
Public key cryptography

A. RSA: Key generation in RSA, mathematics behind RSA, practical issues in RSA, attacks on RSA, Public Key Cryptography Standards (PKCS), Key management (digital certificate, public key infrastructure).
Cryptographic hash: properties, applications (hashed based MAC, digital signature), performance, attacks**.**
Diffie-Helleman key exchange: protocol, parameter choice, attack.

Elliptic Curve Cryptography (ECC): equation of a curve, find the inverse, ECC over prime fields, ECC over binary field.
B. Diffie-Hellman key exchange on EC Groups, EC- based digital signature.

Unit IV **(8+1 Hrs)**
Authentication and access control

A. Authentication: One-Way Authentication, Mutual Authentication, Dictionary Attacks, Centralized Authentication, The Needham-Schroeder Protocol, Kerberos.
Access Control in Operating Systems: Discretionary Access Control, Mandatory Access Control, Role Based Access Control.
B. Recent trends in Operating system.

Unit V **(8+1 Hrs)**
Applying security

A. Network layer security: IPSec for IPV4 and IPV6.
Transport layer security: SSL and TLS.
Application layer security: Security services, web security considerations, and S/MIME, PGP, PEM, Https, Honey pots, VPN.
B. Cyber laws.

Text Books

1. Bernard Menezes, "Network Security and Cryptography", Cengage Lerning, 1st Edition, 2010, ISBN 81-315-1349-1.
2. William Stallings, "Cryptography and Network Security-Principles and Practices" Pearson Education, 4th Edition, 2006, ISBN 81-7758-774-9.

Reference Books

1. Matt Bishop, "Computer Security: Art and Science", Pearson Education, 1st Edition 2002, ISBN 0201440997.
2. Charlie Kaufman, Radia Perlman and mike speciner, "Network security, private communication in a public world", Prentice Hall, 2nd Edition, 2002, ISBN 9780130460196.

Additional Reading

1. Christopher M. King, Curtis Patton and RSA press, "Security architecture, design deployment and operations", McGraw-Hill, 1st Edition , 2001, ISBN 0072133856.
2. Stephen northcatt, leny zeltser, et al, 'INSIDE NETWORK Perimeter Security" Pearson Education Asia, 1st Edition, ISBN 8178087618.

F No. : 654

CS 42107:: SOFTWARE DESIGN AND ARCHITECTURE

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

Prerequisites: Software Engineering

Objectives:

- To describe what patterns are, how to use them, and why they are important.
- To understand contribution of patterns towards the design process efficiency
- To trace the relationship between patterns and traditional methods
- To learn the relationship among patterns, frameworks, object-oriented languages, and software architecture
- To identify fundamental and advanced concepts of design and architectural patterns
- To Structure systems by applying architectural patterns
- To focus on Archetypes and Architecture Documentation
- Mapping with PEOs :- I, V, (j).

Unit I **(8+1 Hrs)**
Introduction to Software Architecture and Design

A. Software Architecture Vs Software Design, Software Architecture Relationships to Other Disciplines, Foundations of Software Architecture, Software architecture in the context of the overall software life cycle ,Role of Software Architect, Architectural Styles, Architectural Frameworks, Designing, Describing, and Using Software Architecture, IS2000: The Advanced Imaging Solution, Global Analysis, Conceptual Architecture View, Module Architecture View, Execution Architecture View, Code Architecture View.
B. CASE study of Architectures: Air traffic control case study, Flight simulation case study, SOA, SOMF, TOGAF, CORBA, EJB.

Unit II **(8+1 Hrs)**
Architectural Patterns and Design Patterns

A. Introduction to software Patterns: Architectural Patterns, Design Patterns and Idioms. Architectural Patterns: Blackboard, Pipe and filter, Design Patterns proposed by GoF: Creational Patterns, Structural Patterns, and Behavioral Patterns. Design Patterns proposed by Buchman: Object Management Patterns Adaptation Patterns, Communication Patterns, Patterns for Distribution, Patterns for Interactive Systems, Adaptable Systems, Analysis Patterns.
B. Design patterns in java, software design anti-patterns.

Unit III **(8+1 Hrs)**
Enterprise Architecture Patterns

A. Layering, Organizing Domain Logic, Mapping to Relational Databases, Web Presentation, Domain Logic Patterns, Data Source Architectural Patterns, Object-Relational Behavioral Patterns, Object-Relational Structural Patterns, Object-Relational Metadata Mapping Patterns, Web Presentation Patterns, Distribution Patterns, Offline Concurrency Patterns
B. TADG Architecture Patterns, IBM Patterns for e-business

Unit IV **(8+1 Hrs)**
Enterprise Architecture Integration

A. Defining EAI, Data-Level EAI, Application Interface-Level EAI, Method-Level EAI, User Interface-Level EAI, The EAI Process, An Introduction to EAI and Middleware, Transactional Middleware and EAI, RPCs, Messaging, and EAI, Distributed Objects and EAI, Database-Oriented Middleware and EAI, Java Middleware and EAI, Implementing and Integrating Packaged Applications, XML and EAI, Message Brokers, Process Automation and EAI.
B. Enterprise Integration Patterns

Unit V **(8+1 Hrs)**
Archetype Patterns

A. Archetypes and Archetype Patterns, Model Driven Architecture with Archetype Patterns. Literate Modeling, Archetype Pattern, Customer Relationship Management (CRM) Archetype Pattern, Product Archetype Pattern, Quantity Archetype Pattern, Rule Archetype Pattern
B. Application of archetypes in a particular domain to understand pattern mapping.

Text Books

1. Erich Gamma, Richard Helm, Ralph Johnson,"Design Patterns: Elements of Reusable Object-Oriented Software" (Addison-Wesley Professional Computing Series) ,John Vlissides, Publisher: Addison-Wesley Professional, 1st edition (January 15, 1995) , ISBN-10: 0201633612 ISBN-13: 978-0201633610

2. Martin Fowler ,"Patterns of Enterprise Application Architecture", Addison-Wesley Professional, 2003, ISBN-10: 0321127420 ISBN-13: 9780321127426

Reference Books

1. Paul Clements, Felix Bachmann, Len Bass, David Garlan,Documenting Software Architectures: Views and Beyond Addison-Wesley Professional 2003, ISBN-10: 0201703726, ISBN-13: 9780201703726
2. Frank Buschmann, Hans Rohnert, Kevin Henney, Douglas C. Schmidt ,"Pattern-Oriented Software Architecture Volume 1, 2, 3, 4, 5", Publisher: Wiley, 1 edition (August 8, 1996-2004), ISBN-10: 0471958697, ISBN-13: 978-0471958697

Additional Reading

1. Fred A. Cummins ,"Enterprise Integration: An Architecture for Enterprise Application and Systems Integration", Wiley; 2002 ISBN-10: 0471400106 ISBN-13: 978-0471400103
2. David S. Linthicum, Enterprise Application Integration Addison-Wesley Professional 2003, ISBN-10: 1402052626

FF No. : 654

CS42101:: ADVANCED COMPUTER GRAPHICS

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

Prerequisites: Computer Graphics

Objectives:

- To learn about recent research advances in Computer Graphics, Computational Geometry, Interactive Techniques, and Visualization.
- To gain first-hand experience with the challenges of efficient and accurate modeling, rendering, and simulation, and the necessary data structures and algorithms.
- To explain the principles and techniques underlying 3D computer graphics and 3D API.
- To develop programming skills in 3D computer graphics.
- To introduce advanced techniques for 3D rendering and modeling.
- Implement key components of the rendering pipeline, especially visibility, rasterization, viewing, and shading.
- Mapping with PEOs :- V, (j).

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

A. OpenGL over windows, SDK, Extensions, GLUT, GLU, OpenGL primitives, Programming language: Blending, 3D viewing(camera analogy), Lighting model, Culling, Fog, Texture mapping.
B. OpenGL over Linux, pBuffer rendering, Shadowing Techniques.

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

A. Graphics card, Components of graphics card, General-Purpose computation**,** GPU, GPGPU**,** CUDA architecture, CUDA Programming: Type qualifiers, Execution configuration, vector types, functions, APIs.
B. How graphics card works? GeForce 6800 series GPU architecture.

Unit III **(8+1 Hrs)**
Advanced Rendering Techniques

A. Point based rendering, Mesh Simplification, Spatial partitioning, Solid Modeling, Subdivision surfaces: Catmull-Clark subdivision, Subdivision rules, Visibility Computation: culling types, cells and portals, hardware support.
B. Splines , Tessellation, 3D viewing.

Unit IV **(8+1 Hrs)**
Photorealistic and Volume Rendering

A. Global Illumination, Normals and reflections, Ray-Tracing algorithm and mathematical formulation, Photon mapping algorithm, Monte Carlo algorithm, Volume graphics overview, Direct volume rendering, Marching square algorithm.
B. Monte Carlo mathematical formulation, Marching cubes algorithm.

Unit V **(8+1 Hrs)**
Texture Synthesis and Image Processing

A. Texture synthesis**,** Image processing: Digital image representation, Image data structures, Sampling and Quantization, Image enhancement in spatial domain.
B. Image compression, Image synthesis.

Text Books

1. "Procedural Elements for Computer Graphics", Rogers David F.,Tata McGraw Hill, 2001, ISBN 0-07-047371-4.
2. "OpenGL Programming Guide: The Official Guide to Learning OpenGL", Mason Woo, Jackie, Tom Davis, Version 2.1, 6th Edition, Pearson Education, ISBN 978-81-317-2184-1.

Reference Books

1. "Computer Graphics", M Paulin Baker, Donald Hearn, PHI, 2001, ISBN 81-203-09440-8.
2. "Digital Image Processing", Rafael C. Gonzalez , Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8.

Additional Reading

1. "Computer graphics: A Programming approach", Harrington Steven, Tata McGraw Hill, ISBN 0-07-026753-7.
2. "Advanced Animation and Rendering Techniques : Theory and Practice", Alan H. Watt and Mark Watt, Addison-Wesley, acm press, ISBN: 0201544121.
3. "CUDA by Example: An Introduction to General-Purpose GPU Programming" , Jason Sanders, Edward Kandrot, Addition-Wesley, ISBN-13: 978-0-13-138768-3.

FF No. : 654

CS42108:: SYSTEMS PROGRAMMING

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

Prerequisites:
1. Data Structures
2. Computer Organization
3. C programming

Objectives:
1. To understand the concepts and components of Systems Programming
2. To Learn and understand the fundamentals of Operating systems.
3. Mapping with PEOs :- II, III, (d)

Unit I **(8+1 Hrs)**
Introduction to System Programming

A.System Software: Concept, introduction to various system programs such as Assemblers, Assembler design, Assembler design options, Loaders, Linkers, Macro Processors, Compilers, Interpreters, Operating Systems, Introduction to Device Drivers.System software machine architecture, the simplified instructional computer, Traditional machines - RISC machines. Machine dependent and machine independent Assembler features, Implementation.
B.Examples - AIX Assembler, Boot strap loaders and implementation examples- MS-DOS Linker, Sun OS linker

Unit II **(8+1 Hrs)**
Machine & Assembly Languages
A. Overview of the register set and instructions, Evolution from the 386 to Pentium 4 and beyond. Machine instruction set, assembly language, How to run simple assembly language programs under Linux and Windows. Many examples of assembly language code. Interfacing C and assembly language.
B. Instruction description, Pseudo operations, Instruction Mapping

Unit III **(8+1 Hrs)**
Encoding and Decoding

A. Encoding and decoding schemes for the X-86 processor, Covering the entire Instruction set and all Memory Addressing Formats. System Programming Examples: Operating system interfaces, Stack smashing.

B. Library Description for IA-32/Intel64.

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

Introduction to Linux

A. Introduction and essential concepts of LINUX system programming: System Programming, APIs and ABIs, standards, concepts of Linux programming. Program segments/sections; The ELF Format; Linking and loading; Linux dynamic libraries (shared objects); Multitasking and paging; Address translation; Memory Protection; Comparison with Windows.

B. Dynamic linking, API compatibility, Dynamically linked libraries, Overall architecture and limitations.

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

DirectX Programming

A. Types of Drivers, Driver History, Driver Issues, Writing a Driver, Device Driver Stack Buses and Physical Devices, PnP, Device Namespace, and Named Devices.
Direct X: History, Components, Compatibility, Architecture.

B. .Net Framework and DirectX

Text Books

1. "Systems Programming & Operating Systems", D M Dhamdhere, Tata McGraw Hill Publications, ISBN - 0074635794
2. "Systems Programming", John J Donovan, ISBN - 0070176035

Reference Books

1. "Introduction to 3D Game Programming with Direct X 9.0c: A Shader Approach", Frank Luna, Jones and Bartlett publication,ISBN- 1598220160
2. "Linux System Programming", Robert Love, O'Reilly,ISBN 978-0-596-00958-8

FF No. : 654

CS42110:: MULTIMEDIA SYSTEMS

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

Prerequisites: Nil

Objectives:

- To introduce students to the different media used and the design issues in multimedia systems with understanding of multimedia programming.
- To train students in the application of suitable evaluation techniques for multimedia systems.
- Provide an opportunity for students to apply design, implementation and evaluation concepts and techniques to the development of a realistic multimedia system.
- Mapping with PEOs :- II, III, (c)

Unit I **(8+1 Hrs)**
Introduction to multimedia

A. What is multimedia? characteristics of multimedia presentation, Multimedia building blocks, multimedia and internet, Multimedia architecture, Windows multimedia support, Hardware support, Distributed multimedia applications, Streaming technologies, Multimedia database systems, Multimedia authoring tools, overview of multimedia software tools.
Input-Output technologies: Key technology issue, Pen input, Video and image display system, Printout technology, Image scanner, Digital voice and audio, Full motion video.
B. Multimedia Document Architecture, (MHEG, SGML, ODA, OMF etc.), Multimedia applications.

Unit II **(8+1 Hrs)**
Text and Image

A. Text: Types of text, Text compression: Huffman coding, LZ & LZW, Text file formats: TXT, DOC, RTF, PDF, PS. Image: Image fundamentals, Image data types, image File formats, - (BMP, TIFF, JPEG, PCX etc), Enhancement by point processing, Spatial filtering.
Image compression: Types of compression: lossy & lossless, symmetrical & asymmetrical, intraframe & interframe Hybrid, Lossless: RLE, Shannon- Fano algorithm, Arithmetic coding. Lossy: Vector quantization, fractal compression technique, transform coding, psycho-analysis, and interframe correlation.

B. Hybrid: JPEG-DCT, MMDBS-Feature extraction of images.

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

A. Nature of sound waves, characteristics of sound waves, digital representation of audio, psychoacoustic, and elements of audio systems: Microphone, amplifiers, speakers, synthesizer, sound card, MIDI, digital audio, CD formats. Audio file formats: WAV, AIFF, VOC, AVI, MPEG Audio File formats, RMF, WMA etc.
B. MMDBS – Feature extraction of Audio.

Unit IV **(8+1 Hrs)**
Video

A. Video signal formats, Video transmission standards: EDTV, CCIR, CIF, SIF, HDTV, digitization of video, video recording systems: VHS, Video Compact Cassette, DVCAN, Camcorder, Lesser disc, VCD, DVD-video, micro-MV, Video file formats: MOV, RealVideo, H-261, H-263, cinepack. Nerodigtal, Video editing, DVD formats
B. MMDBS – Feature extraction of Video.

Unit V **(8+1 Hrs)**
Multimedia Application Design

A. Virtual reality design, Application workflow design issues, Distributed application design issues, Application like interactive, Television, Video conferencing, Video on demand.
VR devices: Hand Gloves, Head mounted tracking system, VR chair, CCD, VCR, 3D Sound system, Head mounted display. Virtual Objects, Basics of VRML.
Uses of animation, types of animation, principles of animation, Techniques of animation: Onion Skinning, Motion Cycling, masking, Flip Book animation, Rotoscoping & blue-
B. Creating animation using Flash, 3D-Max.

Text Books

1. "Principles of Multimedia", Ranjan Parekh, TMH, ISBN 0-07-058833-3
2. "Fundamentals of Multimedia", Li Ze-Nian, Drew Mark S., Pearson Education, 2004, ISBN 81-297-0438-2

Reference Books

1. "Digital Image Processing", Rafael C. Gonzalez , Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8
2. "Data Compression Book", Mark Nelson, 2nd edition, M & T Books ISBN 1-55851-434-1 541

Additional Reading

1. **"**Flash 8 Bible**",** Robert Reinhardt, Snow Dowd, acromedia, ISBN:9788126507375
2. "Foundation AS Animation: Making Things Move!", Keith Peters**,** Friends of ED publication, ISBN: 1590595181
3. "3ds max Animation and Visual Effects Techniques", Sanford Kennedy, 2nd edition, Charles River Media, ISBN:9788177224924

FF No. : 654

CS42113 :: DIGITAL SIGNAL PROCESSING

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

Prerequisites: Mathematical Transforms and Applications

Objectives:

- To understand how to analyze and manipulate digital signals in various domains and design digital filters.
- Mapping with PEOs :- II, III, (c)

Unit I **(8+1 Hrs)**
Introduction to signals and systems

A. Classification of Signals: Analog, Discrete-time and Digital, Basic sequences and sequence operations. Discrete-time (D.T) systems, Properties of D. T. Systems and Classification Linear Time Invariant Systems, impulse response, linear convolution and its properties, , DTS described by difference equations, Recursive and Non recursive, Relaxed and Non relaxed systems, Periodic Sampling, Sampling Theorem, Frequency Domain representation of sampling, reconstruction of a band limited Signal, A to D conversion Process: Sampling, quantization and encoding.
B. Properties of LTI systems, parallel and cascade connection, Correlation of DTS.

Unit II **(8+1 Hrs)**
Z and Fourier transforms

A. Z-transform, ROC and its properties, Inverse z transform by inspection, partial fraction and complex inversion, Z transform properties: multiplication by exponential sequence, Linearity, time shifting, frequency shifting, time reversal, convolution theorem initial value theorem, final value theorem, System Functions for LTI Systems: Stability and causality, inverse systems, significance of poles/zeros, Unilateral Z-transform: solution of difference equation with and without initial condition. Representation of Sequences by Fourier Transform, F. T. theorems: convolution theorem, and windowing theorem.
B. Symmetry properties of F. T, F. T. theorems: Linearity, time shifting, frequency shifting, time reversal, differentiation.

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

Frequency analysis of Signals and Systems

A. Frequency Response of LTI Systems: Ideal frequency selective filters, magnitude and phase response, group delay, Frequency Response for Rational System Functions: Frequency Response of a single zero or pole, Frequency response from pole-zero plot using simple geometric construction
Sampling the F.T., Fourier representation of finite-duration sequences, The Discrete Fourier Transform, Properties of DFT:circular shift, duality, symmetry, Circular Convolution, Linear Convolution using DFT, Effective computation of DFT and FFT, DIT FFT, Overlap and save algorithm, Inverse DFT using FFT(DIF)
B. Properties of DFT: Linearity,DIF FFT, Goertzel Algorithm, Inverse DFT using FFT(DIT)

Unit IV **(9+1 Hrs)**
Design of Digital Filters

A. Concept of filtering, Ideal filters and approximations, specifications, IIR filter design from continuous time filters: Characteristics of Butterworth, Cheybyshev approximations, impulse invariant and bilinear transformation techniques, Design examples, FIR filter design using windows: properties of commonly used windows, systems with Linear phase, Generalized Linear phase systems, Four Types of GLPS (TypeI), Design Examples, Design using Kaiser window, Comparison of IIR and FIR Filters .
B. Four Types of GLPS (Type II,III,IV),Examples on Filter Design (IIR & FIR)

Unit V **(7+1 Hrs)**
Realization of Filters

A. Block diagrams and Signal flow graph representation of LCCDE, Basic structures for IIR Systems: direct form, cascade form, parallel form, feedback in IIR systems, Basic Structures for FIR Systems: direct form, cascade form, structures for linear phase FIR Systems,
Detail Study of DSP chip architecture as an example of ADSP 21XX series and their desirable features.

B. Instruction set of ADSP 21XX series processor and some examples.

Text Books

1. "Digital signal processing", Proakis J., Manolakis D., Prentice Hall Publications ISBN 9780072957167, 3rd Edition.
2. "Discrete time signal processing", Oppenheim A., Schafer R., Buck J.,Prentice Hall *Publications*, ISBN 0-849-31093-8 2nd Edition

Reference Books

1. "Digital Signal Processing: A Computer Based Approach", Mitra S., Tata McGraw-Hill, ISBN 0-07-044705-5
2. "Digital Signal Processing", Vallavraj A., S Salivahanan, Tata McGraw-Hill, ISBN 0-07-463996, 2nd Edition

FF No. : 654

CS42114:: PRODUCT DESIGN

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

Prerequisites: Nil

Objectives:

- To understand design and development process for products
- To study effect of product development on business plans, team work and growth.
- Mapping with PEOs :- II, III, (c)

Unit I **(9+1 Hrs)**
Introduction and User Studies

A. Product Design, Products, Difference between Product and Service, Understanding of Problem Areas, Visual Design, User Segments, Specialized Users, Children, Physically Challenged and Colorblind Users, Illiterate and Old Users, Left-Handers, Accommodating Specialized Users into Product Design, User Studies, User Persona, Guidelines for User Studies, Developing Questionnaires, Interviewing Users, Observing Users, Photographic Studies of Products in Use, Role of Creativity in Understanding of Latent Needs.
B. Selection of a Product for Design Study such as Antivirus, Operating System, Mobile Phones, Web Browsers, Accounting Software etc.

Unit II **(7+2 Hrs)**
Design and Usability Evaluation

A. Design Methodology for Products, Services and Events, Design of Integrated Systems, Contextual Enquiry, Design Process, Three Pillars of Design, Guidelines for Product Development, Logical User Centered Iterative Design (LUCID), Ethnography, Ethnographic Observations and Research, Participatory Design, Design Issues, Human Information Processing, Human Memory, Fitt's Law, Hick's Law, Heuristic Evaluation, Cognitive Walkthroughs, User Testing Using Think Aloud Protocol, Task Analysis, GOMS, Measurable Human Factors.
B. Ethnographic and Cultural Study of Selected Product.

Unit III **(8+2 Hrs)**

Categorization of Products

A. Products for Future Use, Products to be Used in Groups, Devices used in Public Places, Products that Enrich User Experience, Embedded Products, Designer Products, Interfaces, Complexity of Interfaces, Design of Multi-Modal Interfaces, Expressive Interfaces, Natural Interfaces, Tangible Interfaces, Faulty Interfaces.
B. Classification of Selected Products and Possible Variances with Extended Features.

Unit IV (8+2 Hrs)
Design Management and Professional Practice

A. Designer, Designer Attributes, Role of a Designer, Designer Classification, Setting Up a Design Office, Location, Size, Legal Framework, Infrastructure, Organization of Supplies and Human Resources, Work Environment, Finding Clients, Business Correspondence, Advertising, Professionalism, Ethics, Need for Ethics, Unethical Practices, Cyber Crimes, Human Factors, Cognitive Psychology, Human Information Processing, Managing Teamwork, R&D Activities, Design Evaluation, IPR, Copyrights, Patents and Trademarks, Design Registration Laws and Procedure.
B. Identification of IPR (Copyrights, Patents and Trademarks) Issues with Selected Products**.**

Unit V (8+1 Hrs)
Product Life and Marketing

A. Defining Business Policy, SWOT Analysis, Study of Product Life Cycle, Stages - Introduction, Growth, Maturity, Decline, Evaluation Parameters, Monitoring of Sale and Competition, Assessing Market Potential, Market Research, Consumer Research and Demographic Aspects, Establishing Market Segment and Their Dimensions, Developing a Strategy to Introduce New Products, Developing a Product Plan, Pricing Policy, Factors Influencing Prices, Factors Influenced by Prices, Product Positioning.
B. Analysis of Prices and Related Pricing Policy for Selected Product.

Text Books

1. "The Design of Everyday Things", Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. "Product Design and Development", Karl Ulrich and Steven Eppinger, McGraw-Hill, 2004, ISBN 978-0072471465, 3rd Edition.

Reference Books

1. "Design Secrets: Products 2: 50 Real-Life Projects Uncovered", Industrial Designers Society of America, Edited by Lynn Haller, Cheryl Dangel Cullen, Publisher: Rockport Publishers, Oct 2004, ISBN 978-1592530717.

2. "The Design of Future Things", Donald A. Norman, Basic Books, ISBN 978-0-465-00227-6, 2007 Edition.

Additional Reading

1. "What is a Designer: Things, Places, Messages", Norman Potter, Publisher: Princeton Architectural Press, 2002, ISBN 978-0907259169, 4th Edition.
2. "History of Modern Design" David Raizman, Prentice Hall, 2004, ISBN 978-0131830400.

FF No. : 654

CS42116:: CONVERGENCE TECHNOLOGIES

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

Prerequisites: Computer Networks.

Objectives:

- To understand need of convergence.
- To learn various networks, and signaling in that network.
- To understand voice and data communication.
- Mapping with PEOs :- II, III, (c)

Unit I **(7+2 Hrs)**
Introduction to Convergence

A. what is network Convergence, the promise of network convergence, networking issues and convergence, Voice and data network characteristics, benefits of IP centric network, challenges of converged network, introduction to VOIP, applications of converged networks, VOIP implementation challenges.
B. voice and data network growth factor, effects of network convergence on businesses.

Unit II **(9+1 Hrs)**
Protocols and Standards for Convergence

A. Protocols Supporting VOIP: Multicast IP, RTP, RTCP, RSVP, RTSP, SDP, SAP, SIP.
Subscriber Lines: T1/T3, DS0, DS1, DS3, E1/E3.
Signaling Standards: H.323, SIP. Gateways, Gatekeepers.
B. MGCP, Audio and Video Codecs.

Unit III **(9+1 Hrs)**
Switching networks

A. ISDN: conceptual view of ISDN, transmission structure, user-network interface configuration, ISDN Protocol Architecture, ISDN connection, Addressing, Interworking, PRI, BRI, LAPD,
Basic Call control, SS7.
B-ISDN standards, Broadband services, B-ISDN architecture, B-ISDN protocol reference
B. ISDN standards, SDH.

Unit IV **(7+1 Hrs)**
Frame Relay and SMDS

A. Frame Relay Circuits, Frame mode protocol architecture, frame mode call control, LAPF, Congestion in frame relay networks, approaches to congestion control, Traffic rate management, Explicit congestion avoidance, implicit congestion control.
SMDS: introduction to SMDS, SMDS interface protocol, SMDS addressing.
B. Comparison of SMDS with other LAN technologies.

Unit V **(8+1 Hrs)**
ATM technology

A. ATM VPI& VCI, Creation of virtual channel, Definitions of Virtual circuit and permanent virtual circuit, ATM reference model, step-by-step PVC example of how ATM network processes cells, AAL, Adaption layer from voice over ATM perspective AAL1,AAL2, AAL3, Connection admission control (CAC). Cell Loss Priority (CLP), ATM and convergence technology.
B. ATM versus Frame relay, ATM versus SONET.

Text Books

1. "ISDN and Broadband ISDN with frame relay and ATM" by William Stallings, Pearson Education, 2003, ISBN 81-7808-422-8, 4th Edition.
2. "Voice over IP Technologies" by Mark A. Miller, P.E., Wiley Publications, 2002, ISBN 81-265-0286-X, 1st Edition.

Reference Books

1. "Computer Communications and Networking Technologies", by Michael A. Gallo, William M. Hancock, Cengage Learning, 2002, ISBN81-315-0364-X, 1st Edition.
2. "ATM network concepts and protocols", by Sumeet Kasera and Pankaj Sethi, Tata McGraw Hill, 2001, ISBN 0-07-463776-2, 1st Edition.

Additional Reading

1. "VOIP", by Ulyess Black, Pearson Education, 2001, ISBN 0130652040, 2nd Edition.
2. "Multimedia communication system techniques standards and networks", by K.R. Rao, Zoran Bojkovic and Dragorad Milovanovic, Pearson Education, 2002, ISBN 0-13031398-X, 1st Edition.

FF No. : 654

CS42118:: GEOGRAPHICAL INFORMATION SYSTEMS

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

Prerequisites: Nil

Objectives:

- To increase student awareness of GIS technology and provide opportunities to process, analyze and visualize spatial data and information.
- To understand the complexities of data manipulation, analysis, and mapping at different scales of space, time, and complexity.
- To study applications of GIS and Remote Sensing.
- Mapping with PEOs :- I, V,(j).

Unit I **(8+1 Hrs)**
GIS and Maps

A. Fundamentals of GIS: Roots of GIS, Overview of Information System, Four Ms, GIS Definition and Terminology, GIS Queries, GIS Architecture, Models of GIS, Framework for GIS, GIS Categories, Levels/Scales of Measurement. Map Language: Map as a Model, Classification of Maps, Spatial Referencing System, Map Projections, Commonly Used Map Projections, Grid Systems, Computer in Map Production, Digital Database in a GIS, Linkage of GIS to Remote Sensing
B. Selection of a GIS Application in Various Domains such as Weather Forecasting, Urban Planning, Agriculture, Defense, Network Applications.

Unit II **(8+2 Hrs)**
Remote Sensing Fundamentals

A. Remote Sensing - Basic Principles: Electromagnetic Remote Sensing, Energy Sources, Energy Interactions with Earth's Surface Materials, Microwave Remote Sensing: Radar Principle, Factors affecting Microwave Measurements, Radar Wavebands, SLAR Systems, Interpreting SAR Images, Geometrical Characteristics. Remote Sensing Platform and Sensors: Satellite System Parameters, Sensor Parameters, Imaging Sensor Systems, Earth Resources Satellites, Meteorological Satellites.
B. Study of Satellites such as IRS, OCEANSAT-1, IKONOS etc.

Unit III **(8+2 Hrs)**
Image Processing

A. Digital Image Processing: Basic Character of Digital Images, Preprocessing, Registration, Enhancement, Spatial Filtering, Transformations, Classification, Image Classification and GIS. Visual Image Interpretation: Types of Pictorial Data Products, Image Interpretation Strategy, Image Interpretation Process, Overview of Image
B. Study of GIS Hardware and Software required specially for Image Processing.

Unit IV **(8+2 Hrs)**
Spatial Data Modeling and Management

A. Spatial Data Modeling: Stages of GIS Data Modeling, Graphic Representation of Spatial Data, Raster GIS Models, Vector GIS Models, GIS Data Management: Database Management Systems, GIS Data File Management, Database Models, Storage of GIS Data Object based Data Models, Temporal Topology, Organizational Strategy of DBMS in GIS.
B. Design a Spatial Database for a Selected Application.

Unit V **(8+1 Hrs)**
Data Input, Quality and Analysis

A. Data Input and Editing: The Data Stream, Data Input Models, Data Input Methods, GPS for GIS Data Capture, Data Editing. Data Quality Issues: Components of Data Quality, Accuracy, Precision and Resolution, Consistency, Completeness, Sources of Error in GIS, GIS Output, Modeling Errors and Error Evaluation. Data Analysis and Modeling: Format Conversion, Data Medium Conversion, Spatial Measurement Methods, Buffering Techniques, Overlay Analysis, Modeling Surfaces.
B. Identification of Data Inputs Outputs and Study of Required Analytical Approach.

Text Books

1. "Remote Sensing and Geographical Information Systems", M. Anji Reddy B S Publications, Second Edition, 2006.
2. "Introduction to Geographic information systems", Kang-Tsung Chang, Tata-McGraw-Hill Publications, Third edition, 2006. ISBN: 978-0073101712.

Reference Books

1. "Principles of Geographical Information Systems", Peter A Burroughs and McDonnell, Oxford University Press, 1998. ISBN 978-0198233657.
2. "The GIS Book", George B Korte, Onward press (Thomson Learning), 5th Edition, 2001. ISBN 81-7800-112-8.

Additional Reading

1. Bolstad, Paul "GIS Fundamentals**."**, Eider Press. 2nd edition 2005. ISBN 978-0-9717647-2-9.

FF No. : 654

CS42122 : 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.

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.
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 81-203-21

FF No. : 654

CS42124:: ALGORITHMIC NUMBER THEORY AND ALGEBRA

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

Prerequisites: Basic introduction to linear algebra and abstract algebra (though it is not presumed) is helpful to better appreciate the contents of the course. First course on algorithms.

Objectives:

- Study basic number theory, various algebraic structures (such as groups, rings, fields, vector-spaces …etc) and their applications. These topics will be mainly studied in a computational perspective.
- Study various algorithms for several fundamental algorithmic questions in Number Theory and Algebra.
- Building up mathematical background and tools for further study in areas such as cryptography, computational number theory, computational complexity, coding theory.
- Mapping with PEOs I, II.

Unit I **(8+2 Hrs)**

Basic Number Theory

A. Infinitely many primes in Z(some proofs), greatest common divisor, unique factorization of integers, modular arithmetic, (some results on modular arithmetic: Fermat's little theorem, Wilson's theorem,… etc), linear congruences and Chinese Remaindering Theorem, linear Diophantine equations, some arithmetic multiplicative functions (e.g. Euler's phi function, Mobius function, divisor function…), Dirichlet convolution, Mobius inversion. Quadratic residues, Legendre symbol, Gauss' law of Quadratic reciprocity. Distribution of primes, Prime number theorem.

B. More Diophantine equations (e.g. Pell's equation), more results on distribution of primes(proving lower and upper bound(asymptotic) on pi(x), where pi(x) is number of primes upto x)

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

Basic abstract Algebra

A. Groups, subgroups, Lagrange's theorem, group homomorphism, quotient groups, normal subgroups, cyclic groups, Abelian groups and their decomposition, rings, ideals, some examples of rings (e.g. polynomial ring F[x], ring of integers modulo n), units and zero devisors in the ring, structure of unit group of Z_n, integral domains, fields, vector spaces. Unique factorization in ring k[x] where k is a field, Principal Ideal Domains(PID).
Basics of finite fields: existence of finite fields of size p^n for n>0, p prime, isomorphism of finite fields of same size, structure of multiplicative group, field automorphisms, Frobenius maps.

B. Ring of Gaussian integers Z[i] and Lagrange's four square theorem, analogies between ring of integers and univariate polynomial ring, more properties of finite fields.

Unit III **(8+2 Hrs)**
Number theoretic algorithms

A. Euclid's algorithm for GCD, Extended Euclid's algorithm, fast integer arithmetic, algorithms for modular arithmetic, fast exponentiation, finding modular inverse, finding order of element in a group, finding quadratic non-residues, algorithm for modular square-root, algorithms for discrete-log problem.
Univariate polynomial arithmetic (multiplication, gcd, etc), irreducibility testing for polynomials in F[x] where F is finite field, ring F[x]/(f), modular inverse computation.
B. Chinese Remaindering and computing determinant of integer matrix, Euclid's algorithm and Fibonacci numbers (a detailed analysis of Euclid's algorithm), Some more algorithmic questions over finite fields.

Unit IV **(9+2 Hrs)**
Polynomial Factorization

A. *Univariate polynomial factorization over finite fields:* revisit unique factorization, Randomized polynomial time algorithms:

a. Berlekamp's algorithm: linear algebra preliminaries for Berlekamp's algorithm, Frobenius map, the algorithm, resultants and some implications of Berlekamp's algorithm, parallel algorithm for computing gcd of polynomials.

b. Cantor-Zassenhaus algorithm: distinct degree and equal degree factorization, CRT and Cantor-Zassenhaus algorithm.

Geometry of Numbers and polynomial factorization over rationals: Basics on integer lattices, Minkowski's theorems, algorithmic questions over integer lattices (Closest Vector Problem and Shortest Vector Problem) Gauss' algorithm for SVP in 2 dimensions. Lenstra-Lenstra-Lovasz(LLL) approximation algorithm for SVP. Deterministic polynomial time algorithm for factorization of univariate polynomials over rational(using LLL and Hensel lifting lemma)

B. Reduction of polynomial factorization problem to root finding using Berlekamp's algorithm. Recent deterministic sub-exponential time algorithm for the problem.

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

A. Pratt's result: PRIMES in NP intersection coNP, randomized polynomial time algorithms:

a. Miller-Rabin primality test: Carmichael numbers, derandomizing Miller-Rabin test using Riemann Hypothesis, computing a factor of a number given phi(n) where phi is Euler's totient function.

b. Solovay-Stassen primality test: Jacobi symbol, quadratic reciprocity, Solovay-Strassen primality test.

Prime number theorem and generating large primes (application to RSA crypto system)

B. Agarwal-Kayal-Saxena(deterministic polynomial time) primality test.

Text Books

1. Modern Computer Algebra by Joachim von zur Gathen, Jürgen Gerhard (Cambridge)
2. A computational introduction to Number Theory and Algebra by Victor Shoup(Cambridge)
3. A classical introduction to modern number theory by Ireland and Rosen

(Springer)

Reference Books

1. Topics in Algebra by I. N. Herstein (Wiley Publishing company)
2. Algebra by Michael Artin (Pearson Prentice Hall)

FF No. : 654

CS 40204 :: SOFTWARE TESTING & QUALITY ASSURANCE

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

Prerequisites: Software Engineering

Objectives:

- To understand Software Measurement Theory and Software Test Automation
- To practice Software Testing Techniques and Strategies
- Understand the fundamental concepts, approaches, and methodologies in software quality management and assurance.
- Understand the framework and general approach of several Quality System Standards and Total Quality Management (TQM).
- Mapping with PEOs :- III, (e)

List of Contents

A TERM-WORK containing the record of the following:

1. To Prepare Test Plan for the given problem. The Test plan consists of following issues.
    a. Purpose of the test.
    b. Location and schedule of the test.
    c. Test descriptions.
    d. Pass and Fail Criteria.
2. To identify and narrate Test cases, Test scripts/procedures. To learn Test suite in manual testing using Rational Test Manager tool to explore testing basic concepts.
3. To study difference between Automation Testing and Manual Testing use Rational Robot and Rational Test Manager (Hands on).
4. To perform Unit testing especially indicating the traced Independent data paths, Control paths and Error handling paths. Prepare control flow graphs for the unit under test. Compute the Cyclomatic complexity of the unit.
5. To perform Data Flow testing for the Program Segments by identifying the Definition-Use chain and type of data flow anomaly.
6. To perform Mutation Analysis of the Program Segments along with mutant history, mutation score and type of mutation by using any Code analysis Tool (JUNIT).
7. To perform Black-Box Testing for all the units contained in the architectural segments using Equivalence Partitioning, Boundary Value Analysis and

Orthogonal Array testing methods.

8. To study exploratory Testing for the Module under Test and merits/demerits of this technique.
9. To study Regression Testing / GUI Testing of the System under construction with Unit and Integration profiles by using any Functional Testing Tool.
10. To study Web Based Testing for Web Application incorporating any Open Source Tool available. To study Performance Testing, Load Testing, Security Testing, Stress Testing, Demonstrate on link Test expectation.

Text Books

1. Fenton, Pfleeger, "Software Metrics: A Rigourous and practical Approach", Thomson Brooks/Cole, ISBN 981-240-385-X.
2. Desikan, Ramesh, " Software Testing: principles and Practices", Pearson Education, ISBN 81-7758-121-X.

Reference Books

1. Burnstein, "Practical Software Testing", Springer International Edition, ISBN 81-8128-089-X
2. William E. Perry, " Effective Methods for Software Testing", John Wiley and Sons, ISBN 9971-51-345-5

Additional Reading

1. Nina Godbole, "Software Quality Assurance: Principles And Practice",Alpha Science International, Ltd (August 1, 2004) ISBN-10: 1842651765 ISBN-13: 978-1842651766
2. Ronald Radice, "Software Inspections", Tata McGraw Hill, ISBN 0-07-048340-X
3. Capers Jones," Software Assessments, Benchmarks, and Best Practices" ,*Burlington, Vermont* Publisher: Addison-Wesley Professional 2000 ISBN-10: 0201485427 ,ISBN-13: 9780201485424

FF No. : 654

CS42213:: DIGITAL SIGNAL PROCESSING

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

Prerequisites:: Nil

Objectives:

- To understand how to analyze and manipulate digital signals in various domains
- Mapping with PEOs :- II, III, (c)

<u>List of Contents</u>

A TERM-WORK containing the record of the following:

Assignments :

1 Verification of sampling Theorem:

2 Linear Convolution

3 GDE

4 Correlation.

5 Pole Zero Implementation

6 Magnitude and Phase response of a system

7 DFT

8 Circular convolution

9 FFT Algorithms (DIT/DIF)

10 Design IIR filter using analog filter approximations

11 Designing FIR filters using windowing techniques

Students should implement the above assignments in Matlab .

Text Books

1. "Digital signal processing", Proakis J., Manolakis D., Prentice Hall Publications ISBN 9780072957167, 3rd Edition.
2. "Discrete time signal processing", Oppenheim A., Schafer R., Buck J., Prentice Hall *Publications*, ISBN 0-849-31093-8 2nd Edition

Reference Books

1. "Digital Signal Processing: A Computer Based Approach", Mitra S., Tata McGraw- Hill, ISBN 0-07-044705-5
2. "Digital Signal Processing", Vallavraj A., S Salivahanan, Tata McGraw- Hill, ISBN 0-07-463996, 2nd Edition

FF No. : 654

CS42214:: PRODUCT DESIGN

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

Prerequisites: : Nil

Objectives:

- To identify and incorporate key social, cognitive and physiological factors that influence user perceptions, understandings and usages of Information Technology.
- To motivate students for interviews and field-work with users for improved practical approach in interface/interaction based product design.
- Mapping with PEOs :- II, III, (c)

List of Contents

A TERM-WORK containing the record of the following:

Design a questionnaire for study of selected product.

1. Study specialized user population and their impact on the design of selected product.

2. Perform a GOMS analysis for any task(s) related with selected product.

3. Study faulty interfaces/interactions related with selected product.

4. Analyze the cybercrimes related with selected product and suggest preventive measures.

Text Books

1. "The Design of Everyday Things", Donald Norman, Basic Books, ISBN 100-465-06710-7, 2002 Edition.
2. "Product Design and Development", Karl Ulrich and Steven Eppinger, McGraw-Hill, 2004, ISBN 978-0072471465, 3rd Edition.

Reference Books

1. "Design Secrets: Products 2: 50 Real-Life Projects Uncovered", Industrial Designers Society of America, Edited by Lynn Haller, Cheryl Dangel Cullen,

Publisher: Rockport Publishers, Oct 2004, ISBN 978-1592530717.
2. "The Design of Future Things", Donald A. Norman, Basic Books, ISBN 978-0-465-00227-6, 2007 Edition.

Additional Reading

1. "What is a Designer: Things, Places, Messages", Norman Potter, Publisher: Princeton Architectural Press, 2002, ISBN 978-0907259169, 4th Edition.
2. "History of Modern Design" David Raizman, Prentice Hall, 2004, ISBN 978-0131830400.

FF No. : 654

CS42216:: CONVERGENCE TECHNOLOGIES

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

Prerequisites: : Nil

Objectives:

- To understand the next generation technology.
- Understand the switching techniques.
- Mapping with PEOs :- II, III, (c)

List of Contents

A TERM-WORK containing the record of the following:

Assignments :

1. Study of audio and video data.
2. Signal passing through network for voice data.
3. Study of E/T cables.
4. Study of gatekeepers in convergence technology.
5. Study of ISDN devices.
6. Study of SIP implementation.
7. Study of SS7 implementation.
8. Comparison of ISDN and B-ISDN.
9. Use of frame relay in convergence.
10. Examples on convergence

Text Books

1. "ISDN and Broadband ISDN with frame relay and ATM" by William Stallings, Pearson Education, 2003, ISBN 81-7808-422-8, 4th Edition.
2. "Voice over IP Technologies" by Mark A. Miller, P.E., Wiley Publications, 2002,

ISBN 81-265-0286-X, 1st Edition.

Reference Books

1. "Computer Communications and Networking Technologies", by Michael A. Gallo, William M. Hancock, Cengage Learning, 2002, ISBN81-315-0364-X, 1st Edition.
2. "ATM network concepts and protocols", by Sumeet Kasera and Pankaj Sethi, Tata McGraw Hill, 2001, ISBN 0-07-463776-2, 1st Edition.

Additional Reading

1. "VOIP", by Ulyess Black, Pearson Education, 2001, ISBN 0130652040, 2nd Edition.
2. "Multimedia communication system techniques standards and networks", by K.R. Rao, Zoran Bojkovic and Dragorad Milovanovic, Pearson Education, 2002, ISBN 0-13031398-X, 1st Edition.

FF: 654

CS42218::GEOGRAPHICAL INFORMATION SYSTEMS

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

Prerequisites: Nil

Objectives:

- To study applications of GIS & Remote Sensing
- To study Data Modeling and Analysis required by these systems.
- Mapping with PEOs :- I, V, (j).

List of Practical

A TERM-WORK containing the record of the following:

1. Prepare a map for the selected geographical area as per topological survey.
2. Design a spatial database for the entities related with a geographical area specified in above map.
3. Study the connectivity of maps with spatial databases.
4. Analyze a case study of any GIS application of your choice.
5. Prepare a presentation on any latest GIS technology / technique / software / hardware.

Text Books

1. "Remote Sensing and Geographical Information Systems", M. Anji Reddy B S Publications, Second Edition, 2006.
2. "Introduction to Geographic information systems", Kang-Tsung Chang, Tata-McGraw-Hill Publications, Third edition, 2006. ISBN: 978-0073101712.

Reference Books

1. "Principles of Geographical Information Systems", Peter A Burroughs and McDonnell, Oxford University Press, 1998. ISBN 978-0198233657.
2. "The GIS Book", George B Korte, Onward press (Thomson Learning), 5th

Edition, 2001. ISBN 81-7800-112-8.

Additional Reading

1. Bolstad, Paul "GIS Fundamentals.", Eider Press. 2nd edition 2005. ISBN 978-0-9717647-2-9.

FF No. : 654

CS42222:: DESIGN AND ANALYSIS OF ALGORITHMS

Credits: 01 **Teaching Scheme: -** Tutorial 1 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)

A Term work containing the following record:

1. Job Scheduling using Greedy Strategy.
2. Find the median using divide and conquer approach. Time complexity measure is to be obtained.
3. Minimal spanning Trees/ Job scheduling as an example of Greedy approach
4. Finding shortest path for multistage graph problem. (single source shortest path and all pairs shortest path.)
5. OBST/Flow Shop Scheduling as an example of dynamic programming.
6. Approximate algorithms for : Traveling Salesperson problem.
7. Knapsack problem using Greedy, Dynamic Programming, Backtracking and Branch & Bound Strategies.
8. 8-Queen problem/ Graph coloring problem: general backtracking method and recursive back tracking method and their comparison for space and time complexity.

9. A complete LC branch and bound algorithm for job sequencing with deadlines problem. Use fixed tuple size formulation.
10. Algorithm implementation for `Traveling salesman' problem using -
    Dynamic programming approach.
    Branch & Bound approach.
11. Simulation/ Implementation of any Parallel Algorithms.
12. Randomized Quick Sort and its analysis.

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

CS42224:: ALGORITHMIC NUMBER THEORY AND ALGEBRA

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

Prerequisites: Basic introduction to linear algebra and abstract algebra (though it is not presumed) is helpful to better appreciate the contents of the course. First course on algorithms.

Objectives:

- Study basic number theory, various algebraic structures (such as groups, rings, fields, vector-spaces …etc) and their applications. These topics will be mainly studied in a computational perspective.
- Study various algorithms for several fundamental algorithmic questions in Number Theory and Algebra.
- Building up mathematical background and tools for further study in areas such as cryptography, computational number theory, computational complexity, coding theory.
- Mapping with PEOs I, II.

List of Contents

A TERM-WORK containing the record of the following:

1. Problem solving based on topic like prime numbers, gcd of integers, some simple number theoretic questions
2. Modular arithmetic, Chinese remaindering applications
3. Multiplicative functions, analytical estimates of some number theoretic functions
4. Problem solving (based on topics Groups, subgroups, homomorphism, cyclic groups etc)
5. Ring, ideals, some examples of commutative rings
6. Vector spaces

7. Integral domains, finite fields
8. More on finite fields, automorphisms, Frobenius maps, some algorithmic questions..
9. Ring of univariate polynomials F[x], quotient ring F[x]/(f)
10. Berlekamp's algorithm and more
11. Integer lattices
12. Carmichael numbers, Lagrange symbol, Jacobi symbols, Primality testing.

Text Books

1. Modern Computer Algebra by Joachim von zur Gathen, Jürgen Gerhard (Cambridge)
2. A computational introduction to Number Theory and Algebra by Victor Shoup(Cambridge)
3. A classical introduction to modern number theory by Ireland and Rosen (Springer)

Reference Books

1. Topics in Algebra by I. N. Herstein (Wiley Publishing company)
2. Algebra by Michael Artin (Pearson Prentice Hall)

FF No. : 654

CS40308 :: NETWORK SECURITY

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

Prerequisites: Nil

Objectives:

- Analyze the packets
- To Understand various attacks
- To able to do encryption and decryption
- Mapping with PEOs :- IV, V, (c)

List of Practical

1. Study of DoS, DDOS attack.
2. Study of antivirus tool.
3. Demonstrate: SQL injection, Cross-site scripting, buffer overflow.
4. Implement packet sniffer.
5. Demonstrate: ARP spoofing, IP spoofing.
6. Implementation of DES.
7. Implementation of RSA.
8. Comparison of encryption time and decryption of RSA, DES, ECC.
9. Implementation of Diffie-Hellman key exchange algorithm.
10. Implement Hash algorithm.
11. Implementation of email security using PGP.
12. Kerberos simulation.

Text Books

1. Bernard Menezes, "Network Security and Cryptography", Cengage Lerning, 1st Edition, 2010, ISBN 81-315-1349-1.
2. William Stallings, "Cryptography and Network Security-Principles and Practices" Pearson Education, 4th Edition, 2006, ISBN 81-7758-774-9.

Reference Books

1. Matt Bishop, "Computer Security: Art and Science", Pearson Education, 1st Edition 2002, ISBN 0201440997.
2. Charlie Kaufman, Radia Perlman and mike speciner, "Network security, private communication in a public world", Prentice Hall, 2nd Edition, 2002, ISBN 9780130460196.

Additional Reading

1. Christopher M. King, Curtis Patton and RSA press, "Security architecture, design deployment and operations", McGraw-Hill, 1st Edition , 2001, ISBN 0072133856
2. Stephen northcatt, leny zeltser, et al, 'INSIDE NETWORK Perimeter Security" Pearson Education Asia, 1st Edition, ISBN 8178087618.

1.

CS 42307:: SOFTWARE DESIGN AND ARCHITECTURE

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

Prerequisites: Software Engineering

Objectives:

- To describe what patterns are, how to use them, and why they are important.
- To understand contribution of patterns towards the design process efficiency
- To trace the relationship between patterns and traditional methods
- To learn the relationship among patterns, frameworks, object-oriented languages, and software architecture
- To identify fundamental and advanced concepts of design and architectural patterns
- To Structure systems by applying architectural patterns
- To focus on Archetypes and Architecture Documentation
- Mapping with PEOs :- I,V, (j)

<u>List of Practical</u>

1. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Abstract Factory and Composite design patterns. State the complete pattern specification and note the difference between the patterns.

2. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Facade and Proxy design patterns. State the complete pattern specification and note the difference between the patterns.

3. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Flyweight and Iterator design patterns. State the complete pattern specification and note the difference between the patterns.

4. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Template and Command design patterns. State the complete pattern specification and note the difference between the patterns.

5. Select a moderately complex system and narrate concise specification for the same. Implement the system features using Mediator and Observer design patterns. State the complete pattern specification and note the difference between the patterns.

6. Select a complex system and narrate concise specification for the same. Develop architecture specification and use archetypes to recognize the architectural elements.

7.

Text Books

1. Erich Gamma, Richard Helm, Ralph Johnson, ,"Design Patterns: Elements of Reusable Object-Oriented Software" (Addison-Wesley Professional Computing Series) ,John Vlissides, Publisher: Addison-Wesley Professional, 1st edition (January 15, 1995) , ISBN-10: 0201633612 ISBN-13: 978-0201633610
2. Martin Fowler ,"Patterns of Enterprise Application Architecture", Addison-Wesley Professional, 2003, ISBN-10: 0321127420 ISBN-13: 9780321127426

Reference Books

1. Paul Clements, Felix Bachmann, Len Bass, David Garlan,Documenting Software Architectures: Views and Beyond Addison-Wesley Professional 2003, ISBN-10: 0201703726, ISBN-13: 9780201703726
2. Frank Buschmann, Hans Rohnert, Kevin Henney, Douglas C. Schmidt ,"Pattern-Oriented Software Architecture Volume 1, 2, 3, 4, 5", Publisher: Wiley, 1 edition (August 8, 1996-2004), ISBN-10: 0471958697, ISBN-13: 978-0471958697

Additional Reading

1. Fred A. Cummins ,"Enterprise Integration: An Architecture for Enterprise Application and Systems Integration", Wiley; 2002 ISBN-10: 0471400106 ISBN-13: 978-0471400103
2. David S. Linthicum, Enterprise Application Integration Addison-Wesley Professional 2003, ISBN-10: 1402052626

FF No. : 654

CS42301:: ADVANCED COMPUTER GRAPHICS

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

Prerequisites: Nil

Objectives:

- To gain first-hand experience with the challenges of efficient and accurate modeling, rendering, and simulation, and the necessary data structures and algorithms.
- To introduce a current 3D graphics API.
- To develop programming skills in 3D computer graphics.
- Become acquainted with some advanced topics in computer graphics; these might include texturing, physically-based modeling, procedural modeling, curves and surfaces, global illumination, interaction, and visualization.
- Mapping with PEOs :- V, (j)

List of Practical

1. Implement an OpenGL program to draw different 2D shapes.
2. Implement an OpenGL program to draw 2 overlapped shapes and use alpha blending.
3. Implement an OpenGL program to draw 3D cube and apply transformations.
4. Implement an OpenGL program to draw 12 spheres and apply different light effects.
5. Implement an OpenGL program to draw scene and apply fog effect.
6. Implement an OpenGL program to draw 3D cube and apply different textures on different faces.
7. Implement CUDA program for the prefix addition.
8. Implement CUDA program for the multiply two matrices.
9. Draw histogram of 256-color bmp image.

10. Implement a program for edge detection using Gaussian filter.

Text Books

1. "Procedural Elements for Computer Graphics", Rogers David F.,Tata McGraw Hill, 2001, ISBN 0-07-047371-4.
2. "OpenGL Programming Guide: The Official Guide to Learning OpenGL", Mason Woo, Jackie, Tom Davis, Version 2.1, 6th Edition, Pearson Education, ISBN 978-81-317-2184-1.

Reference Books

1. "Computer Graphics", M Paulin Baker, Donald Hearn, PHI, 2001, ISBN 81-203-09440-8.
2. "Digital Image Processing", Rafael C. Gonzalez , Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8.

Additional Reading

1. "Advanced Animation and Rendering Techniques : Theory and Practice", Alan H. Watt and Mark Watt, Addison-Wesley, acm press, ISBN: 0201544121
2. "CUDA by Example: An Introduction to General-Purpose GPU Programming" , Jason Sanders, Edward Kandrot, Addition-Wesley, ISBN-13: 978-0-13-138768-3.

FF No. : 654

CS42308:: SYSTEM PROGRAMMING

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

Prerequisites: Nil

Objectives:
1. To understand the concepts and components of Systems Programming
2. To Learn and understand the fundamentals of Operating systems
3. Mapping with PEOs :- II, III, (d)

List of Practical

1. Implementation of Macros.
2. Implementation of Nested macros.
3. Design and implementation of 1 pass assemblers.
4. Design and implementation of 2 pass assemblers.
5. Design of an Editor: Design of a Line or Screen Editor using C Language.
6. Symbol table generation for input *.c file.
7. Design Lex specifications for the tokens – keywords, identifiers, numbers, operators, white spaces.
8. Implementation of Toy-code generator.
9. Simulation of linkers.
10. Simulation of loaders.
11. 3-4 assignments on DLL on Linux shared library.
12. Use of different debugger tools.

Text Books

1. "Systems Programming & Operating Systems", D M Dhamdhere,TMH,ISBN – 0074635794

Reference Books

1. "Introduction to 3D Game Programming with Direct X 9.0c: A Shader Approach", Frank Luna, Jones and Bartlett publication,ISBN- 1598220160

FF No. : 654

CS42310:: MULTIMEDIA SYSTEMS

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

Prerequisites: Nil

Objectives:

- To implement basic concepts of computer graphics.
- To implement algorithms to draw various graphics primitives.
- To implement 2-D and 3-D transformations.
- To implement applications of multimedia
- Mapping with PEOs :- II, III, (c)

List of Practical

1. Write a code in c to read the contents of any .bmp file and display image.

2. Write a menu Driven program
   a) Create, edit .Voc file and convert into .Wav file format
   b) Create, edit .Wav file and convert it to .Voc file format.

3. Create an animation using 3-D Max

4. Create an animation using Flash

5. Write a tool to create presentation slide with audio & video effects

6. Using VRML generate anyone virtual scene
   1. Coffee House
   2. Building Model
   3. Garden Model

7. Implement Edge Detection Algorithm on any Image

8. Implement arithmetic coding technique on any image.

9. Implement JPEG-.DCT compression Technique.

Text Books

1. Principles of Multimedia", Ranjan Parekh, TMH, ISBN 0-07-058833-3
2. "Fundamentals of Multimedia", Li Ze-Nian, Drew Mark S., Pearson Education, 2004, ISBN 81-297-0438-2

Reference Books

1. "Digital Image Processing", Rafael C. Gonzalez , Richard E. Woods, 2nd Edition, Prentice Hall, ISBN: 0-201-18075-8
2. "Data Compression Book", Mark Nelson, 2nd edition, M&T Books ISBN 1-55851-434-1 541

Additional Reading

2. **"**Flash 8 Bible**",** Robert Reinhardt, Snow Dowd, Macromedia,ISBN:9788126507375
3. "Foundation AS Animation: Making Things Move!", Keith Peters**,** Friends of ED publication, ISBN: 1590595181
4. "3ds max Animation and Visual Effects Techniques", Sanford Kennedy, 2nd edition, Charles River Media, ISBN:9788177224924

FF No. : 654

CS47308 :: PROJECT STAGE 3

Credits: 06 **Teaching Scheme: -** 8 Hrs/Week

Aim

This course addresses the issues associated with the successful management of a software development project. The course emphasizes project life cycle phases, requirement engineering, system analysis and system design. A further aim is for students to heighten personal awareness of the importance of developing strategies for themselves and their career. The Project Work can lead to:

f. Transform existing systems into conceptual models.
g. Transform conceptual models into determinable models.
h. Use determinable models to obtain system specifications.
i. Select optimum specifications and create physical models.
j. Apply the results from physical models to create real target systems.

Objectives

1. To provide an understanding of the project planning process and problem scoping
2. To define roles and work with cross functional teams
3. To establish clear project objectives and milestones
4. To create effective and deliverable project plans
5. To perform rigorous analysis and design activities for solution planning
6. To select appropriate technology for implementation and testing

Overview of the Course:

1. The Student Project Group will prepare a detailed Project Report consisting Semester I Preliminary Project document along with Detailed System Design Document, Implementation and Testing Document with conclusion and future scope of the Project Work. All the documents indicated will have a prescribed format. The Project Report ideally should consist of following documents: (Exceptions may be there based on the nature of the project, especially if some of the following documents are not applicable to particular project as determined by the project guide , coordinator and head of department.)

Sr.	Project Item
1	Project Cover Front Page
2	Project Completion Certificate [Institute]
3	Project Completion Letter [In case of Sponsored Projects]
4	Acknowledgments
5	Table of Contents
6	List of Figures
7	List of Tables
8	Project Synopsis [Problem Background, Existing System Details, Proposed Solution]
9	Feasibility Study Report
10	Project Plan
11	System Requirement Specification
12	System Analysis Document: UML Use Case Diagrams
13	System Analysis Document: UML Sequence Diagrams
14	System Analysis Document: UML State Diagrams
15	System Design Document with Module Specifications
16	System Implementation
17	System Testing and Experimental Findings
18	Conclusion
19	References

2. The Project Work will be assessed jointly by a panel of examiners consisting faculty and industry experts. The Project Groups will deliver the presentation and demonstration of the Project Work which will be assessed by the panel.
3. The Student Project Group needs to actively participate in the presentation. The panel of examiners will evaluate the candidate's performance based on presentation skills, questions based on the Project Work and overall development effort taken by the candidates.

Note:
The student needs to design and develop solution for the identified technological problem in the area of Computer Engineering or Information Technology of their choice. The Project Implementation needs to be completed using best possible use of available technologies as applicable to deal with the complexity of the project. The Project Group will prepare a detailed report of the project work which will be approved by the concerned faculty member. The Project Report need to be submitted both in Hard form

and Soft form in CD. The Soft Copy of the Project Report must accompany other project deliverables as well.

Assessment Scheme

Sr. No.	Content	Marks
1	System Requirement Specification	05
2	Feasibility Study	05
3	System Analysis	10
4	System Design	10
5	System Implementation	25
6	System Testing	25
7	Presentation of the Project Work	20

Outcomes:
Upon completion of the course, the students will be to:

1. Identify major issues in complex situations; and know how to prepare alternative solutions and make decisions.

Becoming aware of the need to think and act in an entrepreneurial manner by developing the ability to: critically and creatively understand innovations and development, work independently and collaboratively.

HONORS

Structure, HONORS (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	CS28102	Unix Programming	2	0	0	2
P_1	CS28302	Unix Programming	0	0	2	1
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

Unit IV **(5+1 Hrs)**
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
Introduction to Queuing Theory **(8 Hrs)**

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.

Unit IV **(8 Hrs)**
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 CS29302	Principles of Programming Languages Principles of Programming Languages	2 0	0 0	0 2	3
S_2	CS39101 CS39103 CS39303	Computer Architecture & Operating Systems OR Computer Graphics Computer Graphics	3 2 0	0 0 0	0 0 2	3
S_3	CS39102 CS39104 CS39304	Analysis of Algorithms OR Data Structures Data Structures	3 2 0	0 0 0	0 0 2	3
S_4	CS49101	Software Engineering & Project Management	3	0	0	3
S_5	CS49102 CS49302	Database Management Systems Database Management Systems	2 0	0 0	0 2	3
		Total	18	0	6	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)

<u>List of Practical</u>

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)

List of Practical

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.