CS 401 Artificial Intelligence

UNIT I INTRODUCTION TO Al AND PRODUCTION SYSTEMS

Introduction to AI-Problem formulation, Problem Definition -Production systems, Control strategies, Search strategies. Problem characteristics, Production system characteristics -Specialized production system- Problem solving methods - Problem graphs, Matching, Indexing and Heuristic functions -Hill Climbing-Depth first and Breath first, Constraints satisfaction - Related algorithms, Measure of performance and analysis of search algorithms.

UNIT II REPRESENTATION OF KNOWLEDGE

Game playing - Knowledge representation, Knowledge representation using Predicate logic, Introduction to predicate calculus, Resolution, Use of predicate calculus, Knowledge representation using other logic-Structured representation of knowledge.

UNIT III KNOWLEDGE INFERENCE

Knowledge representation -Production based system, Frame based system. Inference - Backward chaining, Forward chaining, Rule value approach, Fuzzy reasoning - Certainty factors, Bayesian Theory-Bayesian Network-Dempster - Shafer theory.

UNIT IV PLANNING AND MACHINE LEARNING

Basic plan generation systems - Strips -Advanced plan generation systems – K strips -Strategic explanations -Why, Why not and how explanations. Learning- Machine learning, adaptive Learning.

UNIT V EXPERT SYSTEMS

Expert systems - Architecture of expert systems, Roles of expert systems - Knowledge Acquisition – Meta knowledge, Heuristics. Typical expert systems - MYCIN, DART, XOON, Expert systems shells.

Texts/Reference:

1. Russel&Norvig: Artificial Intelligence a Modern Approach;Pearson

2. Rich and Knight: Artificial Intelligence; TMH.

2. N. J. Nilson: Principles of Artificial Intelligence; Narosa.

3. P. Norvig : Paradigms of AI programming; Elsevier.

4. Brakto: Prolog Programming: Pearson

CS 411 Artificial Intelligence Lab.

Prerequisites

1. Probability and statistics
2. Automata and languages

Syllabus as per the theory syllabus covered during the course.

CS 402 Web Technology

Internet and World Wide Web : Introduction, Internet Addressing, ISP, types of Internet Connections, Introduction to WWW, WEB Browsers, WEB Servers, URLs, HTTP, WEB Applications, Tools for web site creation.

HTML 5: Introduction to HTML5, Lists, adding graphics to HTML 5page, creating tables, linking documents, forms, frames, Cascading Style sheets.

Java Script:

Introduction, programming constructs: variables, operators and expressions, conditional checking, functions and dialog boxes, JavaScript DOM, creating forms, introduction to Cookies, Jquery.

AJAX: Introduction, HTTP Request, XMLHttpRequest, AJAX Server Script.

PHP: Introduction, syntax, statements, operators, PHP and MySQL, PHP and AJAX.Introduction to ASP. net, J2EE, POJO, Java servlets and JSP.

Books:

1. Deitel, Deitel, Nieto, Lin and Sadhu, XML How to Program, Pearson Education.

2. Ivan Bayross, Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl CGI, BPB.

3. Steven M. Schafer, HTML, CSS, JavaScript, Perl, Python and PHP, Wiley India Textbooks.

4. Paul S. Wang, G. Keller, S. Katila, An Introduction to Web Design + Programming, Cengage Learning.

5. Jeffery C. Jackson, Web Technologies: A Computer Science Perspective, Pearson Education

CS 501 Neural Networks For Machine Learning

Introduction to the course - machine learning and neural nets.

The Perceptron learning procedure: An overview of the main types of neural network architecture.

The backpropagation learning procedure: Learning the weights of a linear neuron.

Learning feature vectors for words: Learning to predict the next word.

Object recognition with neural nets.

Optimization: How to make the learning go faster- delve into mini-batch gradient descent as well as discuss adaptive learning rates.

Recurrent neural networks, Ways to make neural networks generalize better, Combining multiple neural networks to improve generalization.

Hopfield nets and Boltzmann machines, Restricted Boltzmann machines (RBMs).

Stacking RBMs to make Deep Belief Nets, Deep neural nets with generative pre-training

Modeling hierarchical structure with neural nets, Recent applications of deep neural nets.

Books:

1. E Resource: http://neuralnetworksanddeeplearning.com/

2. Deep Belief Nets in C++ and CUDA C: Volume 1: Restricted Boltzmann Machines and Supervised Feedforward Networks by by Timothy Masters.

3. Artificial Neural Networks and Machine Learning -- ICANN 2013: LNCS 8131

CS 502 Data Mining & Data Warehousing

Data Warehousing
Concept of Data Warehouse, Differences between Operational Databases and Date Warehouse, Multi-dimensional Data Model, Schemas for Multi-dimensional Databases, Data Cube Representations, Data Warehouse Architecture, OLTP vs OLAP, Efficient Query Processing in data Warehouses, Indexing of OLAP data, Materialization concept;
Data Mining
Data Clustering: Partitioning, Hierarchical, Density-based, Grod Based and Model Based Methods;
Classification & Prediction: Decision Tree Techniques, Back-Propagation Method, Bayesian Method
Association Rule Mining Techniques: Frequent Itemset Generation, Apriori, Horizontal Method, Sampling Approach, Hashing Approach; Dynamic Association Rule Mining;
Mining of Complex Types of Data: Mining of Spatial Databases, Multimedia Databases, Timeseries and sequence Data, Text Databases, WWW Data;
Text Book:

- Pang-Ning Tan, Michael Steinbach, Vipin Kumar: Introduction to Data Mining, Pearson; 1 edition (May 12, 2005)

Books/References:

1. Jiawei Han and MichelineKamber: Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers In; 3rd Revised edition edition (25 July 2011)

CS 503 SystemSimulation and Modelling

Introduction to Simulation: System & System Environment, Components of a System, Discrete and Continuous Systems, Model of a System and Types of Models,. Discrete Event System Simulation, Advantages and Disadvantages of Simulation, Areas of ApplicationTechniques of Simulation: Monte Carlo Method, Types of System Simulations, Real Time Simulation, Stochastic Variables, Discrete Probability Functions General Principles: Concepts in Discrete Event Simulation, Event Scheduling /Time Advance Algorithm, List Processing, Using Dynamic Allocation & Linked List

Simulation Software: History of Simulation Software, Selection of Simulation Software, Simulation in C++, GPSS, Simulations Packages, Trends in simulation Software. Statistical Models in Simulation: Useful Statistical Models, Discrete Distribution s, Continuous Distributions, Poisson Process, Empirical Distributions Queuing Models: Characteristics of Queuing systems, Queuing Notation, Long Run Measures of performance of Queuing Systems, Steady State Behavior of infinite Population Markovian Models, Steady State Behavior of finite Population Models, Networks of Queues Random Number Generation: Properties of Random Numbers, Generation of Pseudo-Random

Numbers, Techniques for Generating Random Numbers, Tests for Random Numbers, Inverse transform Techniques, Convolution Methods, and Acceptance –Rejection Techniques Input Modeling: Data Collection, Identifying the Distribution with Data, Parameter Estimation, Chi – Square Test, Selecting Input Models with Data Verification & Validation of simulation Modeling: Model Building, Verification & Validation, Verification of simulation Models, Calibration & Validation of Models.

Text books, and/or reference material:

1. Gordon G, “System Simulation”, PHI 2nd Edition 1998.

2. DeoNarsingh, “System Simulation with Digital Computers”, PHI, New Delhi 1993.

3. K S Trivedi, “Probability and Statistics with Reliability, Queuing and Computer Science Application”, PHI

4. Subranranian, K R V and Sudaresan R Kadayam, “System simulation: Introduction to GPSS”, CBS, New Delhi 1993.

5. W Feller, ”An introduction to Probability Theory and its Applications,” Val 182, Wiley Eastern Ltd. ND.

CS504 WIRELESS NETWORKS

WIRELESS COMMUNICATION
Cellular systems- Frequency Management and Channel Assignment- types of handoff and their characteristics, dropped call rates & their evaluation - MAC – SDMA – FDMA –TDMA – CDMA – Cellular Wireless Networks
WIRELESS LAN IEEE 802.11 Standards – Architecture – Services – Mobile Ad hoc Networks- WiFi and WiMAX - Wireless Local Loop

GSM-architecture-Location tracking and call setup- Mobility management- Handover-Security-GSM SMS –International roaming for GSM- call recording functions-subscriber and service data mgt –- Mobile Number portability -VoIP service for Mobile Networks –GPRS –Architecture-GPRS procedures-attach and detach procedures-PDP context procedure-combined RA/LA update procedures-Billing

Mobile network and transport layers

Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols–Multicast routing-TCP over Wireless Networks – Indirect TCP – Snooping TCP – MobileTCP – Fast Retransmit / Fast Recovery – Transmission/Timeout Freezing-SelectiveRetransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wireless Networks

Application layer

WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAPuser agent profile- caching model-wireless bearers for WAP - WML – WMLScripts – WTA - iMode- SyncML

Textbook:

1. Jochen Schiller, “Mobile Communications”, Second Edition, Pearson Education, 2003.

2. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2002.

Reference:-

1. KavehPahlavan, PrasanthKrishnamoorthy, “Principles of Wireless Networks”, First

Edition, Pearson Education, 2003.

2. UweHansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.

3. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.

CS505: NATURAL LANGUAGE PROCESSING

Introduction: Introduces the theory and methods of natural language processing (NLP). NLP systems understand and produce human language for applications such as information extraction, machine translation, automatic summarization, question-answering, and interactive dialog systems. The course covers knowledge-based and statistical approaches to language processing for syntax (language structures), semantics (language meaning), and pragmatics/discourse (the interpretation of language in context). For graduate students, the course will also cover aspects of current research in NLP.
Text:

1. Jurafsky, D., and Martin, J.H. (2008). Speech and Language Processing (2nd Edition). Upper Saddle River, NJ: Prentice Hall

CS506 COMPUTATIONAL GEOMETRY

Geometric and Algorithm Basics: Fundamentals of Euclidean and Affine Geometry, Convexity; Basic concepts of Algorithms and its complexity, correctness proofs of algorithms; Paradigms of computational geometric algorithms; Degeneracies in Computational Geometry.
Convex Hulls Planar convex hulls definition, deterministic, randomized, output-sensitive and dynamic algorithms; applications of convex hull.
Intersection: Plane sweep algorithm for line segment intersection.

Geometric searching: Segment tree, Interval tree and Priority search tree; Point location query; Range searching -- Kd tree, range tree, fractional cascading; Proximity queries -- Nearest neighbor, closest pair; persistent data structure (if possible)
Triangulation and Partitioning: Polygon triangulation -- existence and algorithms, Art Gallery Theorem.

Voronoi Diagram and Delaunay Triangulation: Voronoi diagram, Delaunay triangulation and their dual relations; algorithms for computing Voronoi diagram and Delaunay triangulation. Duality and Arrangement: Duality relation between points and lines; Arrangements and their applications.

Basics of Combinatorial Geometry: Unit distance problem, Point line incidences.

Text Book:

1. M. de Berg, O. Cheong, M. van Kreveld, and M. Overmars. Computational Geometry: Algorithms and Applications. Springer-Verlag, 3rd revised edition, 2008.

Reference Books:

1. Preparata and Shamos, Computational Geometry – an introduction, Springer-Verlag (1985, revised ed., 1991).
2. J. O' Rourke, Computational Geometry in C, Cambridge University Press, second edition,1998.
3. Jean-Daniel Boissonnat, Mariette Yvinec, Algorithmic Geometry, Cambridge University Press, 1998.

CS507 :D IGITAL IMAGE PROCESSING

DIGITAL IMAGE FUNDAMENTALS

Elements of digital image processing systems, Vidicon and Digital Camera working principles, Eleme nts ofvisual perception, brightness, contrast, hue, saturation, mach band effect, Color image fundamen tals - RGB,HSI models, Image sampling, Quantization, dither, Two-
dimensional mathematical preliminaries, 2Dtransforms - DFT, DCT, KLT, SVD.

IMAGE ENHANCEMENT

Histogram equalization and specification techniques, Noise distributions, Spatial averaging, Direction alSmoothing, Median, Geometric mean, Harmonic mean, Contraharmonic mean filters, Homomorphi c filtering,Color image enhancement.

IMAGE RESTORATION

Image Restoration - degradation model, Unconstrained restoration -
Lagrange multiplier and Constrainedrestoration, Inverse filtering-

removal of blur caused by uniform linear motion, Wiener filtering, Geometrictransformations-spatial transformations.

IMAGE SEGMENTATION

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Regiongrowing – Region splitting and Merging – Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

IMAGE COMPRESSION

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, VectorQuantization, Transform coding, JPEG standard, MPEG.

TEXTBOOK:-

1. Rafael C. Gonzalez, Richard E. Woods, , Digital Image Processing', Pearson, Second Edition,2004.
2. Anil K. Jain, , Fundamentals of Digital Image Processing', Pearson 2002.

REFERENCES

1. Kenneth R. Castleman, Digital Image Processing, Pearson, 2006.

2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins,' Digital Image Processing using MATLAB' ,Pearson Education, Inc., 2004.

3. D,E. Dudgeon and RM. Mersereau, , Multidimensional Digital Signal Processing', Prentice Hall Pr ofessional Technical Reference, 1990.
4. William K. Pratt, , Digital Image Processing' , John Wiley, New York, 2002

5. Milan Sonka et aI, 'IMAGE PROCESSING, ANALYSIS AND MACHINE VISION', Brookes/Col e, VikasPublishing House, 2nd edition, 1999,

CS508 BIO INFORMATICS

Evolution and inheritance.Concept of gene, genetic material and genome.Chemistry of nucleic acids - structure and chemical composition of DNA and RNA.Concept of cell-cycle and its regulation.Replication of genome, molecular basis of genome evolution. Molecular biology of gene functions (transciption and translation. Concepts of transciptome, proteome and metabolome.Genomics (genome projects, concepts of structural and functional genomics). Databases, DNA sequence analysis, protein sequence analysis. Introduction to Neurobiology, Signal Transduction.Computational tools and techniques for Bioinformatics.

Text Book:

1. Phillip Compeau, PavelPevzner, Bioinformatics Algorithms: an Active Learning Approach
2. Neil C. Jones, PavelPevzner, Introduction to Bioinformatics Algorithms, ANE Books, 1st Edition edition (1 December 2009)

Books/References:

1. Molecular Cell Biology by DaidBaltimar
2. Aurther M. Lesk, Introduction to Bioinformatics, Oxford University Press, 4th edition (2014)
3. Dan E. Krane and Michael L. Raymer, Fundamental Concepts of Bioinformatics Krane and Raymer, DORLING KINDERSLEY (RS); First edition (2003)
4. David Mount : Bioinformatics: Sequence and Genome Analysis, CBS; 2 edition (2005)

CS509 :ADVANCED DESIGN AND ANALYSIS OF ALGORITHMS

Introduction to hashing, bloom filters, scheduling, network design, online load balancing, algorithms in machine learning, boosting (in the context of learning), Markov chains and the MCMC method, byzantine agreement, internet algorithms, and nearest neighbor algorithms. Enroute, we will encounter various useful ideas, including randomization, probabilistic analysis, amortized analysis, competitive analysis, eigenvalues, linear and semi-definite programming, high dimensional geometry, and random walks.
REFERENCES---
Approximation Algorithms
Vijay Vazirani, *Approximation Algorithms*, Springer, 2001. (on reserve)
Dorit S. Hochbaum (ed.), *Approximation Algorithms for NP-hard Problems*, PWS Publishing, 1997. (on reserve)
Randomized Algorithms
Rajeev Motwani and PrabhakarRaghavan, *Randomized Algorithms*, Cambridge University Press, 2000. (on reserve)
Michael Mitzenmacher and Eli Upfal, *Probability and Computing*, Cambridge University Press, 2005.
Online Algorithms
Allan Borodin and Ran El-Yaniv, *Online Computation and Competitive Analysis*, Cambridge University Press, 2005. (on reserve)
Learning theory
Michael Kearns and UmeshVazirani, *An Introduction to Computational Learning Theory*, The MIT Press, 1994. (on reserve)

Basic algorithm design

Jon Kleinber and Eva Tardos, *Algorithm Design*, Addison-Wesley, 2006. (on reserve)
T. Cormen, C. Leiserson, R. Rivest, and C. Stein, *Introduction to Algorithms*, 2nd edition, 2001.

CS510 ADVANCED COMPUTER ARCHITECTURE

Introduction to high performance computing, RISC philosophy and overview of pipelined architecture.Performance evaluation of pipelined architecture. Limitations of scalar pipelines, Instruction level parallelism, superscalar architecture, dynamic pipelines, superscalar techniques, performance evaluation of superscalar architectures, VLIW architecture, data-level parallelism, thread-level parallelism, simultaneous multi-threaded architectures, and instruction fetch policies in multi-threaded architectures, multi-core architectures. Memory system design, storage system design.

References

3. J.L. Hennessy, and D.A. Patterson, *Computer Architecture: A quantitative approach*, Fifth Edition, Morgan Kaufman Publication, 2012
4. J.P. Shen and M.H. Lipasti, *Modern Processor Design*, MC Graw Hill, Crowfordsville, 2005
5. Current Literature (Papers from ISCA, Micro, HPCA, ICCD, and IEEE Trans. on Computers, IEEE Architecture Letters)

CS511: DISTRIBUTED COMPUTING

Fundamentals

Evolution of Distributed Computing Systems, System models, issues in design of Distributed Systems, Distributedcomputing environment, web based distributed model, computer networks related to distributed systems and web based protocols.

Message Passing

Inter process Communication, Desirable Features of Good Message-Passing Systems, Issues in IPC by Message, Synchronization, Buffering, Multidatagram Messages, Encoding and Decoding of Message Data, Process Addressing, Failure Handling, Group Communication.

Remote Procedure Calls

The RPC Model, Transparency of RPC, Implementing RPC Mechanism, Stub Generation, RPC Messages, Marshaling Arguments and Results, Server Management, Communication Protocols for RPCs, Complicated RPCs, Client-Server Binding, Exception Handling, Security, Some Special Types of RPCs, Lightweight RPC, Optimization for Better Performance.

Distributed Shared Memory

Design and Implementation issues of DSM, Granularity, Structure of Shared memory Space, Consistency Models, replacement Strategy, Thrashing, Other Approaches to DSM, Advantages of DSM.

Synchronization Clock Synchronization, Event Ordering, Mutual Exclusion, Election Algorithms.

Resource and Process Management Desirable Features of a good global scheduling algorithm, Task assignment approach, Load Balancing approach, Load Sharing Approach, Process Migration, Threads, Processor allocation, Real time distributed Systems.

Distributed File Systems

Desirable Features of a good Distributed File Systems, File Models, File Accessing Models, File-shearing Semantics, Filecaching Schemes, File Replication, Fault Tolerance, Design Principles, Sun's network file system, Andrews file system, comparison of NFS and AFS.

Naming Desirable Features of a Good Naming System, Fundamental Terminologies and Concepts, Systems-Oriented Names, Name caches, Naming & security, DCE directory services.

References:

1. Distributed OS by Pradeep K. Sinha (PHI)
2. Tanenbaum S.: Distributed Operating Systems, Pearson Education
3. Tanenbaum S. Maarten V.S.: Distributed Systems Principles and Paradigms, (Pearson Education)
4. George Coulouris, Jean Dollimore. Tim Kindberg: Distributed Systems concepts and design.

CS 512 FUZZY SET THEORY AND APPLICATION

1) Fuzzy Sets
2) Constructing Fuzzy Sets
3) Operations on Fuzzy Sets
4) Decomposition Theorem
5) Extension Principle
6) Fuzzy Numbers
7) Fuzzy Arithmetic
8) Possibility Theory
9) Fuzzification in Integrations
10) Applications in Operations Research and/or Data/Mining

Book:

Wang, Zhenyuan, Rong Yang, and KwongSak Leung. Nonlinear Integrals And Their Applications In Data Mining. Singapore: World Scientific Publishing Company, 2010

CS513 MOBILE AD HOC NETWOKS

UNIT-I INTRODUCTION: Introduction of ad-hoc/sensor networks, Key definitions of adhoc/sensor networks - Advantages of ad-hoc/sensor networks - Unique constraints and challenges Driving Applications. Electromagnetic spectrum-Radio propagation mechanismcharacteristics of the wireless channel Adhoc Wireless Networks – Heterogeneity in Mobile Devices – Wireless Sensor Networks – Traffic Profiles – Types of Adhoc Mobile Communications – Types of Mobile Host Movements – Challenges Facing Adhoc Mobile Networks – Adhoc Wireless Internet. Ad-Hoc wireless networks Introductions to lan, wan, man, pan architectures and applications.

UNIT-II END TO END DELIVERY AND SECURITY: Transport layer: Issues in designing-Transport layer classification, adhoc transport Protocols, Security issues in adhoc networks: issues and challenges, network securityattacks, secure routing protocols Ad-Hoc wireless networks Introductions to local area networks, wide area networks, man, pan architectures and applications.

UNIT-III MEDIA ACCESS CONTROL (MAC) PROTOCOLS: Media Access Control (MAC) Protocols Introduction- Issues in Designing a MAC Protocol for Ad Hoc Wireless Networks – Classifications of MAC Protocol.

UNIT-IV ROUTING PROTOCOLS: Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks – Classifications of Routing Protocols -Table-driven protocols – DSDV – WRP – CGSR – On-Demand protocols – DSR – AODV – TORA – LAR – ABR – Zone Routing Protocol – Power Aware Routing protocols UNIT-V NETWORKING SENSORS AND APPLICATIONS: Unique features, Deployment of ad-hoc/sensor network -Sensor tasking and control Transport layer and security protocols, SENSOR NETWORK PLATFORMS AND TOOLS: Berkley Motes - Sensor network programming challenges - Embedded Operating System Simulators,

TEXT BOOKS:

[1] Holger Karl and Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, WILEY lectures and applications (ISBN: 0-470-09510-5).

[2] C. Siva Ram Murthy and B. S. Manoj, “Ad Hoc Wireless Networks: Architectures and Protocols”, Prentice Hall, 2004.

CS514 ALGORITHMIC GAME THEORY

This course provides an introduction to algorithmic game theory: the study of games from the perspective of algorithms and theoretical computer science. There will be a particular focus on games that arise naturally from economic interactions involving computer systems (such as economic interactions between large-scale networks, online advertising markets, etc.), but there will also be broad coverage of games and mechanisms of all sorts. This course will have essentially three parts. We will begin by defining standard notions of equilibria (e.g. pure and mixed Nash, correlated and coarse-correlated, etc.) and studying algorithms for computing them (or at least approximations). This will include algorithms based on online learning and regret minimization, combinatorial algorithms, and algorithms based on convex optimization. We will also study the complexity-theoretic hardness of computing equilibria, focusing on Nash equilibria. The second part of the class will be the study of the inefficiency of equilibria: how well each notion of equilibrium approximates important objectives such as the social welfare. This will include the study of the price of stability, the price of anarchy, price of total anarchy, etc., as well as connections between them. Important games we will study will include routing games, network formation games, potential games, and smooth games. Finally, we will study algorithmic mechanism design: how to design algorithms that do not assume that the players will do what they are told, but rather take into account the incentives of the players. We will focus on incentive-compatible mechanisms, i.e., mechanisms for which the dominant strategy for each

player is to tell the truth about their preferences. We will discuss combinatorial auctions, mechanisms without money, online mechanisms, and profit-maximizing mechanisms.
Course Topics
Basic definitions of equilibria
Algorithms for computing equilibria
Efficiency of equilibria
Algorithmic mechanism design
Textbook
1. Nisan, RoughgardenTardos, and Vazirani.Algorithmic Game Theory .Cambridge University Press, 2007. http://www.cambridge.org/us/9780521872829, username: agt1user, password: camb2agt.

CS 515 AGILE SOFTWARE DEVELOPMENT

COURSE OUTCOMES:
Students will gain an understanding of the testing role within an agile project and be able toeffectively apply practical skills associated with that role. At the end of the course, successfulstudents will be able to:

- Understand the principles behind the agile approach to software development
- Differentiate between the testing role in agile projects compared with the role of testers in non-agile projects
- Positively contribute as an agile team member focused on testing
- Appreciate the challenges and difficulties associated with the non-testing activities performed in an agile team
- Demonstrate a range of soft skills required by agile team members

TOPICS COVERED:
Fundamentals of Agile:
The Genesis of Agile, Introduction and background, Agile Manifesto and principles, Overview ofScrum, Extreme Programming, Feature Driven development, Lean Software Development, Agileproject management, Design and development practices in Agile projects, Test DrivenDevelopment, Continuous Integration, Refactoring, Pair Programming, Simple Design, UserStories, Agile Testing, Agile Tools
Agile Scrum Framework:
Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprintbacklog, Iteration planning, User story definition, Characteristics and content of user stories,Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning andretrospective, Daily scrum, Scrum roles–Product Owner, Scrum Master, Scrum Team, Scrum casestudy, Tools for Agile project management
Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit frameworkand tools for TDD, Testing user stories -acceptance tests and scenarios, Planning and managingtesting cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools tosupport the Agile tester
Agile Software Design and Development:
Agile design practices, Role of design Principles including Single Responsibility Principle, OpenClosed Principle, Liskov Substitution Principle, Interface Segregation Principles, DependencyInversion Principle in Agile Design, Need and significance of Refactoring, RefactoringTechniques, Continuous Integration, Automated build tools, Version control
Industry Trends:

Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability,Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agileprojects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies

RECOMMENDED BOOKS:

1. Agile Software Development with Scrum By Ken Schawber, Mike Beedle, Pearson.
2. Agile Software Development, Principles, Patterns and Practices By Robert C. Martin, Prentice Hall.
3. Agile Testing: A Practical Guide for Testers and Agile Teams By Lisa Crispin, Janet Gregory, Addison Wesley.
4. Agile Software Development: The Cooperative Game By Alistair Cockburn, Addison Wesley.

CS 516 GRAPH ANALYSIS

Network Analysis

1. Introduction to Graph Theory & Data Structures
2. Motivating Applications in Data
3. Opportunities & Challenges
4. Parallel, Multicore, & Multithreaded Architectural Support for Graph Processing
5. Mapping Graph Algorithms to Architectures

Static Parallel Algorithms

1. Programming Models
2. Parallel Prefix & List Ranking
3. Graph Search, Spanning Tree, Connected Components
4. Minimum Spanning Tree Matroid Algorithms
5. Social Networking Algorithms
6. Betweenness Centrality
7. Community Detection

Dynamic Parallel Algorithms

1. Streaming Data Analysis
2. Data Structures for Streaming Data
3. Tracking Clustering Coefficients
4. Tracking Connected Components
5. Anomaly Detection

Books:

1. R.J. Wilson, “Introduction to Graph Theory”, Fourth Edition, Pearson Education, 2003.

CS 517 REAL TIME SYSTEMS-ORIENTED

- Introduction
- Modeling Timing constraints
- Scheduling Real-Time Tasks: Types of Schedulers, table-driven, Cyclic, EDF, RMA
- Handling Resource sharing among real-time tasks
- Scheduling Real-Time Tasks in Multiprocessor and Distributed systems
- Commercial Real-time operating systems: General concepts, Unix and Windows as RTOS
- Survey of commercial RTOS
- Real-Time Communication

- Real-Time Databases

Books:

Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.

Jane W. Liu, "Real-Time Systems" Pearson Education, 2001.

Krishna and Shin, "Real-TIme Systems," Tata McGraw Hill. 1999.

ADDITIONAL READINGS

Alan C. Shaw, Real-Time Systems and Software, Wiley, 2001.

Philip Laplante, Real-TIme Systems Design and Analysis, 2nd Edition, Prentice Hall of India.

CS 518 ADVANCE SOFTWARE ENGINEERING

Unit 1: Software Engineering Basics – Introduction, Software Engineering Terminologies, Product Life Cycle, Project Life Cycle Models- Spiral model, Waterfall model, Evolutionary prototyping model, Reusable software model

Unit 2: Software Engineering Methodologies- Introduction, Components of Software Engineering, Software Development Models- Capability Maturity Model, Rapid Application Development model, Incremental model

Unit 3: Predictive Versus Adaptive Approaches to SDLC- Introduction, Traditional Predictive Approaches to SDLC, Adaptive Approaches to SDLC, Separation of Design and Construction, Unpredictability of Requirements

Unit 4: Agile Programming- Introduction, Flavors of Agile Development, Agile Manifesto, Refactoring Techniques, Limitations of The Agile Process.

Unit 5: Extreme Programming (XP)- Introduction, XP Equation, XP Values, Assuming Sufficiency- Sufficient time and resources, Constant change of cost, Developer effectiveness, Freedom to experiment

Unit 6: Extreme Programming Practices- Introduction, Coding Practices, Developer Practices, Business Practices

Unit 7: XP Events- Introduction, Iteration Planning- Stories and tasks, Estimates and schedules, First iteration, Iteration, Releasing

Unit 8: Extreme Programming Practices- Introduction, Story Cards, Task Cards, Bullpens

Unit 9: Roles in Extreme Programming- Introduction, Customer’s Roles, Developer’s Roles, Supplementary Roles

Unit 10: Coding XP Style- Introduction, Balance Functionality with Simplicity, Implement Only the Needed Features, Eliminate Repetition

Unit 11: Adopting XP- Introduction, Before Commencing XP, Eliminating Fear and Working Together, Starting Feedback, Including Managers and Customers

Unit 12: Agile Modeling with XP- Introduction, Agile Modeling – Principles, Comparing XP and Agile Modeling, Scrum Methodology- The roles of Scrum, Advantages of Scrum

Unit 13: Dynamic Systems Development Methodology- Introduction, Overview of DSDM, the Principles of DSDM, Phases of DSDM, Core Techniques Used in DSDM

Unit 14: XP Tools- Introduction, JAVA and XP, Tools and Philosophies, Open source Toolkit

Books:

1. Software Engineering by Ian Sommerville
2. Software Engineering by Rajib Mall

CS 519 Advanced programming concepts using Java

Overview of Basic OOP Concepts: Need for object oriented paradigm: Agents, responsibility, messages, methods, classes and instances, class hierarchies (Inheritance), method binding, datatypes, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, classes and objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling, inheritance, super keyword, polymorphismmethod overriding, abstract classes. Packages and Interfaces:Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces. Exploring packages –Java.io, Java.util. Exception handling and multithreading: Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. Differences between multi threading and multitasking, thread life cycle, creating threads, synchronizing threads, daemon threads, thread groups.Event Handling: Even ts, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes.The AWT class hierarchy, user interface components -labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels –scrollpane, dialogs, menubar, graphics, layout manager –layout manager types – boarder, grid, flow, card and grib bag.

Applets: Concepts of Applets, differences between applets and applications, life cycle of a n applet, types of applets, creating applets, passing parameters to applets.bSwing:Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing-JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons –The Jbutton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.Networking: Basics of network programming, addresses, ports, sockets, simple client server program, multiple clients, Java .net package Packages –java.util

TEXT BOOKS, AND/OR REFERENCE MATERIAL:

1.An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John wiley& sons.
2. An Introduction to OOP, second edition, T. Budd, pearson education.
3.Introduction to Java programming 6th edition, Y. Daniel Liang, Pearson education.
4. An introduction to Java programming and object oriented application development, R.A. Johnson - Thomson.
5. Core Java 2, Vol 1, Fundamentals, Cay.S.Horstmann and Gary Cornell, seventh Edition, Pearson Educat

CS 520 Unix and shell Programming

OURSE OUTCOMES:

- Will be able to describe anduse the LINUX operating system.
- Will be able to describe and use the fundamental LINUX system tools and utilities.
- We will able to describe and write shell scripts in order to perform basic shell programming.
- Will be able to describe and understand the LINUX file system.

TOPICS COVERED

Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Commands – PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

Unix Utilities:- Introduction to unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text processing utilities and backup utilities , detailed commands to be covered are tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, Cpio

Introduction to Shells: Unix Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

Filters : Filters and Pipes, Concatenating files, Display Beginning and End of files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count characters, Words or Lines, Comparing Files.

Grep : Operation, grep Family, Searching for File Content.

Sed : Scripts, Operation, Addresses, commands, Applications, grep and sed.awk: Execution, Fields and Records, Scripts, Operations, Patterns, Actions, Associative Arrays,

String Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands in awk, Applications, awk and grep, sed and awk.

Interactive Korn Shell: Korn Shell Features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process.

Korn Shell Programming: Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

Interactive C Shell: C shell features, Two Special Files, Variables, Output, Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts.

C Shell Programming: Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

File Management: File Structures, System Calls for File Management – create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

TEXT BOOKS, AND/OR REFERENCE MATERIAL:

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
3. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Beginning shell scripting, E. Foster – Johnson & other, Wile Y- India.

CS601 Information theory and Coding

ALGEBRA

Groups – fields – binary field arithmetic – construction of Galois field – basic properties - computations, vector spaces, matrices

INFORMATION THEORY

Information and entropy – properties of entropy of a binary memoryless source –extension of a binary memoryless source – source coding theorem – Shannon fano coding - Huffman coding

SHANNON'S THEOREM AND MUTUAL INFORMATION

Binary symmetric channel – mutual information – properties – channel capacity – Hartley, Shannon Law – channel coding theorem - Lempel-Ziv coding

LINEAR AND CYCLIC CODES

Linear block codes – generator matrices – parity check matrices – encoder – syndrome and error correction – minimum distance –error correction and error detection capabilities – cyclic codes – coding and decoding

OTHER CODING TECHNIQUES

Convolutional codes – encoder – generator matrix – state diagram – distance properties - maximum likelihood decoding – viterbi decoding – sequential decoding –Hadamard matrices and Hadamard codes – BCH codes – description, decoding – Reed Solomon codes

TEXT BOOKS

1. Norman Abramson, Information Theory, John Wiley, 2002.
2. Shu Lin, Costello D.J., Error Control Coding - Fundamentals and Applications, PHI, 2000.

REFERENCE BOOKS

1. Simon Haykin, Digital Communications, John Wiley, 2001.
2. Taub& Schilling, Principles of Communication System, TMH, 1998.
3. Tomasi, Electronic Communication, Fundamentals Through Advanced, Pearson Education, 2001.
4. Sklar, Digital Communication, Pearson Education, 1999. 5. Cover T., and Thomas, Elements of Information Theory, John Wiley & Sons 1991.

CS602 Robotics

Robot Anatomy Arm Geometry-Direct & Inverse Kinematics Problem.ArmDynamics,D Alembert Equations of Motion, Synthesis of elements with movalulityconstraints,manipulations-trajectory planning,joint interpolated trajectories.

Control of Robot Manipulation-computed torque technique sequencing & adaptive control, resolved motion control Moluie Robots.

Robot sensing-Range & Proximity & Higher-Level vision, illumination techniques,Imaging Geometry, Segmentation Recognition & Interpretation.

Robot Programming Language Characteristics of Robot Level & Task Level languages.Robot intelligence-State Space search, Robot learning,Robot Task Planning,Knowledge Engineering.

Books/References:

1. K.S Fu R.C . CSG Lee-Robotics Control,Sensing, Vision &Intelligence,McGraw-Hill.
2. M.P. Groover,M.Weins,R.N. Nagel,N.C. Odrey –Industrial Robotics,McGraw Hill
3. Andrew C.Straugard-Robotics & AI,PHI
4. S. SitharamaIyengar, Alberto Elefes-Autonomous Mobile Robots Control,Planning&Achitecture,IEEE Computer Society Press

CS603 Graph Theory and Combinatorics

UNITI: Graphs – Introduction – Isomorphism – Sub graphs – Walks, Paths, Circuits – Connectedness – Components – Euler Graphs – Hamiltonian Paths and Circuits – Trees – Properties of trees – Distance and Centers in Tree – Rooted and Binary Trees.

UNITII: Spanning trees – Fundamental Circuits –Spanning Trees in a Weighted Graph – Cut Sets – Properties of Cut Set – All Cut Sets – Fundamental Circuits and Cut Sets – Connectivity and Separability – Network flows – 1-Isomorphism – 2-Isomorphism – Combinational and Geometric Graphs – Planer Graphs – Different Representation of a Planer Graph.

UNITIII:Incidence matrix – Submatrices – Circuit Matrix – Path Matrix – Adjacency Matrix – Chromatic Number – Chromatic partitioning – Chromatic polynomial - Matching - Covering – Four Color Problem – Directed Graphs – Types of Directed Graphs – Digraphs and Binary Relations – Directed Paths and Connectedness – Euler Graphs – Adjacency Matrix of a Digraph.

UNITIV:Algorithms: Connectedness and Components – Spanning tree – Finding all Spanning Trees of a Graph –Set of Fundamental Circuits – Cut Vertices and Separability – Directed Circuits.

UNIT V:Algorithms: Shortest Path Algorithm – DFS – Planarity Testing – Isomorphism

BOOK

1. NarsinghDeo, "Graph Theory: With Application to Engineering and Computer Science", PHI, 2003.

REFERENCE

1.R.J. Wilson, "Introduction to Graph Theory", Fourth Edition, Pearson Education, 2003.

CS 604 Network Programming

COURSE OUTCOMES:

Upon successful completion of this course student should be able to

- Analyse the security requirements of a networked programming environment and identify the issues to be solved;
- Come up with conceptual solutions to those issues;
- Implement a programming solution;
- Understand the key protocols that support the Internet;
- Be familiar with severalcommon programming interfaces for network communication;
- Have a detailed knowledge of the TCP/UDP Sockets
- Learn advanced programming techniques such as Broadcasting, Multicasting

TOPICS COVERED

Introduction to Network Programming: OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application.

Sockets: Address structures, value – result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets – Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host.

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions. Socket states,

Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options.
Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP.Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information.
IPC: Introduction, File and record locking, Pipes, FIFOs streams and messages, Name spaces, system IPC, Message queues, Semaphores.
Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.
TEXT BOOKS, AND/OR REFERENCE MATERIAL:
1. UNIX Network Programming, Vol. I, Sockets API, 2nd Edition. - W.Richard Stevens, Pearson Edn. Asia.
2. UNIX Network Programming, 1st Edition, - W.Richard Stevens. PHI.
3. UNIX SYSTEMS PROGRAMMING USING C++ T CHAN, PHI.
4. UNIX for programmers and Users, 3RD Edition, GRAHAM GLASS, KING ABLES, Pearson Education.
5. Advanced UNIX programming, 2nd edition, M J Rochkindpearson education.

CS 605 Introduction to Big data

Topics
- Batch computing models for Big Data computing
- Key-value storage systems
- Scalable prediction models
- Distributed file systems
- Scalable data analytics
- Data models
- Realtime data stream analytics
- Frameworks for the graph data analytics
- In-memory distributed data storage systems

Books:

Data Analytics Made Accessible, by A. Maheshwari

CS606 Embedded System

Introduction to Embedded Systems: What is an embedded system? Basic architecture of an embedded system. Some embedded systems around us. General characteristics of embedded systems, Concept of real time systems, Classification of embedded systems, Challenges in embedded system design.

Embedded Systems Processors: Custom single purpose processor design – FSM method, FSMD method, HPL method and ASM chart method.

Embedded System Peripherals: Timers, Counters and Watchdog timers, UART, PWM, LCD Controllers, Keypad Controllers, Stepper Motor Controllers.

The ARM Processor: Processor architecture and memory organization, Data operations, Flow of control, Pipelining in ARM, Timing of execution, FIR filter implementation using ARM.

Programming Embedded Systems: Design patterns for embedded systems, Data flow graphs, Control/ Data flow graphs, Assembly and Linking, Basic Compilation techniques, Analysis and optimization of execution time.

Real-Time Operating Systems (RTOS): Real-time Kernels, Types of real-time operating systems, Real-time scheduling, RTOS issues, Implementing real-time operating system.

Embedded System Specification: UML as design tool, UML notation, Requirement analysis and Use case modelling, Static modelling, Object and Class structuring, Dynamic modelling.

Design Case Studies: i) Data Compressor, ii) Alarm Clock, iii) Software Modem, iv) Elevator Controller, v) Digital Camera

Text Books

1. Computers as Components: Principles of Embedded Computing Design by W. Wolf: Morgan Kaufmann Publishers

2. Embedded System Design: A Unified Hardware /Software Introduction by F. Vahid and T. Givargis: John Wiley & Sons

3. Embedded Systems: A Contemporary Design Tool by Peckol, K. James: John Wiley & Sons

CS607 Programming Paradigms

To understand the concepts of object-oriented, event driven, and concurrent programming paradigms and develop skills in using these paradigms using Java.

UNIT I OBJECT-ORIENTED PROGRAMMING – FUNDAMENTALS 9

Review of OOP - Objects and classes in Java – defining classes – methods - access specifiers – static members – constructors – finalize method – Arrays – Strings - Packages – JavaDoc comments

UNIT II OBJECT-ORIENTED PROGRAMMING – INHERITANCE 10

Inheritance – class hierarchy – polymorphism – dynamic binding – final keyword – abstract classes – the Object class – Reflection – interfaces – object cloning – inner classes – proxies

UNIT III EVENT-DRIVEN PROGRAMMING 10

Graphics programming – Frame – Components – working with 2D shapes – Using color, fonts, and images - Basics of event handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View- Controller design pattern – buttons – layout management – Swing Components

UNIT IV GENERIC PROGRAMMING 8

Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics – exceptions – exception hierarchy – throwing and catching exceptions – Stack Trace Elements - assertions - logging

UNIT V CONCURRENT PROGRAMMING 8

Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – thread-safe Collections – Executors – synchronizers – threads and event-driven programming

TEXT BOOK:

1. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth

Edition, Sun Microsystems Press, 2008.

REFERENCES:
1. K. Arnold and J. Gosling, “The JAVA programming language”, Third edition, Pearson Education, 2000.
2. Timothy Budd, “Understanding Object-oriented programming with Java”, Updated Edition, Pearson Education, 2000.
3. C. Thomas Wu, “An introduction to Object-oriented programming with Java”, Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006.

CS608 Modelling and simulation of networks

Delay Models in Data Networks: Queuing Models, M/M/1, M/M/m, M/M/
M/M/m/m and other Markov System, M/G/1 System, Networks of Transmission Lines, Time Reversibility, Networks of Queues.
Multi-access Communication: Slotted Multi-access and the Aloha System, Splitting Algorithms, Carrier Sensing, Multi-access Reservations, Packet Radio Networks.
Routing in Data Networks: Introduction, Network Algorithms and Shortest Path Routing, Broadcasting Routing Information: Coping with Link Failures, Flow models, Optimal Routing, and Topological Design, Characterization of Optimal Routing, Feasible Direction Methods for Optimal Routing, Projection Methods for Optimum Routing, Routing in the Codex Network.
Flow Control: Introduction, Window Flow Control, Rate Control Schemes, Overview of Flow Control Practice, Rate Adjustment Algorithms.
Books/References:
1. DimitriBertsekas and Robert Gallager, “Data Networks," 2nd edition, Prentice Hall of India, 2003.
2. William Stallings, “High-Speed Networks and Internets,” Pearson Education (Asia) Pte. Ltd, 2004.
3. J. Walrand and P. Varaya,”High Performance Communication Networks,” 2nd edition, Harcourt India Pte.Ltd. & Morgan Kaufman, 2000.
4. Jean Walrand, KallolBagchi,George W. Zobrist “Network performance modeling and simulation”, Gordon and Breach Science Publishers, Inc. Newark, NJ, USA
5. Nader F. Mir, “Computer and Communication”, Prentice hall.

CS609 Network Security

Introduction to Cryptography, Mathematical Foundation of Cryptography :,Number Theory, Probability Theory;

Secret Key Cryptosystem : Stream and Block Ciphers; Pseudo-random pattern generators, LFSR based stream ciphers, other stream ciphers; Correlation attacks and other relevant attacks for steam ciphers; DES and Its Security, other Block Ciphers;

Linear Cryptanalysis, Differential Cryptanalysis, Attacks on Block Ciphers;

One-Way Hash Functions and Data Integrity: Snefru, MD4, MD5, SHA, HAVAL; Cryptanalysis of hash functions;

Public Key Cryptography: Mathematical Foundation, RSA, Security Analysis of RSA Key Establishment Protocols: Symmetric key based and Asymmetric Key based protocols, KERBEROS, EKE, DH-EKE, PAKE, etc; Secret Sharing;

Digital Signature Schemes: RSA and other related signature schemes, Possible Attacks, DSA and other related signature schemes;
IPsec, TCP security, Wireless Security, Email Security

Text Book:

1. M. Subramanian, Network Management, Principles and Practice, Prentice Hall; 2 edition (May 17, 2012)
2. C. Kaufman, R. Perlman,Network Security: Private Communication in a Public World, Prentice Hall;2nd edition (May 2, 2002)

Books/References:

1. William Stallings, Cryptography and Network Security: Principles and Practice, Pearson; 6 edition (March 16, 2013)
2. Manezes, Oorschot and Vanstone: Handbook of Applied Cryptography, CRC Press; 1 edition (October 16, 1996)
3. Alexander Clemm: Network Management Fundamentals, Cisco Press; 1 edition (2006)

CS610 Cloud computing

COURSE OUTCOMES: Upon successful completion of this course, the student will be able toperform:

- Large data processing in the cloud.
- Virtualization techniques and Security.
- Resource and Power Management in the cloud.
- Monitoring and SLA Assurance.
- Semantic Cloud and SaaS.

TOPICS COVERED

UNIT-I Introduction

Cloud-definition, benefits, usage scenarios, History of Cloud Computing – Cloud Architecture

Types of Clouds – Business models around Clouds – Major Players in Cloud Computing – issuesin Clouds – Eucalyptus – Nimbus – Open Nebula, CloudSim, Risks Involved in Cloud Computing.

UNIT-II Cloud Services

Types of Cloud services: Software as a service – Platform as a Service – Infrastructure as a Service – database as a Service – Monitoring as a Service – Communication as services. Serviceproviders – Google, Amazon, Microsoft Azure, IBM, Salesforce.

UNIT-III Collaborating Using Cloud Services

Email Communication over the Cloud – CRM Management – Project Management – Event Management – Task Management – Calendar – Schedules – Word Processing – Presentation –Spreadsheet – Databases – Desktop – Social Networks and Groupware, Work Loan Managementin Cloud.

UNIT-IV Virtualization for Cloud

Need for Virtualization – Pros and cons of Virtualization – Types of Virtualization – System Vm, Process VM, Virtual Machine monitor – Virtual machine properties – Interpretation and binary translation, HLL VM – Hypervisors – Xen, KVM, VMWare, Virtual Box, Hyper V.

UNIT-V Other Ways to Collaborate OnlineCollaborating via Web - Based Communication Tools - Evaluating Web Mail Services –Evaluating Web Conference Tools – Collaborating via Social Networks and Groupware -Collaborating via Blogs and Wikis.

UNIT-VI Security, Standards and Applications
Security in Cloud: Cloud security challenges – Software as a Service Security, Common Standards: The Open Cloud Consortium – The Distributed Management Task Force – Standardsfor application Developer – Standards for Messaging – Standards for Security, End user accessto cloud computing, Mobile Internet devices and the cloud.

TEXT BOOKS, AND/OR REFERENCE MATERIAL:
1. John Rittinghouse and James Ransome, Cloud Computing, Implementation,Management and Strategy, CRC Press, 2010.
2. Michael Miller, Cloud Computing: Web-Based Applications That Change the WayYou Work and Collaborate Que Publishing, August 2008.
3. James E Smith, Ravi Nair, Virtual Machines, Morgan Kaufmann Publishers, 2006.
4. David E. Y. Sarna Implementing and Developing Cloud Application, CRC press 2011.
5. Lee Badger, Tim Grance, Robert Patt-Corner, Jeff Voas, NIST, Draft cloud computing synopsis and recommendation, May 2011.