



Bansilal Ramnath Agarwal Charitable Trust's
Vishwakarma Institute of Technology
(An Autonomous Institute affiliated to University of Pune)

Structure & Syllabus of
ME-CSE (Information Technology)

Pattern 'A-13'
Effective from Academic Year 2013-14

Prepared by: - Board of Studies in Computer Engineering

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

Signed by

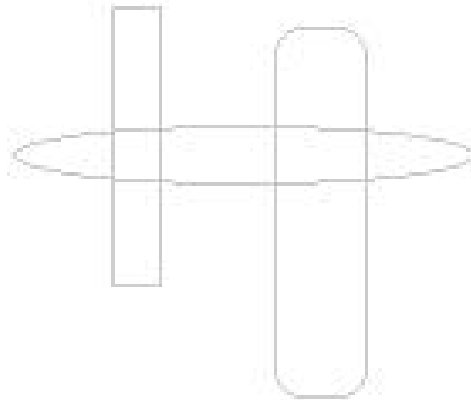
Chairman – BOS

Chairman – Academic Board

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FIRST YEAR

ME-CSE (Information Technology)

Pattern – A

SEMESTER I

(Theory)



Semester I

Code	Subject	Type	Teaching Scheme		Assessment Scheme					Credits
			L	P	ISA			ESA		
					CT *	MSE	HA *	CA	ESE	
CS50151	Mathematical foundations for Computer Engineering	Theory	3	-	10	30	10	-	50	3
CS50152	Advanced Operating Systems	Theory	3	-	10	30	10	-	50	3
CS50153	Data Management Techniques	Theory	3	-	10	30	10	-	50	3
	Department Elective – I	Theory	3	-	10	30	10	-	50	3
	Department Elective - II	Theory	3	-	10	30	10	-	50	3
CS50351	PG Lab – I	Lab	-	4	-	-	-	100	-	4
HS56301	Communication & Soft Skill	Lab	-	2	-	-	-	-	100	2
CS50451	CVV – I	Oral	-	-	-	-	-	-	100	2
CS57751	Semester Project – I	Project		6	-	-	-	-	100	2
			15	12						25

* CT (Unit 1) 1 hour 30 marks converted to 10 marks + HA (minimum 3) – Total 30 marks converted to 10 marks = 20 marks

MSE – 2 hours 60 marks converted to 30 marks (Unit 2 & 3)

ESE – 3 hours 100 marks converted to 50 marks (Unit 1 to 6)

\$ L- Lecture, P-Practical, ISA – In Semester Assessment, ESA – End Semester Assessment, CT- Class Test, MSE – Mid Semester Examination, HA- Home Assignment, CA – Continuous Assessment, ESE – End Semester Examination

Title: Syllabus Format – PG Courses

FF No. : 658

CS50151: MATHEMATICAL FOUNDATIONS FOR COMPUTER ENGINEERING

PREREQUISITES:

Infinite Series, Ratio Test, Differential and integral calculus, elementary differential equations, matrix analysis, some signal and system theory including Laplace and Fourier transforms and a course on introduction to computer programming

OBJECTIVES:

The aim of this module is to provide an introduction to series solution, special functions, probability, random variables, stochastic processes and mathematical statistics for students of computer engineering, computer science, information technology and reliability engineering.

OUTCOMES:

By the end of the module students will be expected to demonstrate knowledge of

1. Series method of solving differential equations of second order especially by the method of Frobenius series.
2. Solution of Bessel , Legendre's differential equations and Sturm-Liouville problems by orthogonal eigen function expansions (generalized Fourier series.)
3. Mastering both “probability model building and the subsequent analysis of these (certain games of chance) models.
4. The notion of random variables which provides the power of abstraction , the distribution and the density functions with standard important probability distributions of discrete and continuous type.
5. Collection of random variables known as random processes and the Markov process, the Poisson process and the knowledge of other processes.

Unit-1. Series Solutions of Differential Equations .Special Functions: (7 Hrs)

Power Series Method, Theory of Power Series Method, Legendre's, Equations. Legendre's Polynomials $P_n(x)$, Frobenius Method, Bessel's Equation. Bessel Functions $J_\epsilon(x)$, Bessel Functions of the Second Kind $Y_\epsilon(x)$, Sturm-Liouville Problems. Orthogonal Functions, Orthogonal Eigenfunction Expansions

Unit-2. Discrete Random Variables**(7 Hrs)**

Probability Models , Sample Space, Events , Algebra of Events , Graphical Methods of Representing Events , Probability Axioms , Combinatorial Problems ,Conditional Probability , Independence of Events, Bayes' Rule , Bernoulli Trials. Discrete Random Variables, Random Variables and Their Event Spaces ,The Probability Mass Function , Distribution Functions , Special Discrete Distributions ,The Probability Generating Function , Discrete Random Vectors , Independent Random Variables .

Unit-3. Continuous Random Variables**(7 Hrs)**

The Exponential Distribution, The Reliability and Failure Rate, Some Important Distributions, Functions of a Random Variable, Jointly Distributed Random Variables, Order Statistics , Distribution of Sums , Functions of Normal Random Variables .

Unit-4. Expectation**(7 Hrs)**

Moments , Expectation Based on Multiple Random Variables , Transform Methods
Moments and Transforms of Some Distributions , Computation of Mean Time to Failure.
Inequalities and Limit Theorems.

Unit-5. Conditional Distribution and Expectation**(7 Hrs)**

Mixture Distributions, Conditional Expectation, Imperfect Fault Coverage and Reliability, Random Sums.

Unit-6. Stochastic Processes**(7 Hrs)**

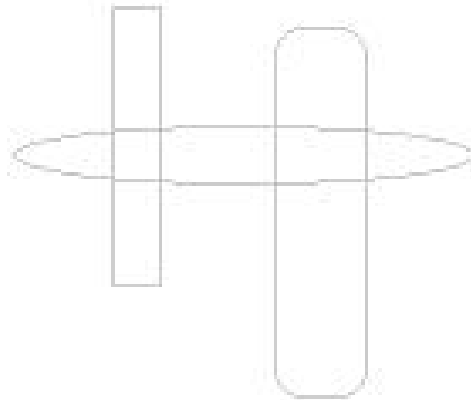
Classification of Stochastic Processes, The Bernoulli Process, The Poisson Process, Renewal Processes , Availability Analysis, Random Incidence, Renewal Model of Program Behavior

TEXT BOOKS:

1. Erwin Kreyszig, 'Advanced Engineering Mathematics', John Wiley and sons (8th Edition), Inc., 2003.
2. Kishor S.Trivedi, 'Probability and Statistics with reliability, Queuing, and Computer Science Applications', Prentice Hall India New Delhi, India reprints, (2005).

REFERENCE BOOKS:

1. Dennis G. Zill and Michael R. Cullen, 'Advanced Engineering Mathematics', CBS New Delhi, (2nd Edition), 2000.
2. Michael D.Greenberg, 'Advanced Engineering Mathematics', Prentice Hall International, (Second Edition), 1998.
3. C. Ray Wylie, Louis C Barrett R, 'Advanced Engineering Mathematics', McGraw-Hill Book Company, 6th Ed, 2003.
4. Pipes and Harvill, 'Applied Mathematics for Engineers and Physicists', McGraw-Hill Book Company, 3rd Ed. 1984.
5. Alan Jeffrey 'Advanced Engineering Mathematics', Academic Press, 1st Ed., 2002.
6. Glyn James, Burley David Clements Dick, Dyke Phil, 'Advanced Modern Engineering Mathematics', Prentice Hall, (3rd Edition), 2004.
7. Larry C., Andrews & Ronald L. Philips, 'Mathematical Techniques for Engineers & scientists', PHI Pvt. Ltd., New Delhi, Indian reprint by SPIE, 2005.
8. Murray R. Spiegel, 'Theory and Problems of Statistics', Schaum's out line series in Mathematics, McGraw- Hill Book Company New York, 1961.
9. Albert Leon-Gracia, 'Probability and Random Processes for electrical engineering', University of Toronto Pearson Education, 2nd Edition, 2004.
10. S. M. Ross, 'Introduction to probability & statistics for engineers & scientists', Academic Press, 3rd edition 2005.
11. Allen, A.O., 'Probability, Statistics and Queuing theory', Academic Press, 2nd Ed, 2005.
12. Sheldon M. Ross, 'Introduction to probability models', Academic Press, seventh Edition, 2001.
13. William Feller, 'An introduction to probability theory and its application', Vol.-I, John Wiley & Sons, 3rd edition, 1950.



Title : Syllabus Format – PG Courses

FF No. : 658

CS50152: ADVANCED OPERATING SYSTEMS

Course Objectives:

- i.** Exposing students to current operating systems research and modern OS technology.
- ii.** Providing insight in the design principles of kernels.
- iii.** Providing experience in low-level systems programming in a realistic development environment.
- iv.** To study the implementation of Process Management, Memory Management, File Management and I/O Management in Windows and Linux
- v.** To study the basic concepts in Real Time Operating Systems

Course Outcomes:

- i.** Work in an environment and on engineering problems related to OS
- ii.** Understanding lowest-level OS code and its interaction with hardware and design issues

Unit 1 : Introduction to Operating Systems Internals

(8 Hrs)

OS concepts: Process Management, Memory Management, File Management, I/O Management. Study and comparison of different operating system architectures: Windows, Linux

Unit 2 : Process Management

(8 Hrs)

Windows: System Mechanisms, Management Mechanisms, Startup and Shutdown, Process, Threads and Jobs

Linux: Process Descriptor and Task Structure, Process Creation, Implementation of threads, Process Termination, Process Scheduling.

Unit 3 : Memory Management

(6 Hrs)

Windows: Memory manager & its services, System memory pools, Virtual address space layout, address translation, page fault handling.

Linux: Pages, Zones, kmalloc, vmalloc, slab layer, slab layer allocator, statically allocating on the stack, High memory mapping.

Unit 4 : File Management

(6 Hrs)

Windows: Windows file system formats, FS driver architecture, troubleshooting FS problems, NTFS design goal and features, NTFS drivers, NTFS on disk structure.

Linux: Common File system Interface, File Abstraction Layer, Unix File System, VFS, Dentry Object, Super block Object, Inode Object, File Object, Data structure associated with File systems.

Unit 5 : I/O Management

(6 Hrs)

Windows: I/O system components, Device drivers, I/O processing, PnP manager.

Linux: Anatomy of block device, Buffer & Buffer Heads, Bio structure, Request queue, I/O scheduler.

Unit 6 : Real Time Operating Systems

(6 Hrs)

Task Assignment Algorithms, Uniprocessor scheduling algorithms, Multiprocessor scheduling algorithms, Time Services, Scheduling Mechanisms, Commercial Real Time Operating Systems.

Total Contact Hours: 40

Text Books:

1. Mark Russinovich, David Solomon, "Windows Internals", Microsoft Press, 4th edition, 2005.
2. Robert Love, "Linux Kernel Development", Pearson Education, 2nd edition, 2005.

Reference Books :

1. Jane Liu, "Real-Time Systems" Publication: Pearson Education, 1st edition, 2003.
2. Krishna C.M & Kang Shin, "Real-Time Systems", McGraw Hill, 1st Edition, 1997.

Title : Syllabus Format – PG Courses

FF No. : 658

CS50153 : DATA MANAGEMENT TECHNIQUES

Course Objectives:

- i. To have an overview of the topics covered in data management system course.
- ii. To have an overview of indexing and hashing.
- iii. To study in detail the data structures used for data storage.
- iv. To study in detail the query processing and optimization techniques.
- v. To understand the basics of data warehousing and how it facilitates data mining.
- vi. To understand the process of data mining and OLAP technique.
- vii. To study in detail the implementation of distributed and parallel databases.
- viii. To study current trends in application oriented databases.

Course Outcomes:

- i. Have an overview of relational databases
- ii. Write database queries in the most efficient manner
- iii. Define the concept, structure and major issues of data warehousing
- iv. Understand the OLAP technique
- v. Define and recognize key areas and issues in knowledge discovery in data
- vi. Develop an in-depth understanding of several data mining techniques
- vii. Understand how transaction processing, concurrency control, query processing works on distributed and parallel systems
- viii. Have introduction to application oriented database approaches

Unit 1 : Overview of Relational Databases

(7 Hrs)

Need of databases, Introduction to relational databases, Steps in database design.

Overview of Data Model: ER Diagram, Extended E-R features, Relational Model: SQL as DDL and DML, Keys, Referential Integrity, Overview of ER to Relational Mapping

Normalization and schema refinement: 4NF, 5NF, DKNF

Unit 2 : Data Storage and Querying

(7 Hrs)

Overview of Storage and File Structure: File organization, Organization of records in files, Overview of indexing and hashing, Indexing types, Hash Indices, Static and dynamic hashing

Database Data Structures: B-Trees, B+Trees, k-d Trees, R-Trees

Query processing: Translation of SQL queries into Relational Algebra, Basic algorithms for executing query operations

Query Optimization: Query trees, Query execution plans, Selectivity and Cost estimates in query optimization, Cost functions

Unit 3 : Distributed and Parallel Databases

(7 Hrs)

Distributed Vs Parallel Technology

Distributed Databases: Advantages of distributed databases, Data fragmentation, Data replication and allocation, Types of distributed database systems, Distributed transactions, 2 Phase Commit and 3 Phase Commit protocols, Concurrency control and recovery in distributed databases, Deadlock handling, Query processing in distributed databases, Client-server architecture in distributed databases

Parallel Databases: I/O parallelism, Interquery and Intra query parallelism, Intra operation and Interoperation parallelism

Unit 4 : Fundamental of Data Warehousing (7 Hrs)

Introduction of Decision Support System (DSS), OLTP Vs Data Warehouse, Use of Data warehouse

Dimensional modeling: Star schema, Snowflakes schema, Fact constellations, Concept hierarchies: total and partial, Set-grouping hierarchies, Measures: Their Categorization and Computation

OLAP: Data cube, OLAP operations: drill-down, Roll-up and extreme Roll-up, slice-dice and pivot

Unit 5: Fundamentals Data Mining (7 Hrs)

Introduction, Data mining primitives, Data mining steps, Techniques:- Clustering: Partitioning Methods, Classification: Decision Tree Induction, Frequent Item set mining and Association rules: Apriori Algorithm, Outlier analysis: Statistical approaches, Data Mining on Different kind of Data

Unit 6 : Advance Topics in Databases (7 Hrs)

Temporal databases: Time Representation, Calendars and Time Dimensions, Incorporating time in relational databases using tuple versioning

Spatial databases: Range query, Nearest neighbor query, Special joins, Overlays

Multimedia databases: CBIR, Image databases, Video/ audio source, Nature of multimedia data and applications, Data management issues, Open research problems, Multimedia database applications

Active and Deductive databases: Introduction, Prolog/Datalog notation, Interpretation of rules, Basic inference mechanisms for logic programs, Datalog programs, Deductive database systems

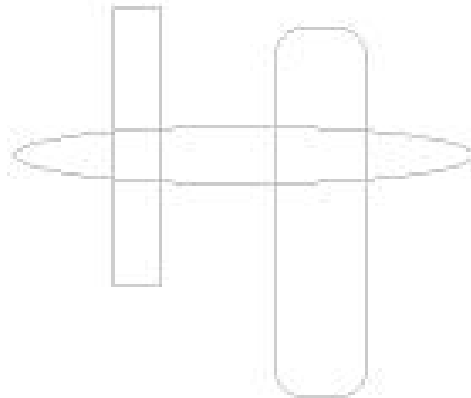
Total Contact Hours: 42

Text Books:

1. Silberschatz ,Korth and Sudarshan, “Database system Concepts”, Fifth edition, McGraw Hill, International Edition 2006, ISBN – 007-124476-X.
2. Jiawei Han and Micheline Kamber “Data mining: concepts and techniques”, the Morgan Kaufman,2001.

Reference Books :

1. Elmasri, Navathe, "Fundamentals of database system", Third edition, Published by Pearson Education Pte. Ltd, ISBN – 81-7808-137-7.
2. Kimball, "Data warehouse life cycle toolkit", John Wiley,1998
3. Raghu Ramkrishan and Johannes Gerkhe, 'Database Management Systems', 3rd edition, McGraw Hill, 2003. Rob, Coronel, "Database system, design, implementation and management", Thomson Learning, Fourth Edition, 2001, ISBN – 0-07-123151-X.
4. Hand, Smyth, Mannila,"Principles of Data mining ", MIT press.
5. Gagendra Sharma ,"Data mining, Data warehousing and OLAP", S.K. Kataria and sons, First edition, 2007-08.
6. "R-Trees. A Dynamic Index Structure For Spatial Searching", by Antomn Guttman, University of Cahforma Berkeley, ACM Transactions, 1984
7. "A simple guide to five normal forms in relational database theory", by William Kent, International Business Machines Corporation, ACM Transactions, 1983.
8. "A Normal Form for Relational Databases That Is Based on Domains and Keys", Ronald Fagin, IBM Research Laboratory, ACM Transactions on Database Systems, Vol. 6, No. 3, September 1981, Pages 387-415.



CS57751: SEMESTER PROJECT -1

Projects based on AOS and DMT shall be implemented.

ADVANCED OPERATING SYSTEMS

Objectives:

1. To get hand-on experience of Operating System Implementation
2. To study the Windows and Linux system architectures
3. To study the implementation of Process Management, Memory Management and File Management in Windows and Linux
4. To study the different design issues of Distributed Systems

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

2. Linux Project

- a. Introduction to Linux Kernel programming
 - i. To write a hello world module
 - ii. To display pid and other parameters of current process
 - iii. To display process tree of system with various parameters of process.
- b. Display the contents of an inode using kernel programming.
- c. Implement a linked list in kernel space using:
 - i. kmalloc
 - ii. lab allocator

Outcomes:

Students will be able to learn the intricacies of the implementation of a multiprogramming operating system. Student will be able to implement systems based projects in industry on the LINUX and Windows platform. Since industry has specialized system oriented projects, this course will equip the student in handling those projects.

Text Books:

1. Shaw, Alan C, "The Logical Design of Operating Systems", Prentice Hall, 1974
2. Robert Love, "Linux Kernel Development", Pearson Education, 2nd edition, 2005.

Reference Books:

3. Mark Russinovich, David Solomon, "Windows Internals", Microsoft Press, 4th edition, 2005.
4. Andrew S. Tanenbaum & Maarten van Steen, Distributed Systems "Principles and Paradigms", PHI, 1st Indian Edition, 2002.
5. Daniel Bovet: "Understanding the Linux kernel", O'Reilly Publications, 2nd edition, 2003.

Title : Syllabus Format – PG Courses**FF No. : 658**

DATA MANAGEMENT TECHNIQUES

Course Objectives:

- i. To interpret an entity relationship diagram (ERD) to express requirements, create data models into normalized designs and use SQL to create database objects, populate tables, and retrieve data
- ii. To implement the data structures used for databases to be physically stored on storage media
- iii. To write database queries in the most efficient manner and develop query execution plan.
- iv. To understand multi-dimensional data modeling techniques and ETL tools to design and build a data warehouse
- v. To understand the implementation of various data mining algorithms.
- vi. To understand current approaches and trade-offs in the design and development of database systems.

Course Outcomes:

- i. Understand user requirements, develop and refine the conceptual data model, apply normalization techniques with identification of data integrity and security requirements
- ii. Understand and implement the data structure to physically store a database
- iii. Write database queries in the most optimized and cost effective manner.
- iv. Understand multi-dimensional data modeling techniques and use of ETL tools
- v. Understand and implement data mining algorithms.
- vi. Define and recognize key areas and issues in knowledge discovery in data.

Mini Project

Define a real world problem design exercise using ER model. Convert ER to a set of tables and normalize it up to a given normal form. Implement the design using DBMS tool. Insert large amount of data in the database and understand the query optimization strategy implemented by the database tool by displaying query execution plan.

Design a multi dimensional data model using star/ snowflake schema technique for a business fact corresponding to the real world problem domain defined above. Implement the designed schema using a data warehousing tool. Extract the data from the above implemented database by executing ETL to load data in the designed data warehouse.

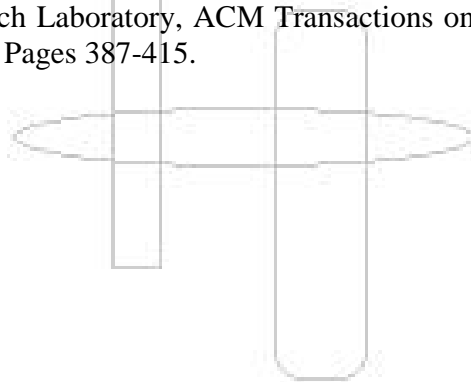
Identify a classification/ clustering/ association rule mining problem on the given data and implement the algorithm using a mining tool.

Total Contact Hours:**Text Books:**

3. Silberschatz ,Korth and Sudarshan, “Database system Concepts”, Fifth edition, McGraw Hill, International Edition 2006, ISBN – 007-124476-X.
4. Jiawei Han and Micheline Kamber “Data mining: concepts and techniques”, the Morgan Kaufman,2001.

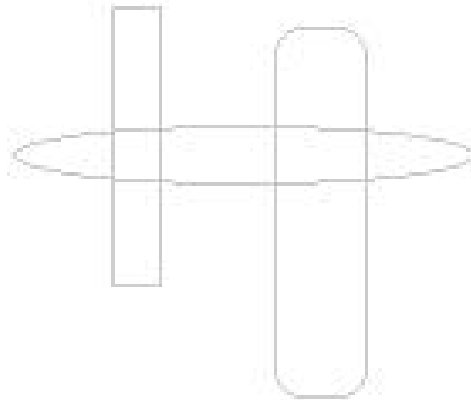
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9. Elmasri, Navathe, “Fundamentals of database system”, Third edition, Published by Pearson Education Pte. Ltd, ISBN – 81-7808-137-7.
10. Kimball, “Data warehouse life cycle toolkit”, John Wiley,1998
11. Raghuram Ramkrishnan and Johannes Gehrke, ‘Database Management Systems’, 3rd edition, McGraw Hill, 2003. Rob, Coronel, “Database system, design, implementation and management”, Thomson Learning, Fourth Edition, 2001, ISBN – 0-07-123151-X.
12. Hand, Smyth, Mannila,”Principles of Data mining “, MIT press.
13. Gagendra Sharma ,”Data mining, Data warehousing and OLAP”, S.K. Kataria and sons, First edition, 2007-08.
14. “R-Trees. A Dynamic Index Structure For Spatial Searching”, by Antonin Guttmann, University of California Berkeley, ACM Transactions, 1984
15. “A simple guide to five normal forms in relational database theory”, by William Kent, International Business Machines Corporation, ACM Transactions, 1983.
16. “A Normal Form for Relational Databases That Is Based on Domains and Keys”, Ronald Fagin, IBM Research Laboratory, ACM Transactions on Database Systems, Vol. 6, No. 3, September 1981, Pages 387-415.



Elective –I

Theory



Title: Syllabus Format – PG Courses

FF No. : 658

CS52151: INTELLIGENT SYSTEMS AND NEURAL NETWORKS

Objectives:

To learn the basics of designing intelligent agents that can solve general purpose problems, represent and process knowledge, plan and act, reason under uncertainty and can learn from experiences

To introduce students to some of the basic principles of Artificial Neural Networks and their applications in scientific disciplines.

Outcomes:

To Understand

- Basic Artificial Neural Network Concepts & Problem Solving
- Logical reasoning to solve real time natural language understanding problems.
- Understand the relationship between Linear Algebra and Artificial Neural Networks
- And Apply Artificial Neural Network Classification and Learning Algorithms and Principles.

Unit 1: Problem Solving:

(6 Hrs)

Introduction: Agents, Problem formulation, uninformed search strategies, heuristics – informed search strategies, - Minmax – constraint satisfaction, IDA*, SMA* strategies.

Unit2: Logical Reasoning

(7 Hrs)

Logical agents – propositional logic – inferences – first-order logic – inferences in first order logic – forward chaining – backward chaining – unification – resolution

Unit 3: Planning

(6 Hrs)

Planning with state-space search – Goal Stack Planning- Partial-order planning – planning graphs, planning and acting in the real world

Unit 4 : Essentials of Neural Network

(7 Hrs)

Historical background: biological model of neuron, description of McCulloch-Pitts model, discussing range of applications, simple perceptron model. Supervised learning, Single layer networks, linear separability, perceptron training algorithm, pocket algorithm, adaptive linear elements, Least Mean Square learning algorithm and its generalisation.

Unit 5 : Multiplayer Perceptron

(7 Hrs)

Hidden layers, back propagation algorithm, accelerating the learning process, Adaptive multi-layer networks and network pruning algorithms, radial basis function networks, decision regions. Validation and novelty detection in MLPs, knowledge discovery from MLPs. Unsupervised learning, Simple competitive learning, winner-take-all networks (Hamming networks, Maxnet), learning vector quantizers, counter propagation networks, self organising maps (Kohonen networks).

Unit 6: Associative Models**(7 Hrs)**

Characteristics of Hopfield networks, discrete and continuous Hopfield networks, energy of the networks, Boltzman machines, Hetero-associators, Statistical Techniques: Input data preparation, discriminant analysis - linear, quadratic and logistic, cross-validation, principal component analysis.

Outcomes:

On successful completion of the module the student will be able to

- Design the most appropriate neural network for an application under study;
- Appreciate the importance of input data and the role of data preprocessing;
- Assess the performance of the networks;
- Apply comparable statistical techniques and contrast the neural network solutions;
- Interpret the results produced by neural networks;
- Implement the algorithms in a software environment using MATLAB/Neural Ware Professional (optionally C).

TEXT BOOK:

1. S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education, 2003.
2. Simon Haykin, "Neural Networks A comprehensive foundations", PHI

REFERENCES:

1. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 2004.
2. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998.
4. Artificial neural networks - B.Vegnanarayana Prentice Hall of India P Ltd 2005
5. Neural networks in Computer intelligence, Li Mm Fu TMH 2003
6. Neural networks James A Freeman David M S kapura pearson education 2004
7. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.

Title: Syllabus Format – PG Courses

FF No. : 658

CS52152: INTERNET ROUTING ALGORITHMS

Objective: To understand core part of the INTERNET which is routing.

Outcomes:

1. To explain routing algorithms in the Internet; link-state routing and distance-vector routing; broadcast and multicast routing algorithms.
2. To explain path determination, strengths of link state and distance vector protocols in differing configurations
3. To describe the goals of routing protocols and convergence as impacted by different protocols
4. To explain the similarities and differences between several types of routing protocols

Unit 1 : Network Basics

(7 Hrs)

OSI Model, Network Hardware, Transmission media, Bridge, Router , Gateways, Network Software Components, MAC, Data Link Protocols, Switching Techniques TCP/IP Protocol suite.

Unit 2 : Networking and Network Routing

(7 Hrs)

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

Unit 3 : Routing Algorithms

(7Hrs)

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, *k*-Shortest Paths Algorithm.

OSPF and Integrated IS-IS : OSPF: Protocol Features, OSPF Packet Format, Integrated IS-IS, Key Features, comparison

BGP : Features ,Operations, Configuration Initialization, phases, Message Format.

IP Routing and Distance Vector Protocol Family :RIPv1 and RIPv2

Unit 4 : Routing Protocols: Framework and Principles

(7 Hrs)

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

Unit 5 : . Internet Routing and Router Architectures

(7 Hrs)

Architectural View of the Internet, Allocation of IP Prefixes and AS Number, Policy-Based Routing, Point of Presence, Traffic Engineering Implications, Internet Routing Instability.
Router Architectures: Functions, Types, Elements of a Router, Packet Flow, Packet Processing: Fast Path versus Slow Path, Router Architectures

Unit 6 : Analysis of Network Algorithms**(9 Hrs)**

Network Bottleneck, Network Algorithmics, Strawman solutions, Thinking Algorithmically, Refining the Algorithm, Cleaning up, Characteristics of Network Algorithms.

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,

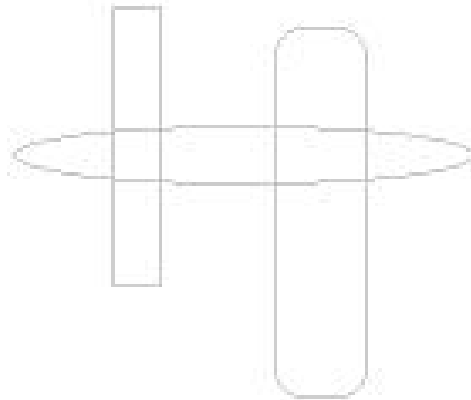
Outcomes:

After completing the course, the students will be able to:

1. Identify the router startup components and modes
2. Understand Router Elements, Router Components, Router Status, Managing Configuration Files, The Running and Startup Configuration Files, Router Identification and Banner
3. Understand in depth the major network, routing, and transport protocols and mechanisms used in the Internet
4. Become familiar with the networking research tools of simulation, traffic analysis, and active measurements
5. Appreciate some open research issues related to Internet routers, routing, congestion control, traffic characteristics, naming & addressing

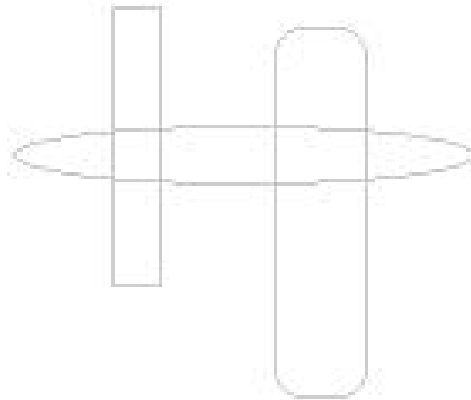
Text Books :

1. Network Routing: Algorithms, Protocols, and Architectures Deepankar Medhi and Karthikeyan Ramasamy (Morgan Kaufmann Series in Networking)
2. Network Algorithmics: An Interdisciplinary Approach to Designing Fast Networked Devices George Varghese (Morgan Kaufmann Series in Networking)



Elective –2 & 4

Theory



Title : Syllabus Format – PG Courses**FF No. : 658****CS52155: Parallel Computing on GPU****Course Objectives :**

1. To increase GPU awareness.
2. To know GPU computing platforms.

Course Outcomes :

1. Students will be able to design parallel programs for GPU
2. Students must have capability to optimize them for better performance.

UNIT-1 Introduction to Parallel Computing**(8 hrs)**

Thinking in Parallel, Parallelism Vs. Concurrency, Types and levels of parallelism, Different grains of parallelism, Flynn's classification of multi-processors, Introduction to parallelization and vectorization: Data dependencies, SIMD technology, Motivation for Heterogeneous Computing, Definition of thread and process, Parallel programming models, Parallel Programming constructs: Synchronization, Deadlocks, Critical sections, Data sharing etc.

UNIT-2 Heterogeneous Architectures**(8 hrs)**

Introduction to heterogeneous architectures- GPU in particular Modern GPU architecture. Introduction to GPU computing (general purpose computation on GPU), GPU architecture case studies: NVIDIA Fermi Tesla C2050/Kepler K20

UNIT-3 CUDA**(6 hrs)**

Introduction to CUDA programming and/ OpenCL (as per decision of instructor)

Compute Unified Device Architecture (CUDA):—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. CUDA structure, API and library (CUDPP, CUBALS, FFT etc.) details. CUDA example programs (Vector dot product, Matrix multiplication (with the usage of tiling and shared memory) etc.).

UNIT -4**(6 hrs)**

GPU Programming using OpenCL: Specifications of OpenCL, thread organization and memory model, basic steps of OpenCL programming. OpenCL programming examples (Image Convolution, Matrix multiplication (with the usage of tiling and shared memory) etc.).

UNIT-5**(7 hrs)****Problem solving using GPUs:-**

Single vss double precision, solving problems that involves Vectors, Matrices, Binomial coefficients, Bernstein coefficients and etc. Instructor will choose the problems from several domains with which students are already aware.

UNIT-6**(7 hrs)**

Optimizations and Tools: Memory coalescing, Reduction operation using prefix sum example. Usage of shared memory optimally, Performance issues in algorithms- deciding parallelization of a part of algorithm and selecting the highest parallelism, Need of profilers and analyzers, Introduction to CUDA Tools: MemCheck, Command line & Visual Profilers.

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 <http://www.amazon.com/CUDA-Example-Introduction-General-Purpose-Programming/dp/0131387685> -# 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:

1. <http://developer.nvidia.com/>
2. www tutorials on introduction to parallel computing
3. John Nickolls, Ian Buck, Michael Garland, Kevin Skadron, Scalable Parallel Programming with CUDA, ACM *Queue*, Vol. 6, No. 2. (March 2008), pp. 40-53.
4. Other references suggested by instructor

Title: Syllabus Format – PG Courses**FF No. : 658****CS52156: DATA WAREHOUSING & DATA MINING****Course Objectives:**

- i. To understand the process of data mining and the key steps involved well enough to lead/manage a real-life data mining project
- ii. Know the basics of data warehousing and how it facilitates data mining
- iii. To understand fundamental issues in statistical data analysis that cut across all procedures, such as generalization to other data, basic tradeoffs, and validity of models.
- iv. To deliver an overview of web data mining and other significant mining techniques

Course Outcomes:

- i. Define and recognize key areas and issues in knowledge discovery and data
- ii. Develop an in-depth understanding of several data mining techniques
- iii. Define the concept, structure and major issues of data warehousing
- iv. Develop general awareness of data warehousing project management

Unit 1: Data warehouse general architecture**(7 Hrs)**

Issues in building data warehouse, Data warehouse design views, 3-tier data warehouse architecture, ROLAP, MOLAP and HOLAP, DWH Design Process, ETL Process, DWH Back-end Tools and Utilities, Metadata Repository, Models of DWH: Enterprise Warehouse, Data Mart, Virtual Warehouse, Comparison, Data warehouse life cycle, Role in Data Analytics and Business Intelligence

Unit 2: Data warehouse performance optimization**(6 Hrs)**

Techniques to Handle Changing Dimensions, Aggregation, Cube materialization, 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 data warehouse, indexing techniques: B-tree Index, B+-tree index, Projection Index, Bitmap Index (pure and encoded), Join Index and their comparison.

Unit 3: Data Preprocessing and Frequent item set mining**(6 Hrs)**

Data Preprocessing: Need, Cleaning, Integration, Transformation, Reduction, Discretization, Concept Hierarchy Generation

A pattern growth approach for mining frequent item set, Mining frequent item-sets using vertical data, association analysis to correlation analysis, pattern mining in multi-level, multi-dimensional space

Unit 4 : Classification and Regression**(7 Hrs)**

Rule-based Classification, Bayes Classification Methods, Classification by back-propagation, Support Vector Machines, Associative Classification, Lazy Learners: KNN classifier, Case-Based Reasoning, Fuzzy set approach, Genetic Algorithms, Classifier

Objectives:

1. To make students understand importance of good user interface design and cost of bad interfaces.
2. To develop the skills necessary to choose media, mode and device for input and output interaction appropriate for the user segment and application requirements.

Unit1: Introduction

(7Hrs)

Importance of good design, defining user interface, graphical user interface, web user interface, graphical business systems, principles of user interface design, measurable human factors, human computer interaction (HCI), usability and design team

Unit 2: User, Client and Business

(7 Hrs)

Understanding people's interaction with computers, users and clients, human characteristics in design, human considerations in design, specialized users, human interaction speeds, human performance and preference, understanding users, business and requirement analysis, basic business functions, design standards, style guide, system training, user persona, user survey and documentation

Unit 3: User Interaction Design

(7 Hrs)

Human consideration in screen design, test for good design, bad designs, organization and structural guidelines, statistical graphics, technological considerations, cognitive models - GOMS, LUCID, task analysis, structures, usability evaluation methods, window management and multi-modal interaction

Unit 4: User Interface and Controls

(7 Hrs)

Input and output devices, characteristics of device-based controls, selecting proper device-based control, interaction styles, operational controls, buttons, text entry / read-only controls, selection controls, check boxes, combo boxes, combination entry, other controls, sliders, tabs, scroll bars, custom controls, presentation controls and selecting proper controls

Unit 5: Visual Interface Design

(7 Hrs)

Words, sentences, text, text design in web pages, error messages, instructions, providing proper feedback, blinking for attention, guidance and assistance, help, wizards, tips, international considerations, localization, accessibility, disabilities, icons, images, animation, multimedia, color – RGB, HSV, color uses, problems with color, cross-disciplinary and cross-cultural differences, color and human vision, choice of colors, discrimination and harmony, accessibility considerations and selection of colors in design

Unit6: Types of Applications and Interfaces

(7Hrs)

Groupware, shared applications and artifacts, computer-supported cooperative work, social issues, social acceptability and organizational change, ubiquitous computing, information kiosk, digital library, virtual and augmented realities, mobile interfaces, hypertext and hypermedia,

interfaces that give and take advice, natural interfaces, eye-free interfaces, context-aware computing, roomware, tangible user interfaces.

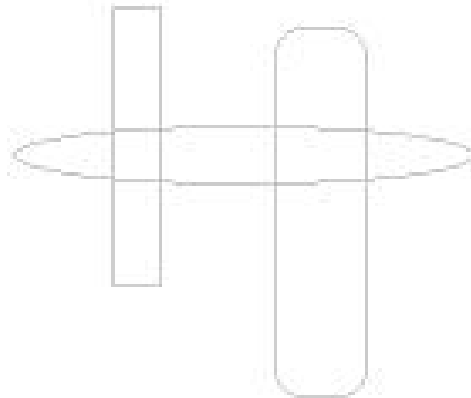
Outcomes: At the end of the course, the students will be able to analyze, design and evaluate various types of user interfaces.

Text Books:

1. Wilbert Galitz, 'The Essential Guide to User Interface Design', Wiley Dreamtech, 2005.
2. Ben Shneiderman, 'Designing the User Interface', Pearson Education, Third edition, 2002.

Reference Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, 'Human Computer Interaction', Third Edition, 2004.
2. Donald Norman, 'The Design of Everyday Things', Basic Books, USA, 2002.
3. Donald Norman, 'The Design of Future Things', Basic Books, USA, 2007.



Title : Syllabus Format – PG Courses

FF No. : 658

CS52158: IMAGE PROCESSING

Objectives : To study fundamentals of Image processing and its applications.

Outcomes:

Explore several different image processing techniques, and learn to improve images with them. Also get familiarized to image enhancement and compression.

Unit 1 :

Introduction to image processing

(8 Hrs)

Components of image processing system, Human Visual System, color vision color model: RGB, HVS, YUV, CMYK, image sampling and quantization, some basic relationships between pixels, linear and non linear operations.

Unit 2 :

Image enhancement in spatial domain & frequency domain

(8 Hrs)

Basic gray level transformations, histogram processing, enhancement using logical and arithmetic operations, basic spatial filtering, smoothing and sharpening spatial filters. Combining spatial enhancement methods. Smoothing frequency domain filters, sharpening frequency domain filters homomorphic filtering

Unit 3 :

Image transform

(6 Hrs)

Introduction to two dimensional orthogonal and unitary transforms, properties of unitary transforms, one-two dimensional discrete Fourier Transform (DFT), Cosine, sine, slant, KL, affine transforms.

Unit 4 :

Compression fundamental

(7 Hrs)

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

Unit 5 :

Image segmentation

(7Hrs)

Detection of Discontinuities, Edge Linking and Boundary Detection, Thresholding, Region – Based Segmentation, Segmentation by Morphological Watersheds, Use of motion in Detection.

Unit 6:

Applications in Image Processing

(6Hrs)

Case Study: Pattern Recognition, Iris Recognition, and Biomedical Applications

Outcomes:

1. Gain knowledge and practical experience in digital image processing.
2. Learn practical skills and analytic background for building digital Image/multimedia applications

Text Books :

- 1 .Rafael Gonzalez & Richard Woods Digital Image Processing (Pearson publications).
- 2 Anil K. Jain Fundamental of Digital Image Processing . (PHI publication)

Reference Books :

- 1 Digital Image Processing by Pratt, Wiley Publication
- 2.K,R, Castleman, Digital Image Processing, Prentice Hall: Upper Saddle River, NJ, 3. 3.
- 3.Image Processing: Analysis and Machine Vision by Milan Sonka

Title : Syllabus Format – PG Courses

FF No. : 658

CS52159: EMBEDDED SYSTEMS

Course Objectives:

- i.** To understand the design Embedded Systems
- ii.** To understand IO Interfacing
- iii.** To understand the RTOS.

Course Outcomes:

- i.** Learn Fundamentals of Microcontrollers.
- ii.** Learn Microcontrollers and IO Interfacing
- iii.** Design Systems using Real Time Operating Systems

Unit 1 : Introduction to Embedded Systems (7 Hrs)

Embedded Systems: Components, Classification, Characteristics of ES. Review of Microprocessors and Microcontrollers. Embedded Processor Technology, Application Specific System Processor. CISC, RISC , Power Management of peripherals, Watch Dog Timers, Structural Units of Microprocessor , Processor and ,Memory Selection ,Interfacing of Processor Memory

Unit 2 : Microcontroller (ARM, ARDUINO, RENESAS (any one.) (7 Hrs)

Family Architecture, Features, Data / Programme Memory, Reg set, Reg Bank, Special Function Registers, Data Memory, Programme Memory, Interrupt Structure, Timer Prog, Serial Port Prog, Misc Features. Memory I/O Design & Interfacing, Timer Calculation

Unit 3 : PIC Microcontrollers (7 Hrs)

Features, Architecture Pin Out, Capture /Compare /Pulse width modulation Mode , Block Dia Prog Model, Rest /Clocking, Mem Org, Prog/Data, Flash Eprom, Add Mode/Inst Set Prog , I/o, Interrupt , Timer, ADC Design Parameters problem solving. PWM ADC Timers

Unit 4 : I/O interfacing (6 Hrs)

Clock, Reset Ckt. ADC / DAC ,Switch, LED Devices , LCD, High Power Devices Relays , OP Amps : Adder, Subtractor, Gain , Low Pass filter, High Pass filter, Integrator, Differentiator, Current to Voltage Converter, Timing /Counting Devices. Communication using RS232C , Sensors, Magnetic, Temperature, Pressure, Design Implementation of OP Amps

Unit 5 : Bus Technologies (6 Hrs)

I/O Bus, Bus management techniques. Serial / Parallel Bus , Bus Design Issues, Allocation , Arbitration. Study of Bus Parameter.
Detail study of CAN, I2C, SPI,USB, RS232C.

Unit 6 : RTOS (7 Hrs)

Device drivers, Interrupts, Interrupt Service Routines, Scheduling Algo, Inter Process Communication, Process Synchronisation. Multiple Tasks, Threads, Processes. Shared Data / Priority Inversion Char: of RTOS, Real Time Scheduling of RTOS Case Study of Embedded Systems in Detail.(H/W + S/W Algo)

Total Contact Hours: 40

Text Books

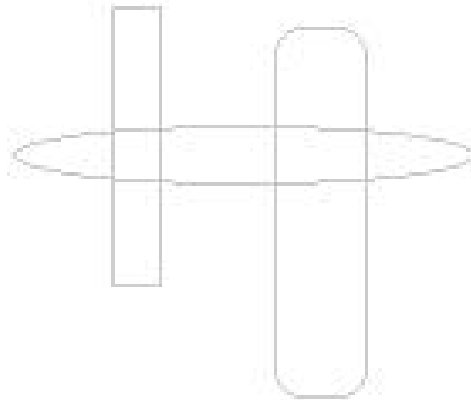
1. Raj Kamal 'Embedded Systems ', Tata McGraw-Hill . ISBN0-07-049470-3
2. Dr. K. V. K. K. Prasad "Embedded/Real time System : Concepts, Design, & Programming ". Dreamtech Press

Reference Books

1. Dr. K. V. K. K. Prasad, Gupta Dass, Verma "Programming for Embedded system "Wiley -Dreamtech India Pvt. Ltd.
2. Sriram Iyer , Pankaj Gupta, "Embedded Real time Systems Programming", Tata Mc-Graw Hill, 2004.

Additional Reading

1. Microcontroller Handbook



Title: Syllabus Format – PG Courses

FF No. : 658

CS52160: Enterprise Software Development

Objectives:

- To study interoperability principles and standards
- To learn essence of Business Processes and Modeling
- To apply Enterprise Architecture and Integration
- To learn development of Software Factories

Outcomes:

Upon completion this course, the students will be able:

- To create Enterprise Model of Target System
- To understand and adapt to Business Processes
- To use Enterprise Integration Strategies
- To develop Workflow artifacts
- To maintain Enterprise Catalogue

1: Business Process and Enterprise Architecture

(7 Hrs)

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, Architecture Views

2. Component Based Development

(6 Hrs)

Definition of Software Component and its Elements, Component Models and Component Services: Concepts and Principles, Business Case for Software Components, COTS Myths and Other Lessons Learned in Component-Based Software Development, Roles for Component-Based Development, Common High Risk Mistakes in Component-Based Software Engineering, CBSE Factors, Software Component Management Processes, Evolution, Maintenance and Management of Component-Based Systems

3. Enterprise Architecture Integration

(7 Hrs)

Introduction to Enterprise Architecture, Defining EAI, Data-Level EAI, Application Interface-Level EAI, Method-Level EAI, User Interface-Level EAI, The EAI Process, 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—The Preferred EAI Engine, Process Automation and EAI, EAI case studies

4. Business Process and Enterprise Architecture Patterns

(7 Hrs)

Introduction to Business Processes, Business Process Design, Business Process Design Notation, Business Process Execution, 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.

5: Software Factories**(7 Hrs)**

Context: Monolithic Construction, Gratuitous Generality, One-Off Development, Process Immaturity, Critical Innovations, Systematic Reuse, Development by Assembly, Model-Driven Development, Process Frameworks

Reuse Paradigm: Industrializing Software Development, Economics of Reuse, Economies of Scale and Scope, Systematic Software Reuse, Integrating the Critical Innovations, Software Factory, Software Factory Schema, Software Factory Template, Building a Software Factory, Implications of Software Factories, Development by Assembly, Software Supply Chains, Relationship Management ,Domain Specific Assets , Organizational Changes, Mass Customization of Software

6: Reuse and Product Lines**(6 Hrs)**

Systematic Reuse : Software Product Families, Software as a Product, How Families Are Formed, Working Within a Family, Solving Problems in Advance, The Role of Architecture ,Commonality and Variability ,Where Families Are Found ,Software Product Lines, Creating Economies of Scope

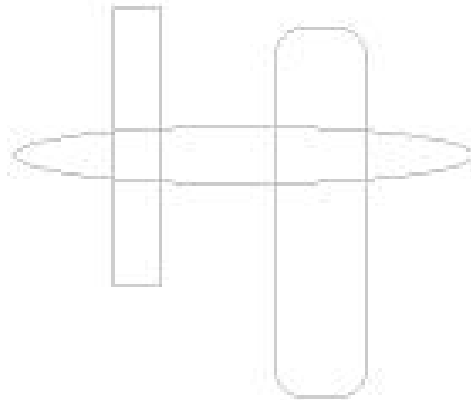
Software Product Lines: Product Line Development, Product Line Analysis, Product Line Design, Product Line Implementation, Product Development, Problem Analysis, Product Specification, Collateral Development, Product Implementation, Product Line Evolution, Product Line Deployment

Text Books:

1. Patterns of Enterprise Application Architecture, Martin Fowler, Addison-Wesley Professional, 2003, ISBN-10: 0321127420 ISBN-13: 9780321127426
2. Enterprise Integration: An Architecture for Enterprise Application and Systems Integration, Fred A. Cummins, Wiley; 2002 ISBN-10: 0471400106 ISBN-13: 978-0471400103

Reference Books:

1. Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions, Gregor Hohpe, Bobby Woolf, Addison-Wesley Professional, 2003, ISBN-10: 0321200683, ISBN-13: 978-0321200686
2. Essential Business Process Modeling, Michael Havey, O'Reilly Media, Inc., 2005, ISBN-10: 0596008430, ISBN-13: 978-0596008437
3. A Pragmatic Guide to Business Process Modelling, Jon Holt, September 2005 , Publisher: BCS ISBN: 978-1-902505-66-4
4. Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions, Gregor Hohpe, Bobby Woolf, Addison-Wesley Professional, 2004, ISBN-10: 0321200683 ISBN-13: 9780321200686
5. Jack Greenfield, Keith Short, Steve Cook, Stuart Kent, Software Factories: Assembling Applications with Patterns, Models, Frameworks, and Tools, Wiley Publication, ISBN: 978-0-471-20284-4, September 2004



Title : Syllabus Format – PG Courses

FF No. : 658

CS52161: CLOUD COMPUTING

Course Objectives:

- i.** To learn the core concepts and principles of cloud computing as well as identify and explore some of the emerging research challenges in clouds.
- ii.** To gain hands-on experience in using cloud computing infrastructure by designing, developing and deploying applications on cloud infrastructures.
- iii.** To work on a large research project in cloud computing.

Course Outcomes:

- i.** Students will explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about and the influence of several enabling technologies in cloud computing.
- ii.** Students will examine the process of working on a large research project under the mentorship of a teaching staff member. They will study how applications for clouds are written, deployed and analyzed. In the process, they will develop the needed skills to go through project planning, design, implementation, analysis and reporting.
- iii.** Students will identify some of the emerging cloud research challenges.

Unit 1 : Introduction to Cloud Computing

(6 Hrs)

Introduction to Cloud Computing, Definition, Characteristics, Components, Cloud provider, SAAS, PAAS, IAAS and Others, Organizational scenarios of clouds, Administering & Monitoring cloud services, benefits and limitations, Deploy application over cloud, Comparison among SAAS, PAAS, IAAS. Data center architecture: FatTree, DCell, BCube

Unit 2 : Cloud Technologies

(6 Hrs)

Virtualization Technology: virtual machine basics, process virtual machine, system virtual machine, virtual machine placement problem, virtualization applications in enterprises, virtual machine migration, pitfalls of virtualization.

Multitenant software: Multi-entity support, Multi-schema approach, Multitenance using cloud data stores, Data access control for enterprise applications.

Unit 3 : Data in the cloud

(8 Hrs)

Cloud file systems: GFS and HDFS, BigTable, HBase, Hiva and Dynamo. Map-Reduce and extensions: Parallel computing, The map-Reduce model, Parallel efficiency of Map-Reduce, Relational operations using Map-Reduce, Enterprise batch processing using Map-Reduce, Introduction to cloud development, Example/Application of Map-reduce, Features and comparisons among GFS,HDFS etc, Map-Reduce model.

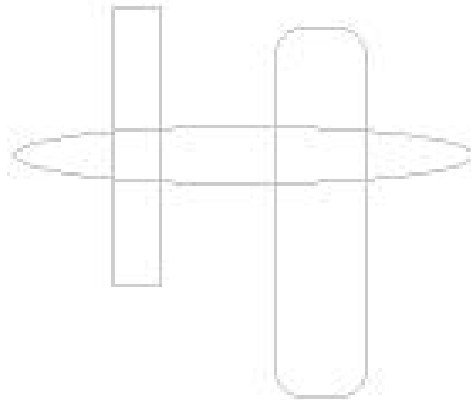
Unit 4 : Cloud Security

(8 Hrs)

Cloud security fundamentals, Privacy and Security in cloud. Cloud computing security architecture: General Issues, Trusted Cloud computing, Secure Execution Environments and Communications, Micro-architectures; Identity Management and Access control; Autonomic

CS50351: PG Lab – I

(Courses selected under Elective-I and Elective-II will be part of this Lab.)



Title: Syllabus Format – PG Courses

FF No. : 658

INTELLIGENT SYSTEMS AND NEURAL NETWORKS LAB

Objectives:

To understand

- about the basic aims and principles of neural network modeling and how to implement it practically
- How to implement intelligent system algorithms practically.
- practice what you have learned in some exercises

Outcomes:

On successful completion of the Lab the student will be able to

- Design the most appropriate neural network for an application under study;
- Appreciate the importance of input data and the role of data preprocessing;
- Assess the performance of the networks;
- Apply comparable statistical techniques and contrast the neural network solutions;
- Interpret the results produced by neural networks;
- Implement the algorithms in a software environment using MATLAB/Neural Ware Professional (optionally C).

Assignment – 1

Group of students of FE are on their way to the FE Freshmen Party. On the way to their destination there is a bridge they have to cross. Since it is night time and there is no moonlight to show the way, the students must light their way across the bridge with a flashlight. Students have only one flashlight. Unfortunately, the old and rusty bridge is very narrow and allows only for two people to cross it at the same time. Each student crosses the bridge at his own pace. If the two students are crossing the bridge together, they are crossing it at the pace of the slower one. The students are in a big hurry to make it to the opening of the party, so they're trying to cross the bridge as quickly as possible. Your task is to write a computer program that finds an optimal solution to the problem using state space search. An optimal solution to the problem is the sequence of bridge crossings that will bring the students across the bridge in a minimum amount of total time. The program must compute the minimum time required for all the students to cross the bridge together with the total number of states visited during the search (i.e., the total number of nodes in the closed list). In addition, the program should print out the sequence of steps (bridge crossings) that lead to the optimal solution. You must solve the problem using:

- blind search, by implementing uniform cost search algorithm;
- heuristic search, by implementing the A* algorithm with the following heuristic functions:

- (1) the amount of time required for the remaining students to cross the bridge is larger than or equal to the amount of time required for the slowest one of them to cross the bridge;
- (2) the time required for the remaining students to cross the bridge is larger than or equal to the sum of the times required for the following bridge crossings: the slowest student and the second slowest student cross the bridge together, the third slowest student and the fourth slowest student cross the bridge together, the fifth slowest student and the sixth slowest student cross the bridge together, etc.

You are encouraged to design your own heuristics that are potentially better than those provided above. In this case, however, you must be certain that your heuristics are optimistic. Finding the optimal solution is the main goal of this lab assignment.

Assignment – 2

Implement the A* algorithm for the following problems:

1. 8 puzzle
2. Missionaries and Cannibals

Specifications:

1. Coding:

The Coding should be Problem Independent.
 Open and closed list should be efficiently managed.
Parent Pointer Redirection should be handled.
 The program should terminate properly.

2. Performanc of Heuristics

The following Heuristics should be implemented and their relative performance (number of nodes expanded) should be analyzed:

- Baseline case ($h=0$).
- Displaced Tile Heuristic for the 8 puzzle problem.
- Manhattan Distance for the 8 puzzle problem.
- Any heuristic of your choice (for both problems) .

Effect of Monotone Restriction:

- First convince yourself that h_1 (displaced tiles) and h_2 (manhattan distance) are monotonic. Then verify that this situation obviates the need for parent pointer redirection.
- Violate monotonicity by including the cost of the empty cell in the heuristic. Now verify that parent pointer redirection is needed. Similarly find a non-monotonic heuristic for the Missionaries and Cannibals problem.
- Also observe that the f values of nodes expanded increase if MR is satisfied

User Interface and other pointers:

Specifying a given input state should be easy.

Present the results in an understandable way, say through graphs and tables.

Have enough comments in the code. These too carry marks.

Assignment –3

Perceptron assignment

1. Implement PTA
2. Observe behaviour for AND, OR, NAND, X-OR X-NOR etc..
3. Do the weights follow a cyclic pattern?
4. Take $n > 2$ and observe behaviour for
 - a. Majority
 - b. Palindrome
 - c. Parity
5. See if you can implement a digit recognizer with a set of perceptrons (7-segment display)
Is there any non-linearity?
6. Implement the Back-Propagation Algorithm for the following cases:
 - a. XOR
 - b. Palindrome
 - c. Parity

Note - The number of inputs as well as the number of nodes in the hidden layer should be taken as an input from the user.

Assignment –4

You will use a fully connected $1 \times 4 \times 1$ neural network (single input neuron, four neurons in the hidden layer, and one output neuron). The neurons in the hidden layer use a sigmoidal activation function, while the neurons in the input layer use the identity function ($f(x)=x$). Throughout the network training, the program should print out the iteration number and the network error (the square error of the output neuron averaged over all training instances). The number of individuals and the termination criterion (the maximum allowed network error and the number of iterations) are specified by the user. After the training is completed, the program must allow the user to provide new input examples and for each example print out the network output. Moreover, the program must allow the user to specify a file with test instances (a test set) and then print out the network error on the whole test set (mean square error).

Assignment –5

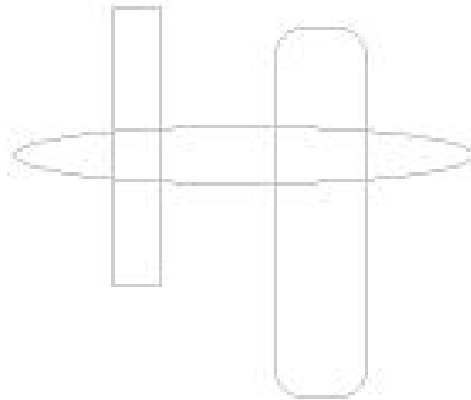
Implement the concept of Hopfield model with suitable real time example.

TEXT BOOK:

1. S. Russel and P. Norvig, “Artificial Intelligence – A Modern Approach”, Second Edition, Pearson Education, 2003.
2. Simon Haykin, “Neural Networks A comprehensive foundations”, PHI

REFERENCES:

8. David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence : a logical approach", Oxford University Press, 2004.
9. G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem solving", Fourth Edition, Pearson Education, 2002.
10. J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers, 1998.
11. Artificial neural networks - B.Vegnanarayana Prentice Haul of India P Ltd 2005
12. Neural networks in Computer intelligence, Li Mm Fu TMH 2003
13. Neural networks James A Freeman David M S kapura pearson education 2004
14. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006.



Title: Syllabus Format – PG Courses

FF No. : 658

INTERNET ROUTING ALGORITHMS LAB

Objective: To understand and implement some of the important Internet routing related concepts.

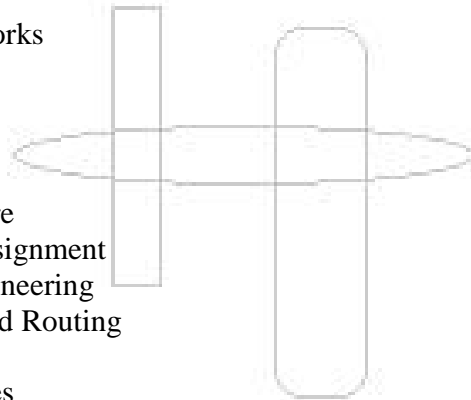
Outcomes:

1. To learn to develop a basic router
2. To understand the implementation details of IP Addresses and IP Packet filtering.

3. To understand and implement different routing algorithms and/or protocols.
4. To understand the Internet and more specifically the Router architecture.

Assignments should be based on the following topics:

1. Network Routing – An Introduction through Implementation
 - a. To setup Intranet : Installation and Configuration of Peer to Peer and Client Server models, Web server, E-mail, Proxy, Firewall and DNS Configurations
 - b. Conversion of a simple machine into a router.
2. Routing Algorithms
 - a. Bellman–Ford Algorithm and the Distance Vector Approach
 - b. Comparison of the Bellman–Ford Algorithm and Dijkstra’s Algorithm
 - c. Shortest and Widest Path Computations
3. Routing Protocols
 - a. Distance Vector Routing
 - b. Link State Routing
4. Routing in IP networks
 - a. RIP
 - b. OSPF
 - c. BGP
5. Internet Architecture
 - a. Address Assignment
 - b. Traffic Engineering
 - c. Policy-Based Routing
6. Router Architectures
 - a. Routing Functions
 - b. Packet Processing
7. IP Address Lookup Algorithms
8. IP Packet Filtering and Classification
9. Quality of Service Routing



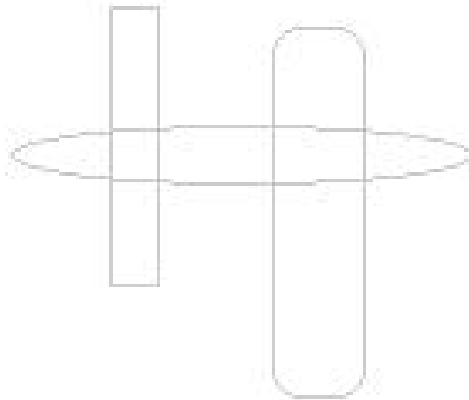
Outcomes:

After completing the course, the students will be able to:

1. Understand router elements, router components, router status, managing configuration files, the running and startup configuration files, router identification and banner
2. Understand in depth the major routing protocols and mechanisms used in the Internet
3. Appreciate some open research issues related to Internet routers, routing, traffic characteristics, naming & addressing

Text Books:

1. Network Routing: Algorithms, Protocols, and Architectures Deepankar Medhi and Karthikeyan Ramasamy (Morgan Kaufmann Series in Networking)
2. Network Algorithmics: An Interdisciplinary Approach to Designing Fast Networked Devices George Varghese (Morgan Kaufmann Series in Networking)



Title: Syllabus Format – PG Courses**FF No. : 658**

Parallel Computing on GPU Lab

Course Objectives :

1. To increase GPU awareness.
2. To know GPU computing platforms.

Course Outcomes :

1. Students will be able to design parallel programs for GPU
2. Students must have capability to optimize them for better performance.

Credits:1**Lab Hours: 24**

There will be 8 minor lab experiments designed by the instructor based on the above syllabus of 2 hours each and one major lab experiment of 8 hours chosen by the student in the area of his/her interest and approved by the instructor. These lab experiments will be implemented using CUDA C and/OR OpenCL.

In each assignment students will note serial and CUDA parallel execution time of their programs for measuring the speedup and other performance measures decided by the instructor.

Minor Lab assignments

- 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.

Major Lab assignment

This assignment is evaluated in terms of optimization of data transfer, memory optimization and the overall parallel design.

Title : Syllabus Format – PG Courses

FF No. : 658

DATA WAREHOUSING & DATA MINING LAB

Course Objectives:

- v. To understand the process of data mining and the key steps involved well enough to lead/manage a real-life data mining project
- vi. Know the basics of data warehousing and how it facilitates data mining
- vii. To understand fundamental issues in statistical data analysis that cut across all procedures, such as generalization to other data, basic tradeoffs, and validity of models.
- viii. To deliver an overview of web data mining and other significant mining techniques

Course Outcomes:

- v. Define and recognize key areas and issues in knowledge discovery and data
- vi. Develop an in-depth understanding of several data mining techniques
- vii. Define the concept, structure and major issues of data warehousing
- viii. Develop general awareness of data warehousing project management

List of Practicals

1. Design a multi dimensional data model using star/ snowflake schema technique for any business fact corresponding to a department of an organization. Implement the designed schema using a data warehouse tool (Oracle business intelligent 11g or SQL Server business intelligence development studio2008: Analysis Services).
2. Use of ETL tool (Integration services) for extracting data from various data sources, transform it into unique schema, and load it to destination tables in DWH and generate reports (Reporting Services)
3. Implementing and understanding data preprocessing methods on Weka.
4. Implementing a FPgrowth algorithm for generating association rules from a given large item set using Java and verifying the results using Weka.
5. Implementing a classifier for a small real data set using MATLAB or Java and verifying the results using Weka.
6. Implementing a clustering algorithm using a data set using MATLAB or Java and verifying the results using Weka.
7. Implementing a linear regression model for a given problem using MATLAB or Java.

Total Contact Hours:

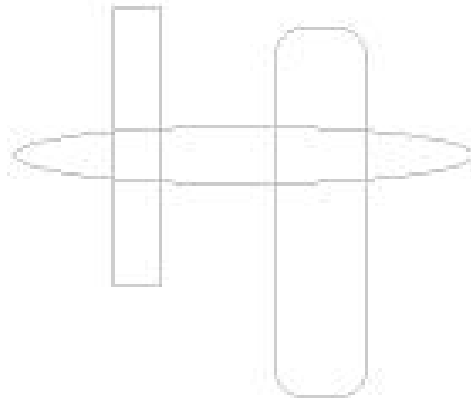
Text Books

1. Jiawei Han and Micheline Kamber “Data mining: concepts and techniques”, the Morgan Kaufman, 2001.
2. Kimball, “Data warehouse life cycle toolkit”, John Wiley,1998

Reference Books:

1. Abraham Silberschatz, Henry F. Korth, S. Sudarshan, “Database Systems Concepts”, 5th edition, 2005.
2. T. Mitchell. “Machine Learning”, McGraw-Hill, 1997.

3. Hand, Smyth, Mannila “Principles of Data mining”, MIT press,2001.
4. Gagendra Sharma, “Data mining, Data warehousing and OLAP”, S.K. Kataria and sons, First edition,2007-08.
- 5 M. Dash and H. Liu. “Feature selection for classification” Intelligent Data Analysis, 1(3):131-156, 1997.
- 6 Other research papers recommended by the staff in charge.



Title : Syllabus Format – PG Courses

FF No. : 658

USER INTERFACE DESIGN (UID) Lab

Objectives:

1. To make students understand importance of good user interface design and cost of bad interfaces.
2. To develop the skills necessary to choose media, mode and device for input and output interaction appropriate for the user population, application requirements and processing capability of the system.

Students should complete following assignments in a group of four students for a selected IT product / application.

1. Perform a literature survey for usability of user interface.
2. Design user personas for target user population.
3. Apply suitable usability evaluation method to detect usability issues.
4. Design user interface using required usability guidelines and principles.
5. Incorporate an innovative feature into the user interface.

Outcomes: At the end of the course, the students will be able to design and evaluate a selected user interface.

Text Books:

1. Wilbert Galitz, 'The Essential Guide to User Interface Design', Wiley Dreamtech, 2005.
2. Ben Shneiderman, 'Designing the User Interface', Pearson Education, Third edition, 2002.

Reference Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, 'Human Computer Interaction', Third Edition, 2004.
2. Donald Norman, 'The Design of Everyday Things', Basic Books, USA, 2002.
3. Donald Norman, 'The Design of Future Things', Basic Books, USA, 2007.

Title: Syllabus Format – PG Courses

FF No. : 658

IMAGE PROCESSING LAB

Course Objectives and Outcomes:

1. Learn to use matlab to manipulate image files .
2. Explore several different image processing techniques, and learn to improve images with them.
3. Extract quantitative data from images.

List of Practicals

Implementation of the following using MATLAB / C:

1. To read and Display Image using ‘C’ programming.
- 2.To explore statistical properties of image and displaying histogram and profile
- 3.Histogram modification.
- 4.Image smoothing operations.
- 5.Pseudo-coloring of gray-level images.
- 6.Edge detection.-2 assignments
- 7.Image transforms-1 assignments
- 8.Image Compression
- 9.Image segmentation

Outcomes:

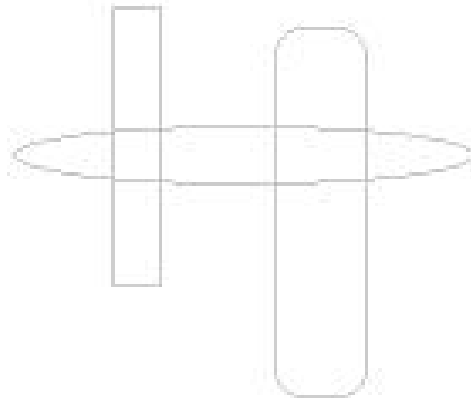
1. Gain knowledge and practical experience in digital image processing.
2. Learn practical skills and analytic background for building digital image/multimedia applications

Text Books :

- 1 Rafael Gonzalez & Richard Woods Digital Image Processing (Pearson publications).
- 2 Anil K. Jain Fundamental of Digital Image Processing . (PHI publication)

Reference Books :

- 1 Digital Image Processing by Pratt,Wiley Publication
- 2.K,R, Castleman, Digital Image Processing, Prentice Hall: Upper Saddle River, NJ, 3. 3.
- 3.Image Processing: Analysis and Machine Vision by Milan Sonka



Title : Syllabus Format – PG Courses

FF No. : 658

EMBEDDED SYSTEMS LAB

Course Objectives:

- i.** To understand the I/O Design
- ii.** To understand Peripheral Interfacing
- iii.** To understand the RTOS.

Course Outcomes:

- i.** Hands on Experience of Sensors.
- ii.** Learn to link individual blocks of Embedded Systems
- iii.** Design and implement a Simple RTOS

List of Practicals

Group A

1. Study of PIC / ARM Microcontroller Development Kit
2. Generate a square Wave . Using all Timers on uC Check and chart error percentages.
3. Establish Serial Communication between uC and PC.
4. Read Analog Data , Convert to BCD / ASCII and display it on PC.
5. Read PIC Kit to Read input from a switch count number key presses and display on LED Display.
6. Stepper Motor Controller using uC. Use switch press to change Direction and Increase / Decrease Speed.
7. DC Motor Control using PWM . Control Input from Potentiometer / ADC
8. Function timing using the timer.(Create a Scheduler)
9. Study of uC other than PIC and ARM. (TI , Freescale ...)
10. RPM Measurement

Group B

- 1 . Demonstrate Non Pre-emptive scheduling.
2. Demonstrate Pre-emptive scheduling.
3. Create a Function delay using the Timer.
4. Write a linux Shell Script to display no of readable Writable Files in a Specific Directory.
5. Write a C program use 2 Threads One Thread reads from Keyboard . Second Thread Displays the Data. Use Message Queue.
6. Write a C program use 2 Threads One Thread reads from Keyboard . Second Thread Displays the Data. Use Shared Memory..
7. Write a Producer Consumer Program using Semaphore.
8. Testing the Serial Port using the Watcom RTOS.
9. Semaphores.
10. Message Queues.
11. Signals.

Note:

- 1) Assignments 1 -10 to be carried out on PIC Microcontroller and ARM Microcontroller

Kit

- 2) All Assignments in Group A compulsory.
- 2) Assignment in Group B to be performed on RTOS using Group A Assignments.
Atleast 2.
- 3) Mini Project covering a combination of some of the assignments given above to be presented at Semester End as part of the Lab Exam.

Text Books

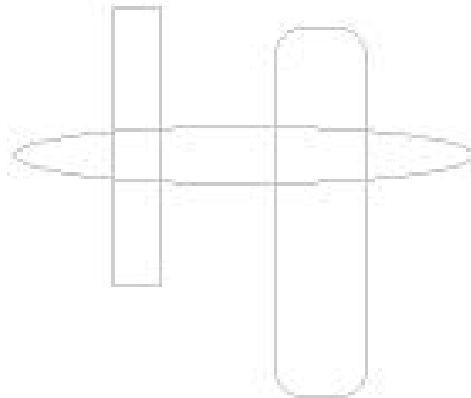
1. Raj Kamal 'Embedded Systems ', Tata McGraw-Hill . ISBN0-07-049470-3
2. Dr. K. V. K. K. Prasad "Embedded/Real time System : Concepts, Design, & Programming ". Dreamtech Press

Reference Books

1. Dr. K. V. K. K. Prasad, Gupta Dass, Verma "Programming for Embedded system "Wiley -Dreamtech India Pvt. Ltd.
2. Sriram Iyer , Pankaj Gupta, "Embedded Real time Systems Programming", Tata Mc-Graw Hill, 2004.

Additional Reading

1. Microcontroller Handbook



Title : Syllabus Format – PG Courses

FF No. : 658

Enterprise Software Development Laboratory

Objectives:

- To study interoperability principles and standards
- To learn essence of Business Processes and Modeling
- To apply Enterprise Architecture and Integration
- To learn development of Software Factories

Course Outcomes:

Upon completion this course, the students will be able:

- To create Enterprise Model of Target System
- To understand and adapt to Business Processes
- To use Enterprise Integration Strategies
- To develop Workflow artifacts
- To maintain Enterprise Catalogue

List of Practicals

1. To narrate Requirement Definition Document and narrate System Requirements Specification Document for target system with Feasibility Study report.
2. To prepare a Risk Assessment and mitigation plan for the target system.
3. To develop Business Process Diagrams specifying the goals and processes in detail.
4. To select appropriate Architecture Style and trace major goals to be addressed with an emphasis on accommodation of non functional requirements in logical architecture.
5. To identify and specify all the components using procedure design language construct aligning to physical architecture.
6. To incorporate the applicable Enterprise Architecture pattern with justification.
7. To implement and validate the components with suitable architecture integration scheme.
8. To prepare a report of assets identified by the execution Enterprise Software Development Cycle.

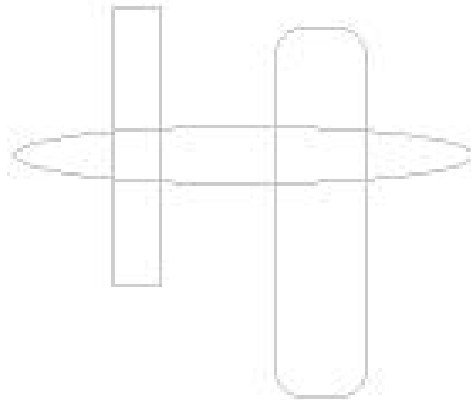
Text Books:

3. Patterns of Enterprise Application Architecture, Martin Fowler, Addison-Wesley Professional, 2003, ISBN-10: 0321127420 ISBN-13: 9780321127426
4. Enterprise Integration: An Architecture for Enterprise Application and Systems Integration, Fred A. Cummins, Wiley; 2002 ISBN-10: 0471400106 ISBN-13: 978-0471400103

Reference Books:

6. Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions, Gregor Hohpe, Bobby Woolf, Addison-Wesley Professional, 2003, ISBN-10: 0321200683, ISBN-13: 978-0321200686
7. Essential Business Process Modeling, Michael Havey, O'Reilly Media, Inc., 2005, ISBN-10: 0596008430, ISBN-13: 978-0596008437
8. A Pragmatic Guide to Business Process Modelling, Jon Holt, September 2005, Publisher: BCS ISBN: 978-1-902505-66-4
9. Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions, Gregor Hohpe, Bobby Woolf, Addison-Wesley Professional, 2004, ISBN-10: 0321200683 ISBN-13: 9780321200686

10. Jack Greenfield, Keith Short, Steve Cook, Stuart Kent, Software Factories: Assembling Applications with Patterns, Models, Frameworks, and Tools, Wiley Publication, ISBN: 978-0-471-20284-4, September 2004



Title: Syllabus Format – PG Courses

FF No. : 658

CLOUD COMPUTING LAB

Course Objectives:

- iv.** To learn the core concepts and principles of cloud computing as well as identify and explore some of the emerging research challenges in clouds.
- v.** To gain hands-on experience in using cloud computing infrastructure by designing, developing and deploying applications on cloud infrastructures.
- vi.** To work on a large research project in cloud computing.

Course Outcomes:

- iv. Students will explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about and the influence of several enabling technologies in cloud computing.
- v. Students will examine the process of working on a large research project under the mentorship of a teaching staff member. They will study how applications for clouds are written, deployed and analyzed. In the process, they will develop the needed skills to go through project planning, design, implementation, analysis and reporting.
- vi. Students will identify some of the emerging cloud research challenges.

List of Practicals

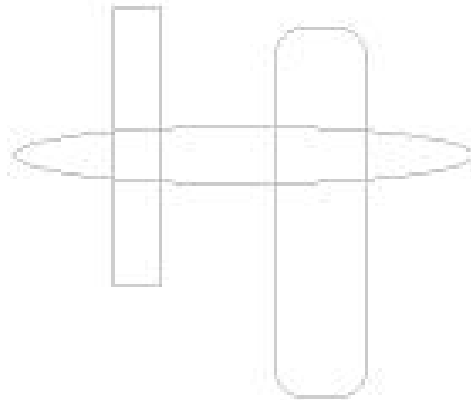
1. Google App engine
2. Amozan cloud services
3. Windows cloud services
4. Map-reduce

Text Books

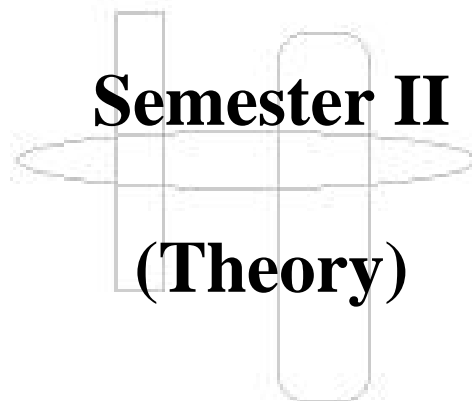
4. Cloud Computing for Dummies by Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper (Wiley India Edition)
5. Enterprise Cloud Computing by Gautam Shroff, Cambridge
6. Cloud Security by Ronald Krutz and Russell Dean Vines, Wiley-India

Reference Books:

6. Google Apps by Scott Granneman, Pearson
7. Cloud Security & Privacy by Tim Malhar, S.Kumaraswamy, S.Latif (SPD, O'REILLY)
8. Cloud Computing : A Practical Approach, Antohy T Velte, et.al McGraw Hill,
9. Cloud Computing Bible by Barrie Sosinsky, Wiley India
10. Cloud Computing, Michael Miller, Que Publishing.



ME- CSE(Information Technology)



Semester II

Code	Subject	Type	Teaching Scheme		Assessment Scheme					Credits
			L	P	ISA				ESA	
					CT *	MSE	HA *	CA	ESE	
CS50154	Advanced Algorithms	Theory	3	-	10	30	10	-	50	3
CS50155	Project Management	Theory	3	-	10	30	10	-	50	3
CS50156	High Performance Network Design and Analysis	Theory	3	-	10	30	10	-	50	3
	Department Elective – III	Theory	3	-	10	30	10	-	50	3
	Department Elective – IV	Theory	3	-	10	30	10	-	50	3
CS50352	PG Lab – II	Lab	-	4	-	-	-	100	-	4
CS57753	Technical Seminar – I	Lab	-	2	-	-	-	100	-	4
CS50452	CVV – II	Lab	-	-	-	-	-	-	100	2
CS57752	Semester Project –II	Project		6	-	-	-	-	100	2
			15	12						27

Title : Syllabus Format – PG Courses

FF No. : 658

CS50154: Advanced Algorithms

Objectives:

1. Study advanced algorithm design techniques
2. Study the role of randomization and approximation techniques in algorithm design.

Course Outcomes:

By the end of the course, it is expected that the students will be able to :

1. Apply techniques such as Divide and Conquer, Greedy and Dynamic programming to solve complex problems.
2. Understand Time complexity computations and prove problems NP-Complete.
3. Use Randomized and Approximation algorithms to problems that cannot be efficiently solved by combinatorial strategies.

Unit 1: Review of Divide and Conquer, Greedy strategies and Complexity analysis (8 Hrs)

Stable Matching problem, Computational Tractability, Time and Space complexity notations. Divide and Conquer : Review of Sorting algorithms, Counting inversions, Finding closest pair of points, Integer Multiplication. Greedy strategy : Interval scheduling, Graph problems.

Unit 2: Dynamic Programming and Network flow problems (7 Hrs)

Weighted interval scheduling, Sequence alignment in linear space, shortest path in graphs, TSP. Maximum flow problem, Min cut theorem, Ford Fulkerson algorithm.

Unit 3 : NP and computational Intractability (6 Hrs)

Classes : P, NP, NP Complete, NP Hard. Decision problems, Cooks Theorem. Reduction process.

NP-Complete problems- Satisfiability problem, vertex cover problem.

NP-Hard problems- graph, scheduling, code generation problems, Simplified NP Hard Problems

Unit 4 : Randomized Algorithms (7 Hrs)

Introduction to randomized algorithms, Las Vegas and Monte-Carlo algorithms (with examples randomized quick sort, min-cut algorithm), Review of Basic probability theory: random variables, expectation, variance, conditional probability, linearity of expectation etc., Indicator random variables and their role in algorithm analysis, Basic complexity classes, P, NP, RP, Co-RP, Markov inequality, Chebyshev inequality (with proof), application to selection problem.

Unit 5 : Algebraic techniques and some applications (7 Hrs)

Chernoff bound (without proof) and some applications, brief introduction to analysis of sum of co-related random variables, Markov chains and random walks, 2-SAT, graph connectivity, finger printing (example of matrix multiplication), Number Theoretic algorithms : Euclid's algorithm, Modulo arithmetic, Quadratic non-residues, Primal testing.

Unit 6: Approximation Algorithms (7+1 Hrs)

Introduction to approximation algorithms, NP-hard optimization problems, lower bounding OPT, example of setcover ($O(\log n)$ factor approx-algorithm based on greedy strategy, layering) Traveling Salesman Problem (TSP), general TSP hard to approximate, metric TSP, Knapsack and FPTAS algorithms.

Linear programming based algorithms, LP relaxation, LP duality, set-cover using LP based techniques.

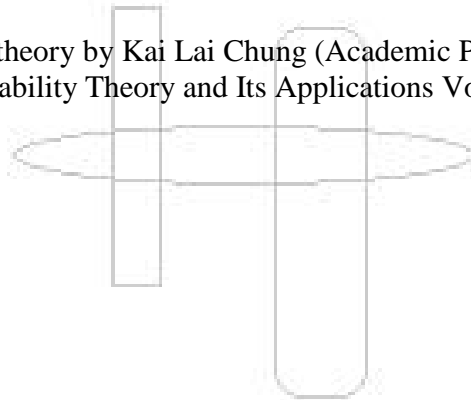
Total Contact Hours: 40

Text Books :

1. "Algorithm Design" by Jon Kleinberg, Eva Tardos, Pearson Education.
2. "Randomized Algorithms" by Rajeev Motwani and Prabhakar Raghavan (Cambridge University Press)
3. "Approximation Algorithms" by Vijay V. Vazirani (Springer)
4. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein (MIT Press)

Reference Books :

1. A course in probability theory by Kai Lai Chung (Academic Press)
2. An Introduction to Probability Theory and Its Applications Vol I by William Feller (Wiley)



Title : Syllabus Format – PG Courses

FF No. : 658

CS50155: Project Management

Objectives:

1. To provide an introduction to the theory and practice of project management
2. To provide an understanding of project budgeting and risk analysis
3. To experience the insights necessary to obtain maximum benefit from object technology
4. To understand the need for, the place of, and aims of, requirements, analysis and design
5. To thoroughly understand the practices of analysis and design (OOA and OOD)
6. To understand the practical connections between the theory of object-oriented design and the object-oriented programming languages
7. To become familiar with the unified modelling language (UML 1.x or UML 2.0)
8. To understand the relative merits of the different UML diagrams, distinguishing those diagrams most likely always to be useful to typical projects from those diagrams more likely to be of interest to more specialized projects
9. To identify fundamental and advanced concepts of design and architectural patterns
10. To Structure systems by applying architectural patterns

Course Outcomes:

By the end of the course, it is expected that the students will be able to :

1. Understand basic project management terminology, methodology and the role of project manager
2. Understand how to produce a project plan with effective budgeting
3. Understand different perspectives about the systems development process
4. Understand the role and importance of requirements analysis and specification
5. Understand the basic principles of object-orientation
6. Acquire a working knowledge of system modeling techniques
7. Become aware of the emerging ideas relevant to object-oriented systems development.
8. Create commonly expected "deliverables" of systems design including models of structure, behavior and dynamics

Unit 1: Introduction to Project Management

(7 Hrs)

Project Activities, Structures and Frameworks, Strategy and Project Management, Project Definition, Development Needs and Implementation, Role of Teams, Types of Teams and team Life Cycles, Teamwork, Management and Leadership in Projects, Best Practices for Project Planning, Time Planning, Developing Realistic Estimates Integrating the Schedule and Critical Path, Activity Planning, Software Configuration Management, Audit Cycle, Version Control, Verification and Validation, Software Production, Release Management, Reengineering Cycle, Refactoring

Unit 2: Project Estimation

(7 Hrs)

Project Cost and Quality Planning, Risk analysis and Planning, Risk Estimation and Control, Complex Projects: Internal and External Risks, Empirical Cost Estimation, COCOMO-II, Modern techniques and impact of Cost Estimation, Software Sizing, Software Scope Management, Introduction to Function Point Analysis , Introduction to Complex Projects, Assessing Project Viability, Managing Stakeholders, Products and Services procurement, Reviews, Inspections, Benchmarks

Unit 3 : Introduction to UML**(6 Hrs)**

Elements of UML: The importance of modeling, Building blocks: things, relationships and diagrams, Architectural views: use case, design, implementation, process and deployment, Levels of detail: visualization, specification and construction, Object oriented concepts
Programming In Small Versus Programming In Large, UML 2.0 History, New Features and introduction to MDA/ MOF/ XMI/ CORBA, Introduction to UML Metamodel, Extensibility Mechanisms and its usage, Introduction to OCL ,Behavioral Diagrams in UML ,Structural Diagrams in UML, Specification techniques of diagrams in UML

Unit 4 : Behavioral Model Development**(7 Hrs)**

Domain Analysis: The Domain Perspective, Use Cases, Use Case Diagram Components, Use Case Diagram, Actor Generalization, Include and Extend, Template for Use Case Narrative, Data Dictionary: Finding the Objects, Responsibilities, Collaborators, and Attributes, CRC Cards, Class Models and Use Case Models, Judging the Domain Model

Use case realization: Sequence diagrams, object lifelines and message types, Modeling collections multiobjects, Refining sequence diagrams, Operators

Implementing memory in objects using state machines: States, events and actions

Nested machines and concurrency, Converting sequence diagrams into communicating state machines

Analyzing object behavior: Modeling methods with activity diagrams, Activity Diagrams: Decisions and Merges, Synchronization, Iteration, Partitions, Parameters and Pins, Expansion Regions, Swimlanes, concurrency and synchronization

Communication Diagram, Interaction Overview Diagrams, Timing Diagrams

Unit 5 : Object Design and Implementation**(7 Hrs)**

Design of Objects: Design and Factoring, Design of Software Objects, Features and Methods, Cohesion of Objects, Coupling between Objects Coupling and Visibility, Inheritance, Constructors & Destructors, Instance Creation, Abstract Classes, Polymorphism, Multiple Inheritance and associated Problems, Interfaces, Interfaces with Ball and Socket Notation

Establishing The Object Model: Refining classes and associations, Analysis model vs. design model classes, Categorizing classes: entity, boundary and control , Modeling associations and collections, Preserving referential integrity , Achieving reusability

Isolating reusable base classes, Reuse through delegation, Identifying and using service packages

Packages and interfaces: Distinguishing between classes/interfaces, Exposing class and package interfaces, Subscribing to interfaces

Component and deployment diagrams: Describing dependencies, Deploying components across threads, processes and processors

Unit 6: Design Patterns and Patterns Types (6 Hrs)

Design Patterns: Creational Patterns, Patterns for Organization of Work, Access Control Patterns, Service Variation Patterns, Service Extension Patterns

Pattern Types: Object Management Patterns Adaptation Patterns, Communication Patterns, Architectural Patterns, Structural Patterns, Patterns for Distribution, Patterns for Interactive Systems , Adaptable Systems, Frameworks and Patterns, Analysis Patterns

Total Contact Hours: 40

Text Books :

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

Reference Books :

1. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.
2. Martin Flower, "UML Distilled: A Brief Guide to The Standard Object Modeling Language ", 3rd Edition, Addison- Wesley, ISBN – 0321193687
3. Software Project Management , Bob Hughes, Mike Cotterell Publisher: McGraw-Hill Publishing Co.; 4Rev Ed edition (November 1, 2005) ISBN-10: 0077109899 ISBN-13: 978-0077109899
4. Design Patterns: Elements of Reusable Object-Oriented Software (Addison-Wesley Professional Computing Series) by Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides Publisher: Addison-Wesley Professional; 1st edition (January 15, 1995) ISBN-10: 0201633612 ISBN-13: 978-0201633610

Title : Syllabus Format – PG Courses

FF No. : 658

CS50156: HIGH PERFORMANCE NETWORKS DESIGN, AND ANALYSIS

Course Objectives:

- i. To understand analysis of a problem, design of its solution, implementation of the solution, testing of the solution.

- ii. To describe the methods used in modeling, analysis and design communications systems.
- iii. To understand need of convergence.
- iv. To learn various networks, and signaling in that network.

Course Outcomes:

- i. Model and analyze computer communication networks and protocols, evaluate network technologies and solutions, and understand and investigate tradeoffs arising in the design process of such systems
- ii. Apply knowledge of mathematics, probability, and statistics to model and analyze some network design problems.
- iii. Use techniques, skills, and modern networking tools necessary for network analysis, design, and management.
- iv. Understand various standards agencies and major industry standards in convergence technologies and telecommunications industry
- v. Understand the signaling functions of ISDN and SS7

Unit 1 : Introduction to convergence**(6 Hrs)**

Voice and Data Network Characteristics, challenges of converged network, Signaling standards for converged network: H.323, SIP, MGCP, Gateways and Gatekeepers, Quality of service.

Unit 2 : Digital Networks**(7 Hrs)**

ISDN Overview, ISDN Interfaces and functions: Transmission Structure, User-Network Interface Configuration, Protocol Architecture, Connection, Addressing, Interworking. LAPD, ISDN Network Layer: basic call control, SS7, B-ISDN architecture, B-ISDN-protocol.

Unit 3 : Frame Relay and ATM**(6 Hrs)**

Frame Relay: protocols and services, Congestion control. ATM: Protocols, Traffic and congestion control. SDH/SONET Infrastructure.

Unit 4 : Network Design**(7 Hrs)**

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

Unit 5 : Queuing Theory**(7 Hrs)**

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, and Occupancy Distribution upon Departure.

Unit 6 : Delay Models in Data Networks**(7 Hrs)**

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. Problem on M/M/1 system for related topics.

Total Contact Hours: 40**Text Books:**

1. "Voice over IP Technologies-Building the converged network", by Mark A. Miller, P.E., Wiley, ISBN 81-265-0286-X,
2. "ISDN and Broadband ISDN with frame relay and ATM" by William Stallings, Pearson Education, 2003, ISBN 81-7808-422-8, 4th Edition.
3. "Telecommunication Network Design Algorithms", by Kershenbaum A., Tata McGraw Hill Publication, ISBN 0-07-034228-8, 1st Edition.
4. "Data Networks", by Bertsekas D. and Gallager R., Prentice-Hall, Englewood Cliffs, N.J., ISBN0-87692-780-0, 2nd Edition, 1992.

Reference Books :

1. "Design and Analysis of Computer Communication Networks", by Vijay Ahuja, McGraw Hill, ISBN 0070006970, 1st Edition, 1981.
2. "Computer Networks", by Andrew S. Tenenbaum, Prentice Hall of India, ISBN 81-203-2175-8, 4th Edition.
3. "Data and Computer Communications", by Stallings W, Prentice Hall of India Pvt. Ltd., 2002, ISBN 81-203-2067-0, Sixth Edition.

Title : Syllabus Format – PG Courses

FF No. : 658

CS57752: SEMESTER PROJECT –II

Projects based on PM and HPNDA shall be implemented.

Project Management Laboratory

Objectives:

11. To experience the insights necessary to obtain maximum benefit from object technology
12. To understand the need for, the place of, and aims of, requirements, analysis and design
13. To thoroughly understand the practices of analysis and design (OOA and OOD)
14. To become familiar with the unified modelling language (UML 1.x or UML 2.0)
15. To understand the relative merits of the different UML diagrams, distinguishing those diagrams most likely always to be useful to typical projects from those diagrams more likely to be of interest to more specialized projects
16. To identify fundamental and advanced concepts of design and architectural patterns
17. To Structure systems by applying architectural patterns

Course Outcomes:

By the end of the course, it is expected that the students will be able to :

9. Understand different perspectives about the systems development process
10. Understand the role and importance of requirements analysis and specification
11. Understand the basic principles of object-orientation
12. Acquire a working knowledge of system modeling techniques
13. Create commonly expected "deliverables" of systems design including models of structure, behavior and dynamics

A green field engineering project is required to be selected and for such a project following would be assignments:

9. To narrate Requirement Definition Document for the target system with following three areas:
 - a. Problem Identification
 - b. Problem Definition
 - c. Problem Statement
10. To narrate System Requirements Specification Document for target system with reference to the IEEE 610.12.1990 Std guidelines.
11. 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) and Transactions (Use Cases)
 - b. Event responses related to transactions with external agents.
 - c. Detection of System boundaries indicating scope of system.
12. 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.
13. 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.
14. To depict the dynamic behavior using detailed Activity diagram.
15. 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.
16. 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 and Program Design Language Constructs for the target system should be prepared according to specification.
17. Implement the system features using suitable design patterns. State the complete pattern specification and note the applicability of the patterns.

Total Contact Hours: 26

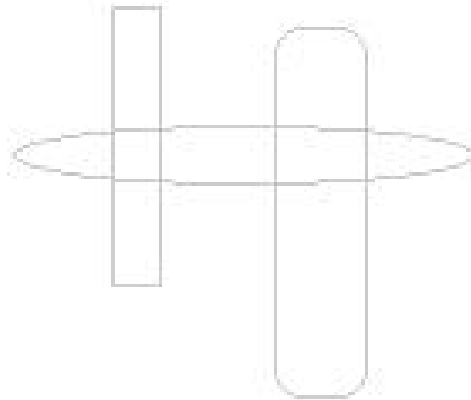
Text Books :

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

Reference Books :

5. Tom Pender, "UML Bible", John Wiley & sons, ISBN – 0764526049.
6. Martin Flower, "UML Distilled: A Brief Guide to The Standard Object Modeling Language", 3rd Edition, Addison- Wesley, ISBN – 0321193687
7. Software Project Management, Bob Hughes, Mike Cotterell Publisher: McGraw-Hill Publishing Co.; 4Rev Ed edition (November 1, 2005) ISBN-10: 0077109899 ISBN-13: 978-0077109899

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



Title : Syllabus Format – PG Courses

FF No. : 658

HIGH PERFORMANCE NETWORKS DESIGN, AND ANALYSIS LAB

Course Objectives:

- v. To understand analysis of a problem, design of its solution, implementation of the solution, testing of the solution.
- vi. To describe the methods used in modeling, analysis and design communications systems.
- vii. To understand need of convergence.
- viii. To learn various networks, and signaling in that network.

Course Outcomes:

- vi. Model and analyze computer communication networks and protocols, evaluate network technologies and solutions, and understand and investigate tradeoffs arising in the design process of such systems
- vii. Apply knowledge of mathematics, probability, and statistics to model and analyze some network design problems.
- viii. Use techniques, skills, and modern networking tools necessary for network analysis, design, and management.
- ix. Understand various standards agencies and major industry standards in convergence technologies and telecommunications industry
- x. Understand the signaling functions of ISDN and SS7

List of Practicals

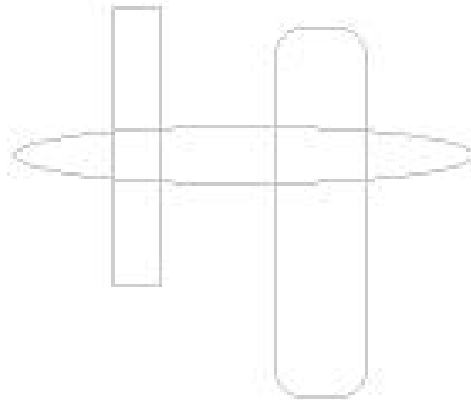
5. Study of Network simulator in detail.
6. Study of Configuring ISDN BRI (U interface)
7. Implementation of ATM simulation model.
8. Implementation of Markov chain formulation
9. Implement a CMST algorithm,
10. Implement a ESAU-William's algorithm,
11. Implement a Sharma's algorithm,
12. Implement a performance analysis of DLL,NL

Text Books:

5. "Voice over IP Technologies-Building the converged network", by Mark A. Miller, P.E., Wiley, ISBN 81-265-0286-X,
6. "ISDN and Broadband ISDN with frame relay and ATM" by William Stallings, Pearson Education, 2003, ISBN 81-7808-422-8, 4th Edition.
7. "Telecommunication Network Design Algorithms", by Kershenbaum A., Tata McGraw Hill Publication, ISBN 0-07-034228-8, 1st Edition.
8. "Data Networks", by Bertsekas D. and Gallager R., Prentice-Hall, Englewood Cliffs, N.J., ISBN0-87692-780-0,2nd Edition, 1992.

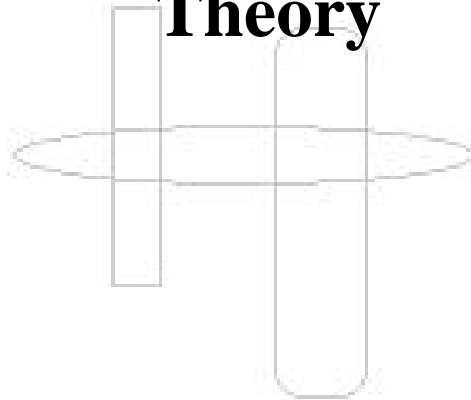
Reference Books :

4. "Design and Analysis of Computer Communication Networks", by Vijay Ahuja, McGraw Hill, ISBN 0070006970, 1st Edition, 1981.
5. "Computer Networks", by Andrew S. Tenenbaum, Prentice Hall of India, ISBN 81-203-2175-8, 4th Edition.
6. "Data and Computer Communications", by Stallings W, Prentice Hall of India Pvt. Ltd., 2002, ISBN 81-203-2067-0, Sixth Edition.



Elective –III

Theory



Title :Syllabus Format – PG Courses

FF No. : 658

CS52153: MACHINE LEARNING

Aim :

This course emphasizes on construction of computer programs that learn in a broad sense in order to enable Artificial Neural Networks, Fuzzy logic, machine learning algorithms and real time problems to improve their performance automatically over time. This course covers several important learning paradigms including learning from examples, genetic algorithm, decision tree learning, neural networks, hypothesis, support vector machines, Bayesian learning, learning rules, analytical learning, and reinforcement learning and fuzzy logic.

Objectives:

1. To introduce students to several prominent areas of soft computing, including feature extraction, decision trees, neural networks, genetic algorithms, Bayesian learning, clustering, ensemble learning, support vector machines, and reinforcement learning, fuzzy logic and illustrate what types of problems the different methods are suited for.
2. To give students hands-on experience with these methods and tools for implementing and using them on real-world problems like Matlab statistical tools, Matlab NN tools, Neurosolutions, WEKA etc.
3. To give students experience with performing simulations and doing statistical data analysis of the results.
4. To design and implement soft computing algorithms and evaluate with the help of different parameters like accuracy, time complexity, space complexity, performance etc.

Unit 1 : Fundamentals

(7 Hrs)

Introduction: Soft computing and hard computing, types, applications. Well posed learning problem, Designing a learning system, Perspectives and issues in soft computing, Concept Learning and the General-to-Specific Ordering: Task, search, Find S algorithm, Version space and the candidate elimination algorithm, list then eliminate algorithm, inductive bias, Decision Tree Learning: representation, appropriate problems, Basic design tree learning algorithm, Hypothesis space, inductive bias, issues in decision tree learning.

Unit 2 : Learning by experience

(7 Hrs)

Artificial Neural Networks: representation, perceptron, learning rules, activation functions, Backpropagation algorithm, Support Vector Machines and Kernel based methods, obtaining the optimal hyperplane, SVM formulation with slack variables; nonlinear SVM classifiers, Kernel Functions for nonlinear SVMs; Mercer and positive definite Kernels, Support Vector Regression and ϵ -insensitive Loss function, examples of SVM learning, Overview of SMO and other algorithms for SVM; ϵ -SVM and ϵ -SVR; SVM as a risk minimizer, Positive Definite Kernels; RKHS; Representer Theorem
Feature Selection, Model assessment and cross-validation, Feature Selection and Dimensionality Reduction; ensemble classifiers, Principal Component Analysis, Assessing Learnt classifiers; Cross Validation, evaluation.

Title : Syllabus Format – PG Courses

FF No. : 658

CS52154: MOBILE COMPUTING

Course Objectives:

- i.** To understand PCS based on GSM and CDMA
- ii.** To understand the design of cellular network
- iii.** To understand the mobility management.

Course Outcomes:

- i.** Use principles of Mobile Computing and its enabling technologies, and explore exciting ideas, solutions, and paradigm shifts.
- ii.** Understand wireless access and core networks and mobility in cellular networks
- iii.** Understand important standards like GSM, CDMA

Unit 1 : Introduction to Cellular Systems (6 Hrs)

Personal Communication System (PCS), PCS Architecture, Overview of Cellular Telephony, Cell phone generation-1G, 2G, 2.5G, 3G, 4G Timeline, Low Tier, High Tier, Wideband Cellular Systems, Need and Applications of wireless communication, Location dependent services, Effects of device portability.

Unit 2 : Cellular Network Design (7 Hrs)

Frequencies for radio transmission, signals, Spectrum allocation, Propagation modes, Line of sight transmission, Fading in Mobile Environment, Performance criterion, Frequency reuse, Co-channel interference and system capacity, Channel Planning, Cell Splitting, Types of non co channel Interference, Cell splitting.

Unit 3 : Medium Access Control (7 Hrs)

Specialized MAC, SDMA, FDMA, TDMA, CDMA, Frequency Hopping Spread Spectrum (FHSS), Direct Sequence Spread Spectrum (DSS), GMSK Modulation.

Unit 4 : GSM (6 Hrs)

GSM – Architecture, Logical and traffic channels, Location tracking, Call setup, Spectrum allocation, UMTS basic architecture and UTRA modes, GPRS

Unit 5 : Mobility Management (7 Hrs)

Handoffs and dropped calls: Value of Implementing. Initialization of handoff, delaying a hand off, Forcing hand off, Power different handoff .Mobile assisted handoff, Intersystem handoff .Dropped call rate formula.

Unit 6 : Mobile Network Layer and Mobile Transport Layer (7 Hrs)

Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast and selective retransmission and recovery, Transaction oriented TCP.

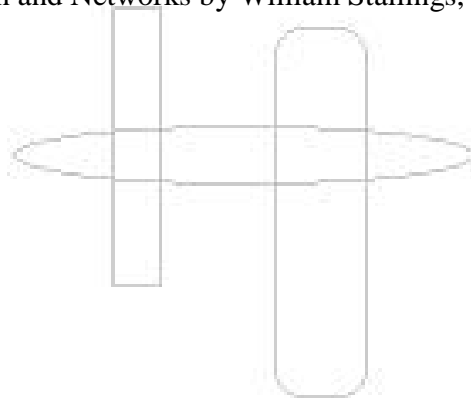
Total Contact Hours: 40

Text Books

1. Wireless and Mobile network Architecture-Yi-Bing Lin, John Wiley & Sons; 2005, ISBN: 0-471-74922-2.
2. Mobile Communications - Jochen Schiller, Second Edition, Pearson Education, 2004

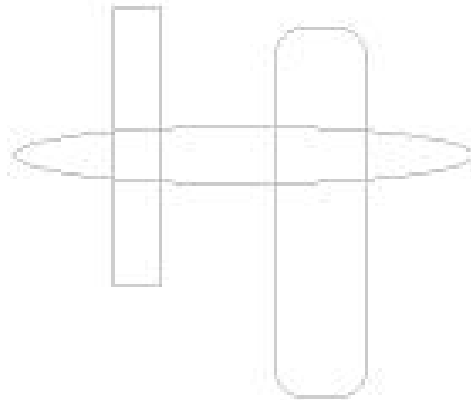
Reference Books:

1. Wireless Communications – Principles and Practice by Theodore S Rappaport, Pearson Education.
2. Wireless Communication and Networks by William Stallings, Second Edition, Prentice Hall



CS50352: PG Lab – II

(Courses selected under Elective-III and Elective-IV will be part of this Lab.)



Title : Syllabus Format – PG Courses

FF No. : 658

MACHINE LEARNING LAB.

Objectives:

1. To introduce students to several prominent areas of machine learning, including feature extraction, decision trees, neural networks, genetic algorithms, Bayesian learning, clustering, ensemble learning, support vector machines, and reinforcement learning, and illustrate what types of problems the different methods are suited for.
2. To give students hands-on experience with these methods and tools for implementing and using them on real-world problems.
3. To give students experience with performing simulations and doing statistical data analysis of the results.
4. To give students experience with performing simulations and doing Matlab neural network tool for data analysis of the results.

List of Practicals

1. Implementation of learning algorithms like Find S algorithm, Version space and the candidate elimination algorithm, list then eliminate algorithm for simple real world problems.
2. Implementation of learning algorithms like Backpropagation algorithm, Support Vector Machines for real time problems.
3. Implementation of algorithms like Evaluating hypothesis accuracy, Sampling theory, Central limit theorem, hypothesis testing, for real time problems.
4. Implementation of learning algorithms like Bayesian Learning for real time problems.
5. Implementation of learning algorithms like weighted majority algorithm, Instance-Based Learning: k-nearest neighbor learning, locally weighted regression for real time problems.
6. Implementation of learning algorithms like Genetic Algorithms for real time problems.
7. Implementation of learning algorithms like unsupervised or reinforcement learning for real time problems.
8. Implementation of Fuzzy logic for real time problems.
9. Presentations on selected research topics.
10. A mini project for a real problem.

Outcomes:

At the end of the course, the students will be able to:

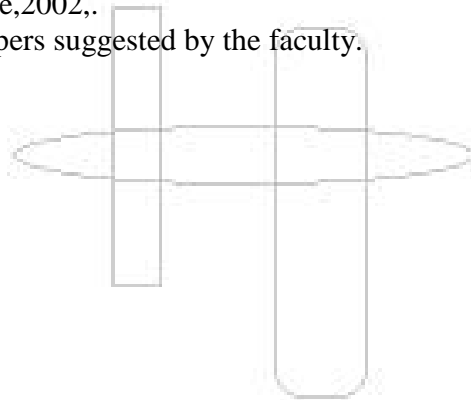
1. Use the advanced concepts and techniques of soft computing.
2. Develop skills of using recent soft computing software for solving practical problems.
3. Gain experience of doing independent study and research.
4. Able to Publish papers in international conferences and journals.

Text Books

- 1) T. Mitchell, “ Machine Learning”, McGraw-Hill, 1997.
- 2) Randy L. Haupt and Sue Ellen Haupt , Practical Genetic Algorithms.
- 3) David E. Goldberg, Genetic Algorithms in Search, Optimization, and Machine Learning.

Reference Books

- 1). Ethem Alpaydin, "Introduction to Machine Learning", MIT press, 2004.
- 2). Jacek M. Zurada, “Introduction to Artificial neural System”, JAICO publishing house,2002,.
- 3). Research papers suggested by the faculty.



Title : Syllabus Format – PG Courses

FF No. : 658

MOBILE COMPUTING LAB

- Course Objectives:**
- i. To understand PCS based on GSM and CDMA
 - ii. To understand the design of cellular network
 - iii. To understand the mobility management.

Course Outcomes:

- i. Use principles of Mobile Computing and its enabling technologies, and explore exciting ideas, solutions, and paradigm shifts.
- ii. Understand wireless access and core networks and mobility in cellular networks
- iii. Understand important standards like GSM, CDMA

List of Practical

Assignment 1. : Write a simple program for displaying “Hello, World” on your mobile screen using J2ME Wireless Toolkit. Test output in different Emulators provided by J2ME Wireless Toolkit and Transfer it to the mobile.

Assignment 2. : Write a program for sending SMS to your friend by using your mobile phone. Use J2ME Wireless Toolkit to develop your application. Test it in the Emulator provided by Toolkit and Transfer it to your mobile.

Assignment 3. : Develop a simple calculator for your mobile by using J2ME Wireless Toolkit.

Assignment 4. : Write a simple program to take a snapshot by using the Camera in your mobile. Save the snapshot in the image or video format. Use Camera Media API provided J2ME. Test it in Emulator and Transfer it to your mobile.

Text Books

- 3. Wireless and Mobile network Architecture-Yi-Bing Lin, John Wiley & Sons; 2005, ISBN: 0-471-74922-2.
- 4. Mobile Communications - Jochen Schiller, Second Edition, Pearson Education, 2004

Reference Books:

- 3. Wireless Communications – Principles and Practice by Theodore S Rappaport, Pearson Education.
- 4. Wireless Communication and Networks by William Stallings, Second Edition, Prentice Hall

SECOND YEAR

ME-CSE (Information Technology)

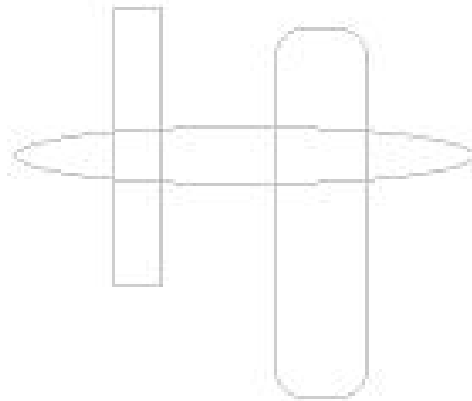
Pattern – A

SEMESTER I

(Theory)

Semester III

Code	Subject	Type	Teaching Scheme		Assessment Scheme					Credits
			L	P	ISA				ESA	
					CT	MSE	HA	CA	ESE	
	Institute level Open Elective	Theory	2	-	10	30	10	-	50	2
CS62151	Research Methodology and Statistics	Theory	2	-	10	30	10	-	50	2
CS67752	Dissertation Stage I	Lab	-	4 [#]	-	-	-	-	100	15
CS67751	Technical Seminar II	Lab	-	2	-	-	-	-	100	4
			4	6						23



Title: Syllabus Format – PG Courses

FF No. : 658

CS3278 Research Methodology and Statistics

Course Objectives:

- i. To understand the concept and distinct types of engineering and science research
- ii. To understand the research process in detail in terms of ideation, concept, design and implementation of research.
- iii. To develop expertise in studying, writing and presenting technical documentation such as papers, thesis, etc.
- iv. To understand and get exposed to different tools and techniques essential for research

Course Outcomes:

- i. Perform research in a more organized and efficient manner
- ii. Choose ideal method to select problem statement, design the research, collect and analyze data and test the hypothesis
- iii. Efficiently read and summarize technical documentation
- iv. Systematically write, publish and present technical documentation
- v. Understand legal issue regarding research
- vi. Be aware of and use searching, documenting and presenting tools and technologies

Unit1: Formulating Research Problem and Literature Review (9 Hrs)

Overview: RE-Search, Definition, Research characteristics, Difference between methods and methodology, Research categories, Overview of research process.

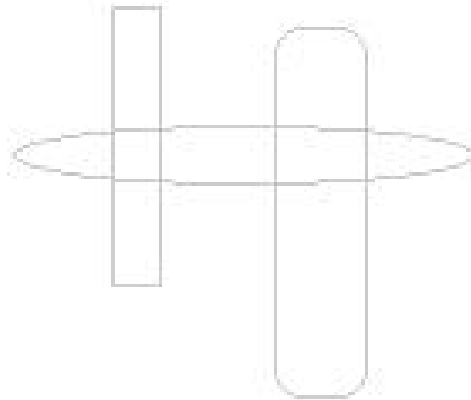
How to get new research ideas: Creating thinking, Preparations for improving thinking

Defining research problem statement: Need, What is a research problem, Sources of research problem, research problem components

Literature Survey Overview: What is literature survey, Types of literature survey, Sources of information, Types of technical papers,

Publication and patent databases, How to read a scientific paper, How to write scientific paper, writing technical papers in English – Grammar, Punctuation, Tips for writing

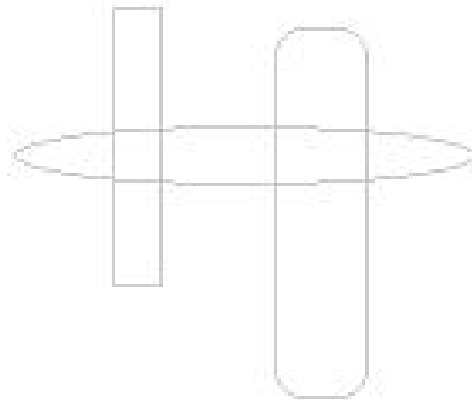
1. 'Research Methodology: A Step by Step Guide for Beginners', by Ranjit Kumar, 2nd Edition, APH Publishing Corporation
2. 'Research methodology: an introduction for science & engineering students', by Stuart Melville and Wayne Goddard
3. 'Research Methodology' by Dr. Jayant Tatke, 2009, Symbiosis Centre for Distance Learning
4. 'Operational Research' by Dr. S.D. Sharma, Kedar Nath Ram Nath & Co
5. Online material provided by the faculty



Semester IV

Code	Subject	Type	Teaching Scheme		Assessment Scheme					Credits
			L	P	ISA				ESA	
					CT	MSE	HA	CA	ESE	
CS67753	Dissertation Stage II	Lab	-	8 [#]	-	-	-	-	100	25

- Student is expected to work around 40 hours per week as Self Study



Guidelines for M.Tech CSE(IT) Dissertation

In the first semester students are expected to complete the following sub-components of Thesis and present it to panel of examiners. Hard copy of the semester I report should include the following.

1. Motivation behind the Research
2. Need of the Research
3. Information Gathering Survey Report
4. Scope of the Thesis
5. Problem specification with System Requirement Specification (SRS).
6. System Analysis and Feasibility study Report covering feasibility in terms of implementation, usability.

In the second semester students are expected to complete the following sub-components of Thesis and present it to panel of examiners.

1. System Design
2. Implementation
3. Testing

It is mandatory to publish the at least one Journal/Conference paper before the submission of Thesis.

