SEMESTER IX

18XD91 DATA PRIVACY AND SECURITY

3 0 0 3

INTRODUCTION: Security Problems in computing – security goals –threats and attacks. – Services and mechanisms. (2)

CRYPTOSYSTEMS: Introduction– symmetric key cryptography-substitution cipher – transposition cipher -stream ciphers and block ciphers – Advanced Encryption Standard (AES) – cryptanalysis of symmetric key cryptosystems. Public key cryptography - Introduction – RSA cryptosystem- attacks on RSA – Elliptic curve cryptosystem. (10)

MESSAGE INTEGRITY, AUTHENTICATION AND KEY MANAGEMENT: Message digest – Message authentication code – Cryptographic hash function – Digital signatures- Anonymous protocols- Challenge response system- zero knowledge protocol-secure two party computation-DSS. Symmetric key distribution – kerberos- Diffie – Hellman key agreement– Public key distribution – Certificates. (10)

NETWORK SECURITY: Application Layer Security – PGP and S/MIME, Transport Layer security – SSL - Network layer security – IPSec. (4)

PROGRAM SECURITY : Secure Coding – Malicious and non-Malicious program errors - OWASP/SANS Top Vulnerabilities - Malwares – types - Buffer Overflows – defense mechanisms- Incomplete mediation - XSS - Redirection - Inference – Application Controls - Evaluation of Security Systems. (4)

DATA BASE SECURITY : Security Requirements – database administration security – SQL injection and exploitation and defense methods - database roles and permissions – Object level security - Sensitive data – Multilevel Databases – Multi level security. (5)

DATA PRIVACY : Introduction – Foundations of privacy- Logical methods for specification and enforcement of privacy policies- Privacy preserving data publication- An introduction to Differential privacy: Definitions and early uses – Noiseless differential privacy- Applications of Differential privacy – Synthetic datasets and network trace analysis- Differential privacy for large data- Differentially private social network analysis – Web privacy: online tracking and advertisement – Privacy and machine learning – case study: HIPAA privacy rule . (10)

Total L:45

TEXT BOOKS:

1. John R. Vacca, “Network and Systems Security” Syngress Imprint of Elsevier, 2014.
2. Behrouz A.Forouzan and Debdeep Mukhopadhyay, “Cryptography and Network Security”, Tata McGraw Hill, 2011.
3. Mark Stamp, “Information Security: Principles and Practice”, John Wiley& Sons, 2011.

REFERENCES:

1. Basta, Alfred, and Melissa Zgola. “Database Security”. Cengage Learning, 2011.
2. Cynthia Dwork and Aaron Roth, “The Algorithmic Foundations of Differential Privacy,” Nova publishers Inc, 2014.

18XD92 NETWORK SCIENCE

3 0 0 3

INTRODUCTION: Basics of networks and graphs, random network model - degree distribution, evolution, small world property, six degrees of separation, Watts-Strogatz model, local clustering coefficient, random networks and network science. (5)

BARABÁSI-ALBERT MODEL: Growth and preferential attachment, Barabási-Albert model, degree dynamics, degree distribution, diameter and the clustering coefficient, preferential attachment - absence of growth, measure, non-linearity, the origins. (8)

SCALE-FREE PROPERTY: Power laws and scale-free networks, Hubs, Universality, Ultra-small property, role of the degree exponent, Generating networks with a pre-defined degree distribution. (8)

EVOLVING NETWORKS: Bianconi-Barabási model, measuring fitness, Bose-Einstein condensation, evolving networks. (8)

DEGREE CORRELATIONS: Assortativity and disassortativity, Measuring degree correlations, Structural cutoffs, Degree correlations in real networks, Generating correlated networks, impact of degree correlations. (8)

NETWORK ROBUSTNESS: Percolation theory, robustness of scale-free networks, attack tolerance, cascading failures, modeling cascading failures, building robustness. (8)

Total: L: 45

TEXT BOOK:

1. Albert-László Barabási, Network Science, Cambridge University Press, 2016

REFERENCES:

1. Estrada, E., Fox, M., Higham, D.J. and Oppo, G.L., “Network Science - Complexity in Nature and Technology”, Springer, 2010.
2. Ted G. Lewis, “Network Science: Theory and Practice”, John Wiley & Sons, 2013.

18XD93 INFORMATION RETRIEVAL

3 0 0 3

INTRODUCTION: Overview of IR Systems - Historical Perspectives - Goals of IR - The impact of the web on IR - The role of artificial intelligence (AI) in IR. (3)

TEXT REPRESENTATION: Statistical Characteristics of Text: Zipf's law; Porter stemmer; morphology; index term selection; using thesauri. **Basic Tokenizing, Indexing:** Simple tokenizing, stop-word removal, and stemming; inverted indices; Data Structure and File Organization for IR - efficient processing with sparse vectors. (8)

RETRIEVAL MODELS: Similarity Measures and Ranking - Boolean Matching – Extended Boolean models - Ranked retrieval - Vector Space Models -, text-similarity metrics - TF-IDF (term frequency/inverse document frequency) weighting - cosine similarity, Probabilistic Models, Evaluations on benchmark text collections. (10)

QUERY PROCESSING: **Query Operations and Languages**- Query expansion; Experimental Evaluation of IR: Performance metrics: recall, precision, and F-measure. (5)

TEXT CATEGORIZATION AND CLUSTERING: Categorization : Rocchio; Naive Bayes, kNN; Clustering: Agglomerative clustering; k-means; Expectation Maximization (EM); Dimension Reduction: LSI, PCA. (6)

INFORMATION FILTERING TECHNIQUES: Introduction to Information Filtering, Relevance Feedback - Applications of Information Filtering: **RECOMMENDER SYSTEMS**: Collaborative filtering and Content-Based recommendation of documents and products. (4)

WEB SEARCH: IR Systems and the WWW - Search Engines: Spidering, Meta Crawlers; Link analysis : Hubs and Authorities, Google PageRank, Duplicate Detection. (4)

INFORMATION EXTRACTION AND INTEGRATION: Extracting data from text; Basic Techniques: NE Recognition, Co-reference Resolution, Relation Extraction, Event Extraction; Extracting and Integrating specialized information on the web, Web Mining and Its Applications. (5)

Total L : 45

TEXT BOOKS:

1. Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, “Introduction to Information Retrieval”, Cambridge University Press, 2012.
2. Ricardo Baeza-Yates and Berthier Ribeiro-Neto, “Modern Information Retrieval”, Pearson Education, 2010.
3. Croft B., Metzler D., Strohman T., Information Retrieval in Practice, Pearson Education, 2010.

REFERENCES:

1. Stephan Buttcher, Charles L. A. Clarke and Gordon Gormack, “Information Retrieval Implementing and Evaluating Search Engines”, MIT Press, 2010.
2. Francesco Ricci, Lior Rokach, BrachaShapira, Paul B. Kantor “Recommender Systems – Handbook”, 2011.
3. Anand Rajaraman and Jeffrey Ullman, “Mining Massive Data sets”, Cambridge University Press, 2014.

18XD96 INFORMATION RETRIEVAL LAB

0 0 4 2

1. Building a web crawler.
2. HITS/PageRank for ranking of Web Pages.
3. Spam detection personal mails in R.
4. Build a Recommender System.
5. Designing a personalized Search Engine.
6. Identifying near duplicates in web pages.
7. Extracting information from web pages.
8. Designing a desktop search engine.

Total P: 60

18XD97 DATA PRIVACY AND SECURITY LAB

0 0 4 2

1. Design of a Client server application for a basic cryptosystem.
2. Performing a frequency analysis attack on a cipher text enciphered with Affine cipher.
3. Detection of a Buffer overflow attack.
4. Packet Sniffing using Wireshark Tool to perform the traffic analysis attack.
5. Implementation of RSA cryptosystem.
6. Key distribution using RSA(KDC) – Key hacking.
7. Key exchange using Diffie-Hellman technique – MITM attack.
8. Authentication of File transfer using Hashing / Message digest.
9. Digital signature, generation and verification.
10. Password authentication.
11. Securing transaction by defending SQL Injection attacks.
12. Cross - Site scripting.
13. Implementation of security techniques to safeguard the database against accidental or deliberate breaches.

14. Security testing for applications.
15. Analysis and removal of vulnerabilities from a web application.

Total P: 60

18XD98 NETWORK SCIENCE LAB

0 0 4 2

1. Implementation of Barabási-Albert model.
2. Implementation of Watts-Strogatz model.
3. Implementation of Bianconi-Barabási model.
4. Obtaining Degree correlations in real networks.
5. Case studies of the theory concepts on real networks.

Total P: 60

SEMESTER 10

18XDP2 PROJECT WORK II

0 0 0 12

ELECTIVES

18XDA1 DATA COMPRESSION

3 2 0 4

DATA COMPRESSION LEXICON: Introduction to Data Compression - Dawn Age - Coding - Lossy Compression. (4)

MINIMUM REDUNDANCY CODING (THE DAWN AGE): The Shannon - Fano Algorithm, The Huffman Algorithm - Into the Huffman Code : Counting the Symbols, Building the tree . (5)

ADAPTIVE HUFFMAN CODING: Adaptive Coding - Updating the Huffman Tree - Escape code. (5)

ARITHMETIC HUFFMAN CODING: Arithmetic Coding with floating point data type – Arithmetic coding with integral data type. (6)

STATISTICAL MODELING: Higher-order Modeling - Finite Context Modeling – Order one modeling – Order two Modeling. (5)

SPEECH COMPRESSION: Digital Audio Concepts - Lossless Compression of Sound. (5)

VIDEO COMPRESSION: JPEG Compression - Implementing DCT - Complete Code Listing. (5)

DICTIONARY-BASED COMPRESSION: LZ77 Compression and Decompression - LZSS Compression and Decompression - LZ78 Compression and Decompression - LZW Compression and Decompression – LZMW Compression and Decompression - LZAP Compression and Decompression – LZY Compression and Decompression. (10)

TUTORIAL PRACTICE:
1. Implement Shannon Fano algorithm and Huffman algorithm.
2. Design compression and decompression program using adaptive Huffman coding.
3. Implement arithmetic coding algorithm.
4. Design compression program using statistical modeling upto 3 order.
5. Design compression and decompression program using LZ77 algorithm.

Total: L: 45+T: 30 = 75

TEXT BOOK:
1. Khalid Sayood, “Introduction to Data Compression”, Morgan Kaufmann, 2013.
2. David Salomon, “Data Compression: The Complete Reference”, Springer, 2014

REFERENCES:
1. Charles K. Chui, Qingtang Jiang, "Applied Mathematics: Data Compression, Spectral Methods, Fourier Analysis, Wavelets and Applications", Atlantic Press, 2013

18XDA2 MOBILE COMPUTING

3 2 0 4

INTRODUCTION: Introduction to mobile and wireless devices - wireless networking, Advantages and disadvantages of wireless networking, Evolution of mobile communication generations- Challenges in mobile computing – Vertical and horizontal mobile applications - Wireless LAN and Wireless WAN. (5)

CELLULAR CONCEPT: Wireless transmission - Frequencies for radio transmission - Regulations - Signals , Antennas , Signal propagation ,Path loss of radio signals , Additional signal propagation effects - Multi-path propagation - Multiplexing - Space division multiplexing - Frequency division multiplexing -Time division multiplexing - Code division multiplexing - Spread spectrum - Direct sequence spread spectrum - Frequency hopping spread spectrum. (10)

CELLULAR NETWORK : Cellular Concepts – Factors determining cell size and shape - GSM-Mobile services - System architecture -- Handover – GPRS – Mobile services – System architecture – Location Management strategies – Eager caching Vs lazy caching - LTE Network architecture and interfaces (10)

MOBILE APPLICATIONS ARCHITECTURE: Smart Client – Smart Client Architecture – Messaging Architecture – The Model-View-Controller Model- Delegate Pattern- Building Smart Client Applications-Design, Development, implementation, testing and deployment phase- MVVM mobile architecture design. (6)

MOBILE APPLICATION DEVELOPMENT: Introduction to Android Platform – Android architecture overview - Application life cycle - UI design for Android - Different types of layouts – Widgets – List view and Adapters - Dialogs and Toasts – Intent filters - Files and database – SQLite on Android - Security model – Comparison with IOS application development -Building cross-platform applications using React Native. (14)

TUTORIAL PRACTICE:

1. Android SDK installation and study
2. Defining Layouts
3. Single Activity Application, Application with multiple activities, using intents to Launch Activities
4. Application using GUI Widgets
5. Application with Notifications
6. Creating and Saving Shared Preferences and Retrieving Shared Preferences
7. Usage of SQLite Databases for storage
8. Working with Retrofit library in Android Applications
9. Android Automated Testing Frameworks
10. Case Study : Dagger Framework for Android

Total L: 45+T: 30=75

TEXT BOOKS:

1. Bill Philips, Kristin Marsicano and Chris Stewart, “Android Programming : The big Nerd Ranch guide”, O’Reilly, 2017.
2. Jochen Schiller, “Mobile Communications”, Pearson Education, 2012.
3. Martyn Mallick, “Mobile and Wireless Design Essentials”, Wiley, 2003

REFERENCES:

1. Ronan Schwarz, Phil Dutson, James Steele and Nelson To, “The Android Developer's Cookbook -Building Applications with the Android SDK”, Addison Wesley, 2013.
2. Andreas F.Mohisch, “Wireless Communications”, John Wiley & Sons, 2010.
3. David Taniar, “Mobile computing concepts, methodologies, tools and applications”, IGI Global, 2009.

18XDA3 DIGITAL IMAGE PROCESSING

3 2 0 4

DIGITAL IMAGE PROCESSING: Elements of a Digital image processing system – Structure of the Human eye – Image formation and contrast sensitivity – Sampling and Quantization – Neighbours of a pixel – Distance measures – Photographic firm structure and exposure – Film characteristics – Linear scanner – Video camera – Image processing applications. (6)

IMAGE TRANSFORMS: Introduction to Fourier transform – DFT – Properties of two dimensional FT – Separability, Translation, Periodicity, Rotation, Average value – FFT algorithm – Walsh transform – Hadamard transform – Discrete Cosine transform. (5)

IMAGE ENHANCEMENT: Definition – Spatial domain methods – Frequency domain methods – Histogram modification technique – Neighborhood averaging – Media filtering – Lowpass filtering – Averaging of multiple images – Image sharpening by differentiation and high pass filtering. (8)

IMAGE RESTORATION: Definition – Degradation model – Discrete formulation – Circulant matrices – Block circulant matrices – Effect of diagnolization of circulant and block circulant matrices – Unconstrained and constrained restorations – Inverse filtering – Wiener filter – Restoration inspatial domain. (8)

IMAGE ENCODING: Objective and fidelity criteria – Basic encoding process – The mapping – The quantizer – The coder – Differential encoding – Contour encoding – Runlength encoding – Image encoding relative to fidelity criterion – Differential pulse code modulation. (8)

IMAGE ANALYSIS AND COMPUTER VISION: Typical computer vision system – Image analysis techniques – Spatial feature extraction – Amplitude and Histogram features. Transform features – Edge detection – Gradient operators – Boundary extraction – Edge linking – Boundary representation – Boundary matching – Shape representation. (10)

TUTORIAL PRACTICE:

1. Implementation of Viewing digital images, bits and bytes, sampling and quantization.
2. Apply scaling, translation and rotation, sums and differences with the grayscale and color images.
3. Implementation of Histograms and stretches, convolutional filters.

4. Construct edge detection algorithms using Operators.
5. Implement Fourier transforms and the frequency domain, non-linear filters.
6. Implement the image restoration techniques.
7. Apply various image encoding methods with grayscale images.
8. Implement the conversion between color spaces.
9. Extract the Spatial, Histogram, and Transform features.
10. Implement the boundary and shape representation of digital images.

Total: L: 45+T: 30 = 75

TEXT BOOKS:

1. Rafael C. Gonzalez and Richard E. Woods, "Digital Image Processing", Prentice Hall, 2011.
2. Kenneth R. Castleman, "Digital Image Processing", Pearson Education, 2007.

REFERENCES:

1. Maria Petrou , Costas Petrou, "Image Processing: The Fundamentals", John Wiley & Sons, 2010.

18XDA4 MULTIMEDIA ANALYTICS

3 2 0 4

MULTIMEDIA DATABASES: Architectures - Schema, Functional, System, Distributed, Interoperability, Hypermedia. Metadata for Multimedia Databases. (5)

DEALING WITH MULTIMEDIA DATABASES: Text Databases - Querying Character Data Using SQL, Statistical Methods for Text Analysis, Querying Multimedia Text, Content-dependent Metadata, Indexing Technologies for Text. Image Databases - Technologies for Image Processing, Role of Feature Extraction, Retrieval Methods, Developing Image Media Databases. Video Databases - Video Analysis and Segmentation, Storage of Video Objects, Dealing with Moving Images, Metadata for Speech and Video, Manipulating Video Data, Video Query Process. (10)

MULTIMEDIA DATA MINING: Technologies, Architectural Support, Process of Multimedia Data Mining, Outcomes, Approaches and Techniques. (5)

TEXT MINING - Overview, From Textural Information to Numerical Vectors - Collection Documents, Document Standardization, Tokenization, Lemmatization, Vector Generation for Prediction, Sentence Boundary Determination, Part-Of-Speech Tagging, Word Sense Disambiguation, Phrase Recognition, Named Entity Recognition, Parsing, Feature Generation. Using Text for Prediction - Recognizing that Documents Fit a Pattern, Document Classification, Learning to Predict from Text, Evaluation of Performance, Applications. (10)

DESIGNING A CONTENT-BASED IMAGE RETRIEVAL SYSTEM: Feature Extraction and Representation, Similarity Measurements, Dimension Reduction and High-dimensional Indexing, Clustering, The Semantic Gap, Learning, Relevance Feedback, Benchmarking Solutions. (7)

DESIGNING A CONTENT-BASED VIDEO RETRIEVAL SYSTEM: Video Parsing, Video Abstraction and Summarization, Video Content Representation, Indexing and Retrieval, Video Browsing Schemes, Samples of Video Retrieval Systems (6)

AUDIO MINING: Overview, Audio Retrieval, Audio Mining, Taxonomy for Audio Mining. (2)

TUTORIAL PRACTICE:

1. Construct the following multimedia databases and manipulate them.
   a. Text Databases
   b. Image Databases
   c. Audio Databases
   d. Video Databases
2. Implement the various phases of text mining algorithm.
3. Construct a document classification system and analyze its performance.
4. Develop a CBIR system for a benchmark database with semantic and relevance feedback.
5. Construct an index based video retrieval system.
6. Develop an audio retrieval system.

Total: L: 45+T: 30 = 75

TEXT BOOKS:

1. Sholom M. Weiss, NitinIndurkhya, Tong Zhang and Fred Damerau, "Text Mining: Predictive Methods for Analyzing Unstructured", Springer, 2010.
2. Oge Marques andBorkoFurht, "Content-Based Image and Video Retrieval", 2012.
3. Robertson, L. Methods and innovations for multimedia database content management/current trends and future practices for digital literacy and competence, Information Science Reference, 2013.

REFERENCES:

1. Djeraba, C. Multimedia mining: a highway to intelligent multimedia documents (Vol. 22). Springer Science & Business Media, 2012.
2. Oge Marques, "Practical Image and Video Processing Using MATLAB", John Wiley & Sons, 2011.
3. Dunckley Lynne, Multimedia Databases: An Object Relational Approach, Pearson Education, 2003.

18XDA5 COMPUTATIONAL NEUROSCIENCE

3 2 0 4

INTRODUCTION: Introduction and history of Computational Neuroscience - Tools and specialization in neuroscience – Levels of organization in the brain – Levels of analysis and Computational Theory of the brain. (5)

MATHEMATICAL BACKGROUND: Linear systems - eigenvalues, eigenvectors for symmetric matrices – quadratic forms, solving a system of linear equations - Dynamic systems, bifurcation map in terms of trace and determinant - Phase plane analysis: null clines - Hopf bifurcation and limit cycles . (9)

HODGKIN HUXLEY MODEL: Neuron - Membrane potential, action potential, Electrophysiology - Goldman-Hodgkin-Katz voltage equation - Hodgkin-Huxley model. (9)

COMPONENTS OF NEURAL SIGNALING – Neurotransmission - Models of Sensory Systems: Vision – Touch –Hearing -Motor Systems (4)

REVIEW OF ARTIFICIAL NEURAL NETWORKS: McCulloch-Pitts Neuron, Perceptron, MLP, Self-organizing map, Hopfield network.Neural Network: Perception – MLP: Back Propogation – case studies - Past tense learning, NetTalk, biological plausibility of backpropagation algorithm – Hebbian Learning and PCA - Linsker's model of the visual system - Reinforcement Learning - Spiking neuron networks. (7)

INTRODUCTION TO INFORMATION THEORY: Communication channel and information gain – Information measure and Entropy – Properties of Joint and Conditional Information Measures and A Markov Source – Non-linear correlation measures. (5)

CASE STUDIES: Complex network analysis- Structural and functional brain networks. (6)

TUTORIAL PRACTICE:

1. Familiarity with tools such as EEGLab, MATLAB, UCINET.
2. Implementation of signal processing concepts – Frequency Component Analysis of signals etc.
3. Implementation of various Artificial Neural Network algorithms using real time neuroscience datasets.
4. Implementation of complex network metrics using UCI Net / PAJEK.
5. Statistical Analysis on Neuroscience data.

Total: L: 45+T: 30 = 75

TEXT BOOKS:

1. Eric Kandel, James Thomas Schwartz and Jessel, "Principles of Neural Science", McGraw-Hill, 2013.
2. Feng J., "Computational Neuro Science: A Comprehensive Approach", Chapman and Hall / CRC, 2004.
3. Randall C. O'Reilly and Yuko Munakata, "Computational Explorations in cognitive Neuroscience: Understanding the Mind" , MIT Press, 2000.
4. Thomas P. Trappenberg, "Fundamental of Computational Neuroscience", Oxford University press, 2010.

REFERENCES:

1. Raymond W. Yeung, "Information Theory and Network Coding", Springer, 2011.
2. Cover T. M. and Thomas J. A., "Elements of Information Theory", John Wiley& Sons, 2006.
3. Claude Elwood Shannon and Warren Weaver, "The Mathematical Theory of Communication", University of Illinois Press, 1999.

WEB LINKS:

1. http://en.wikipedia.org/wiki/Computational_neuroscience
2. http://www.scholarpedia.org/article/Encyclopedia_of_computational_neuroscience
3. http://home.earthlink.net/~perlewitz/

18XDA6 PERVASIVE COMPUTING

3 2 0 4

INTRODUCTION: Pervasive computing, m-Business, challenges and future of pervasive computing - modelling key for pervasive computing - pervasive system environment interaction - IOT - architectural design - application examples: Healthcare, Tracking, emergency information systems, home networking appliances and entertainment. (5)

DEVICE TECHNOLOGY FOR PERVASIVE COMPUTING: Hardware computing devices - pervasive information access devices- smart identification, smart card, labels, tokens - embedded controls, smart sensors, actuators -Human-machine interfaces, Biometrics - Various operating systems for pervasive devices. (4)

COMMUNICATION TECHNOLOGIES FOR PERVASIVE COMPUTING: Connecting the world – WWAN, SRWC, DECT, Bluetooth, IrDA – mobile internet – internet protocols. Audio networks - wireless data networks - pervasive networks - service oriented networks - network design issues - Managing smart devices in virtual environments, user-centered and physical environments - pervasive computing issues. (7)

APPROACHES FOR DEVELOPING PERVASIVE APPLICATIONS: Categorization - smart services for pervasive application development - developing mobile applications – presentation transcoding – device independent view component – heterogeneity of device platforms - Context Awareness and Mobility to build pervasive applications. (8)

CONTEXT AWARE SYSTEMS: Modelling - mobility awareness - spatial awareness - temporal awareness - ICT system awareness - Intelligent Systems - basic concepts- autonomous systems - reflective and self-aware systems - self management and autonomic computing - complex systems. (8)

LOCATION AWARE SYSTEMS: Basic concepts - DNS Server, server process, client process – location modelling –- location update- location inquiry - location management– cost- network topology – mobility pattern, memory less movement model, Markovian Model, Shortest distance model, Gauss-Markov model, Activity Based Model, Mobility Trace, Fluid-flow Model, Gravity Model. (7)

Location dependent information system - location dependent data – location aware queries – location dependent queries – moving object database queries - query transition steps in LDQ processing.

(6)

TUTORIAL PRACTICE:

1. Create application with onClick, onKeyDown, onFocusChanged Event Handlers.
2. Create application with Toast Notifications.
3. Create application with Android's Advanced User Interface Functions.
4. Create Android Audio/Video Application.
5. Create application to Create, Modify and Query an SQLite Database.
6. Create application that Works with an Android Content Provider.
7. Create application that performs Data Storage and Retrieval from Android External Storage.
8. Create Location-Aware application that uses Proximity Alerts and Google Maps API.
9. Implementation of small packages to demonstrate all APIs.

Note: Implementations in android platform.

Total L:45+T:30=75

TEXT BOOKS:

1. Stefan Poslad, “Ubiquitous Computing - Smart Devices, Environment and Interactions”, John Wiley & Sons, 2011.
2. Adelstein F and Gupta S K S, “Fundamentals of Mobile and Pervasive Computing”, Tata McGraw Hill, 2008.

REFERENCES:

1. Syed Ijlal Ali Shah, Mohammad Ilyas, Hussein T. Mouftah, “Pervasive Communications Handbook”, CRC Press, 2015.
2. GuruduthBanavar, Norman Cohen, Chandra Narayanaswami, “Pervasive Computing: An Application-Based Approach”, John Wiley& Sons, 2012.
3. Mohammed Ilyas and ImadMahgoub, “Mobile Computing Handbook”, Auerbach Publications, 2009.
4. Burkhardt, Henn, Hepper and Rintdorff, Schaeck. “Pervasive Computing”, Pearson Education, 2009.
5. AshokeTalukdar and RoopaYavagal, “Mobile Computing”, Tata McGraw Hill, 2010.
6. A. Genco, S. Sorce: Pervasive Systems and Ubiquitous Computing, WIT Press, 2012.

18XDA7 MARKETING ANALYTICS

3 2 0 4

INTRODUCTION: Marketing Analytics, Models and metrics- Market Insight – Market data sources, sizing, PESTLE trend analysis, and porter five forces analysis – Market segment identification and positioning. (8)

COMPETITIVE ANALYSIS AND BUSINESS STRATEGY: Competitor identification, Intelligence gathering, analysis and strategy- Analytics based strategy selection, with strategic models and metrics , Forecasting, balanced scorecard, and critical success factors. (8)

PRODUCT, SERVICE AND PRICE ANALYTICS: Conjoint analysis model, decision tree model, portfolio resource allocation, Pricing techniques, pricing assessment, pricing for business markets, price discrimination. (12)

DISTRIBUTION AND PROMOTION ANALYTICS: Retail location selection, distribution channel evaluation, and multi-channel distribution, Promotion budget estimation and allocation, promotion metrics for traditional media and social media.

(8)

SALES ANALYTICS: E Commerce sales mode, sales metrics, profitability metrics and support metrics. (9)

TUTORIAL PRACTICE:

1. Implementation of different metrics in marketing analytics.
2. Implementation of forecasting techniques for sales data.
3. Implementation of portfolio analysis.

Total: L: 45+T: 30 = 75

TEXT BOOK:

1. Stephan Sorger, “Marketing Analytics – Strategic Models and Metrics”, Admiral Press, 2013.

REFERENCES:

1. Mark Jeffery, “Data Driven Marketing: The 15 Metrics Everyone in Marketing should know”, John Wiley & Sons, 2013.
2. Paul W. Farris, Neil T. Bendle, Phillip E. Pfeifer, David J. Reibstein “Marketing Metrics: The Definitive Guide to Measuring Marketing Performance”, Pearson Education, 2012.

18XDA8 WEB ANALYTICS

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3 0 0 3

INTRODUCTION: Understanding web analytics – The foundations of Web analytics: Techniques and Technologies – Present and Future of Web analytics. (4)

DATA COLLECTION: Importance and Options –Web server log files: Click stream data – User submitted information – Web server performance data – Page tags –First and third party tracking. (12)

WEB ANALYTICS STRATEGY: Key performance indicators – Web analytics process – Heuristics evaluations – Site visits – Surveys – Measuring reach – Measuring acquisition – Measuring conversion – Measuring retention – Security and privacy implications of Web analytics. (13)

WEB ANALYTICS TOOLS: Content organization tools –Process measurement tools – Visitor segmentation tools – Campaign analysis tools – Commerce measurement tools – Google analytics – Omniture – Web trends – Yahoo! Web analytics. (12)

GOOGLE ANALYTICS: Key features and capabilities – Quantitative and qualitative data - Working of Google analytics – Privacy - Tracking visitor clicks, Outbound links and Non HTML files. (4)

TUTORIAL PRACTICE:

1. Data collection using different analytics tools.
2. Web log analysis.
3. Identifying reach.
4. Measuring acquisition.
5. Calculating the conversion from search to purchase.
6. Retain ratio computation.
7. Report generation.
8. Implementing the working of Google analytics.
9. Implementing the working of Yahoo! Analytics.
10. Implementing the working of Omniture.

Total L: 45+T:30=75

TEXT BOOKS:

1. Bernard J. Jansen, “Understanding User-Web Interactions via Web analytics”, Morgan and Claypool, 2009.
2. Avinash Kaushik, “Web Analytics2.0”, John Wiley & Sons, 2010.

REFERENCES:

1. Brian Clifton, “Advanced web metrics with Google analytics”, John Wiley & Sons, 2012.
2. Jerri L. Ledford, Joe Teixeira and Mary E. Tyler, “Google Analytics”, John Wiley & Sons, 2013.

18XDA9 SOFT COMPUTING

3 2 0 4

ARTIFICIAL INTELLIGENCE AND SOFT COMPUTING: Subject of AI – Problem solving by intelligent search – Breadth First Search, Depth First Search, Iterative Deepening, Hill Climbing, Iterative Deepening, A*, Best First Search. (7)

GENETIC ALGORITHM: Basic Concepts – Encoding – Binary, Permutation, Tree, Value – Fitness Function – Reproduction – Roulette Wheel, Boltzmann, Tournament, Rank, Elitism – Operators - Crossover – Single point, Two point, Multi point, Uniform, Matrix, Partially Matched, Order and Cycle – Mutation – Flip, Swap, Inverse – Application. (10)

FUZZY SET THEORY: Basic Definitions and Terminologies – Set theory operations – Membership function formulation and parameterization – Fuzzy rules and reasoning – Extension principle and fuzzy relations, Fuzzy if then rules, Fuzzy reasoning – Fuzzy Inference Systems – Mamdani fuzzy model, Sugeno Fuzzy models, Tsukamoto fuzzy models. (12)

NEURAL NETWORKS: Fundamentals – Neural Network Architecture – Learning methods - Simple neural nets – McCulloch Pitts – Linear separability – Hebb Net – Perceptron – Standard Back Propagation Network – Radial Basis Function Network - Pattern Association – Hebb rule – Hetero associative memory – Auto associative memory – Iterative Associative net – Discrete Hopfield Net – Bidirectional Associative Memory – Competitive net – Kohonen Self Organizing Map – Adaptive Resonance Theory. (16)

TUTORIAL PRACTICE:

1. Genetic algorithm for Travelling Salesman Problem.
2. Genetic algorithm for Feature Selection.
3. Fuzzy set for Classification and Feature Selection.

4. Perceptron for XOR Problem.
5. Backpropagation for fine-tuning the parameters of any algorithm.

Total: L: 45+T: 30 = 75

TEXT BOOKS:

1. Amit Konar, “Artificial Intelligence and Soft Computing : Behavioral and Cognitive Modeling of the Human Brain”, CRC Press, 2008.
2. Ross Timothy J., “Fuzzy Logic with Engineering Applications”, John Wiley and Sons, 2010.
3. Laurene Fausett, “Fundamentals of Neural Networks: Architectures, Algorithms and Applications”, Pearson Education, 2011.

REFERENCES:

1. Nils J. Nilsson, “Artificial Intelligence: A New Synthesis”, Morgan Kaufmann,2003.
2. Rajasekaran S., Vijayalaskhmi Pai G. A., “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice Hall, 2006.
3. David E. Goldberg, “Genetic Algorithms in search, optimization and machine learning”, Addison Wesley, 2012.
4. Jang J. S. R., Sun C. T. and Mizutani E., “Neuro-fuzzy and Soft Computing”, Prentice Hall, 2010.

18XDAA COMPUTER GRAPHICS

3 2 0 4

GRAPHICS INPUT - OUTPUT DEVICES: Raster scan Displays - Random scan displays - Direct view storage tubes - Flat panel displays - Joy Stick - Digitizers - Touch panels - LCD. GRAPHICAL USER INTERFACE AND INTERACTIVE INPUT METHODS: The user dialog - Input of graphical data - Input function - Interactive picture construction techniques - Virtual reality environments. (3)

OPENGL: Architecture, The OpenGL API, Primitives and Attributes, Color, Viewing, Control Functions, Programming Event-Driven Input, Transformations, OpenGL Extensions. (4)

TWO DIMENSIONAL GRAPHICS: Basic transformations - Matrix representation and homogeneous coordinates - Composite transformations - Line drawing algorithms: DDA and Bresenham's algorithms - Circle generation algorithms: Midpoint circle algorithm - Point clipping - Line clipping: Cohen Sutherland algorithm - Polygon clipping: Sutherland Hodgeman algorithm - Line covering. (8)

RASTER GRAPHICS: Fundamentals: generating a raster image, representing a raster image, scan converting a line drawing, displaying characters, speed of scan conversion, natural images - Solid area scan conversion: Scan conversion of polygons,Y-X algorithm, properties of scan conversion algorithms - Interactive raster graphics: painting model, moving parts of an image, feed back images. (8)

CURVES AND SURFACES: Parametric representation of curves - Bezier curves – B-Spline curves - Parametric representation of surfaces - Bezier surfaces - Curved surfaces - Ruled surfaces - Quadric surfaces – Concatenation of two curve segments – Order of Continuity. (5)

IMAGE PROCESSING FUNDAMENTALS: Sampling and Quantization, Image Enhancement - Histogram Processing, Filtering, Edge Detection, Image Transforms. (7)

THREE DIMENSIONAL GRAPHICS: 3D transformations - Viewing 3D graphical data - Orthographic, oblique, perspective projections - Hidden lines and hidden surface removal. (5)

FRACTAL-GEOMETRY METHODS: Tiling the plane - Recursively defined curves - Koch curves - C curves - Dragons - Space filling curves - Fractals - Grammar based models - Graftals - Turtle graphics - Ray tracing. (5)

TUTORIAL PRACTICE:
1. Drawing a line, circle using algorithms.
2. Implementation of 2D Transformations (translation, scaling, rotation).
3. Window – viewport simulation with various aspect ratios.
4. Polygon clipping and line clipping using algorithms.
5. Drawing a 2D curve using Bezier generation.
6. Drawing a 2D curve using B-Spline generation.
7. Model a primitive (car / Aircraft) with OpenGL API.
8. Simulate the primitive.
9. Animate the primitive.

Note: Algorithms in the Computer Graphics have to be implemented by the student using C++/ OpenGL. (Wherever applicable).

Total: L: 45+T: 30 = 75

TEXT BOOKS:

1. Donald Hearn and Pauline Baker M, "Computer Graphics Using OpenGL", Pearson Education, 2014.
2. William M. Newmann, Robert F.Sproull, “Principles of Interactive Computer Graphics”, Tata McGraw Hill, 2014.

REFERENCES:

1. Foley James D., Vandam Andries and Hughes John F., "Computer Graphics: Principles and Practice", Addison Wesley, 2013.
2. Rafael C. Gonzalez., and Richard Eugene Woods, “Digital Image Processing”, Pearson Education, 2013.

3. Anil K. Jain., “Fundamentals of Digital Image Processing”, Pearson Education, 2016.
4. Angel, “Interactive Computer Graphics- A top down approach with OpenGL”, Pearson Education, 2014.
5. Hill F. S., “Computer Graphics Using OpenGL”, PHI Learning Pvt. Ltd., 2012.

18XDAB ALGORITHMS FOR BIOINFORMATICS

3 2 0 4

INTRODUCTION: Biological data, DNA, RNA, Amino acids, Protein, Structural databases, genomes, Central dogma – Molecular Biology, Prediction of molecular function and structure. (7)

SEQUENCE COMPARISON ALGORITHMS: Dynamic Programming Algorithms, Edit Distance and Alignments, Alignment with Gap Penalties, Spliced Alignment, Similarity-Based Approaches to Gene Prediction, Multiple Alignment, HMM, Profile HMM Alignment, Viterbi Algorithm, Randomized Algorithms-Gibbs sampling, Genetic, Expectation Maximization Algorithm. (10)

EXHAUSTIVE SEARCH ALGORITHMS: Repeat finding Hash tables, Exact, approximate, combinatorial pattern matching, profile search, Motifs, Motif finding using Greedy algorithm, Dynamic Programming Algorithms, Divide-and-Conquer Algorithms, Keyword Trees, Suffix Trees, Heuristic Similarity Search Algorithms, BLAST: Sequence against a Database. (10)

GRAPH BASED ALGORITHMS: Shortest superstring problem – sequencing by hybridization – SBH as a Hamiltonian path problem – SBH as an Eulerian Path problem – Fragment assembly in DNA sequencing – Protein sequencing and Identification. (8)

CLUSTERING ALGORITHMS: Support Vector Machine, Ant Colony Algorithm**,** Clustering and Trees, Hierarchical Clustering, k-Means Clustering, Evolutionary Trees, Distance-Based, Additive Matrices, parsimony Tree Reconstruction. (10)

TUTORIAL PRACTICE:
1. Motif Finding.
2. Sequence Comparison.
3. Searching biological databases.
4. Applications of HMM.
5. Finding SBH using Hamilton cycle / Eulerian Path.
6. Implementation of some clustering algorithms.

Total: L: 45+T: 30 = 75

TEXT BOOKS:
1. Neil Jones and PavelPevzner, “An Introduction to Bioinformatics Algorithms”, MIT Press,2009.
2. Jonathan Pevsner, "Bioinformatics and Functional Genomics", John Wiley & Sons, 2009.

REFERENCE:
1. Mount, “Bioinformatics: Sequence and Genome Analysis”, Cold Spring Harbor Laboratory Press, 2006.

18XDAC MATHEMATICAL MODELLING

3 2 0 4

INTRODUCTION TO MODELING: Modeling process, Overview of different kinds of model. (4)

INVENTORY MODELS: Classic Economic Order Quantity (EOQ)Model, EOQ with price breaks, Multi-item EOQ with Storage limitation, Dynamic EOQ , Probabilistic EOQ model , No setup model, Setup model (s-S Policy). (10)

DECISION ANALYSIS: Decision under certainty – Analytic Hierarchy process, Decision under Risk – Decision Tree based expected value criterion – Variations of the Expected value criterion – Decision under Uncertainty (8)

PORTFOLIO MODELING AND ANALYSIS: Portfolios, returns and risk, risk-reward analysis, asset pricing models, mean variance portfolio optimization, Markowitz model and efficient frontier calculation algorithm, Capital Asset Pricing Models (CAPM). (8)

MODELING WITH BIOINFORMATICS: Introduction, Biological data- types, mode of collection, documentation and submission. Sequence alignment- Definition, significance, dot matrix method, dynamic programming- Global and local alignment tools, scoring matrices and gap penalties. Multiple sequence alignment: Iterative methods. Hidden Markovian models, statistical methods, position specific scoring matrices. (15)

TUTORIAL PRACTICE:
Softwares **:** MATLAB programming, Mathlab, Mathematica, Maple.
Topics **:** Some of the major topics to be covered include (not necessarily in the order given):

1. Algebraic Models: Linear, Quadratic, and Exponential.
2. Inventory models
3. Portfolio optimization models.
4. Cox-Ross-Rubinstein (CRR) model.
5. Risk analysis models.
6. Pair wise sequence alignment using dynamic programming.
7. Multiple sequence alignment using Hidden Markovian models.

Total: L: 45+T: 30 = 75

TEXT BOOKS:

1. Giordano F R, Weir M D and Fox W P,"A First Course in Mathematical Modeling", Brooks/Cole, 2008.
2. Mount, DW, "Bioinformatics Sequence and genome analysis ", Cold Spring Harbor Laboratory, 2004.

REFERENCES:

1. Hamdy ATaha, "Operation Research- An Introduction", Pearson Education, 2014.
2. Christoffersen P, " Elements of Financial Risk Management", Academic Press, 2012.
3. Capinski M. and Zastawniak T, "Mathematics for Finance: An Introduction to Financial Engineering", Springer, 2010.
4. Alexander Isaev, "Introduction to Mathematical Methods in Bioinformatics", Springer, 2006

18XDAD SOFTWARE ENGINEERING

3 2 0 4

INTRODUCTION: System - System Development - Types of systems – People involved in the systems development - The project life cycle models - Need for Software Engineering - Objectives and Benefits of Software Engineering - Factors that influence Quality & Productivity – Quality attributes of a software product. (4)

SOFTWARE PLANNING: Software Project Estimation - Different techniques of Project cost estimation Decomposition techniques - COCOMO & PUTNAM models. (4)

SOFTWARE ANALYSIS: Functional and non-functional requirements- Requirements engineering process – Elicitation – validation and management – software prototyping - Principles of Analysis - Analysis tools - Analysis Models. (8)

DESIGN CONCEPTS AND PRINCIPLES: Design process and concepts – Levels of Design - Coupling – Cohesion -Design Tools - Software Design Methods – Design Techniques - Design of Input and control - Design of Output. (8)

SOFTWARE TESTING : Quality Assurance versus Quality Control-The Cost of Quality-Software Quality Factors - Importance - Testing Types -Testing Techniques- Test Design-Test Scenarios-Test Cases Design-types-Test Scenario-Test cases for sample case studies - Smoke Testing-Sanity Testing-Regression Testing, Re-Testing, Ad-Hoc Testing-Gorilla Testing. Test Management-Test Policy-Test Strategy-Test Plan-Test Process-Levels of Testing-Testing Metrics-Review-Walk through – Inspection-Desk Checking - Testing Tools. (6)

OBJECT ORIENTED SYSTEMS DEVELOPMENT: Object Oriented Systems Development life Cycle - Object oriented methodologies -Rational Unified Process – Unified Modeling Language –Process workflows – Importance of Modeling – Types of Modeling. (15)

TUTORIAL PRACTICE:
Case Studies

Total L: 45+T:30=75

TEXT BOOKS:

1. Pressman R.S., "Software Engineering – A Practitioner's Approach", Tata McGraw Hill, 2017.
2. John Hunt, "The Unified Process for Practitioners", Springer, 2014.
3. William Perry, "Effective methods for software testing", John Wiley & Sons, 2017.
4. Boriz Beizer, "Software System Testing & Quality Assurance", Thomson Publishing group, 2016.
5. Glenford J. Myers, "Art of Software Testing", John-Wiley & Sons, 2017.

REFERENCES:

1. Shari Lawrence Pfleeger, "Software Engineering Theory and Practice", Pearson Education, 2017.
2. Philippe Krucheten, "The Rational Unified Process – An Introduction", Pearson Education, 2005.
3. Grady Booch , James Rumbaugh and Ivar Jacobson , "The Unified Modeling Language User Guide", Addison Wesley, 2011.
4. Martin Fowler and Kendall Scott, "UML Distilled", Addison Wesley, 2014.
5. Ian Sommerville, "Software Engineering", Pearson Addison Wesley, 2012.
6. Hans-Erik Eriksson, Magnus Penker, Brain Lyons, David Fado, "UML 2 Toolkit", John Wiley& Sons, 2011.
7. Craig Larman, "Agile and Interactive Development-A Managers Guide", Pearson Education, 2010.

18XDAE SOFTWARE PATTERNS

3 2 0 4

INTRODUCTION TO PATTERNS: Reusable object oriented software – Motivation - Best design practices of object oriented software - Benefits of patterns – Definition – Types - Pattern description - How design patterns solve design problems - Pattern Language - IDIOMS. (10)

DESIGN PATTERNS: Creational pattern: Abstract factory – Builder - Factory method – Prototype – Singleton, Structural patterns: Adapter – Bridge – Composite – Decorator – Façade – Flyweight - Proxy, Behavioral patterns: Command – Interpreter - Iterator, Mediator - Memento – Observer - State – Strategy - Template method – Visitor - Chain of Responsibility, Case Studies. (15)

ARCHITECTURAL PATTERNS: From Mud to Structure: Layers - Pipes and Filters - Blackboard, Interactive Systems: Model View Controller (MVC), Presentation Abstraction Control, Adaptable Systems – Reflection, Microkernel. Anti-Patterns. Case studies. (10)
REFACTORING: What is refactoring, Principles in refactoring, Bad smells in code, Refactoring Techniques - Composing methods, Moving features between objects, Organizing data, Simplifying conditional expressions, Making method calls simpler, Dealing with

generalization. Design Refactoring – Technical Debt, Design Smells, Abstraction Smells, Encapsulation Smells, Modularization Smells, Hierarchy Smells, Architectural Refactoring. Refactoring Tools. (10)

TUTORIAL PRACTICE:

1. ATM Simulation – Singleton pattern.
2. Image Viewer Application – Bridge pattern.
3. Address Book Maintenance – Prototype pattern.
4. US, Canada Tax and Freight charges – Factory Method pattern.
5. The Fast Food Franchise – Builder pattern.
6. Computer Models with different architectures – Abstract Factory pattern.
7. An Evaluation Application – Decorator pattern. **Total: L: 45+T: 30 = 75**

TEXT BOOKS:

1. Erich Gamma, Richard Helm, Ralph Johnsons and John Vlissides, "Design Patterns: Elements of Reusable Object-Oriented Software", Pearson Education, 2004.
2. Frank Buschman, RegineMeunier, Hans Rohnert, Peter Sommerland and Michael Stal, "Pattern-Oriented SoftwareArchitecture: A System of Patterns", John Wiley & Sons, 2011.
3. Martin Fowler, Kent Beck, William Opdyke and Don Roberts, "Refactoring: Improving the Design of Existing Code", Addison-Wesley Longman, 2012.

REFERENCES:

1. Girish Suryanarayana, Ganesh Samarthyam, and Tushar Sharma, "Refactoring for Software Design Smells: Managing Technical Debt", Morgan Kaufmann Publishers, 2014.
2. Len Bass, Paul Clements, and Rick Kazman, "Software Architecture in Practice", Addison Wesley, 2013.

18XDAF APPLIED GRAPH ALGORITHMS

3 2 0 4

BASIC CONCEPTS: Graphs – representations, Planar graphs- Euler's formula, crossing number, doubly connected edge list data structure, Algorithm complexity – time and space. (4)

GEOMETRIC GRAPHS: Planar straight line graph, Euclidean minimum spanning tree algorithm, Art gallery problem, visibility graphs, Computing point visibility for polygons with and without holes. (10)

VLSI PHYSICAL DESIGN: Manhattan distance, overlap graph, containment graph, interval graph, neighborhood graph, hypergraphs, Rectilinear minimum spanning tree, Rectilinear Steiner minimum tree, Kernighan-Lin partitioning algorithm, Partitioning based algorithms for floor planning and placement, Lee's algorithm for routing, Shadow propagation algorithm for compaction. (11)

VERTEX-PURSUIT GAME: Graph homomorphism, retracts, cops and robbers - cop number (k), bounds, cop-win graphs. Polynomial algorithm for fixed k, NP-hard with k not fixed. (10)

VORONOI DIAGRAMS: plane sweep algorithm, Voronoi Diagram – definition and properties, Fortune's algorithm. Delaunay triangulation. (10)

TUTORIAL PRACTICE:

1. Storing planar graphs using doubly connected edge list.
2. Borůvka's Euclidean minimum spanning tree algorithm.
3. Computing point visibility for polygons with and without holes.
4. Polynomial time approximation algorithms for vertex guarding.
5. Vertex guard algorithm using set cover.
6. Kernighan-Lin partitioning algorithm.
7. Partitioning based algorithms for floorplanning and placement.
8. Lee's algorithm for routing.
9. Shadow propagation algorithm for compaction.
10. Polynomial algorithm for fixed cop number.
11. Plane sweep algorithm.
12. Fortune's algorithm for Voronoi diagram.
13. Divide and conquer Delaunay triangulation.

Total: L: 45+T: 30 = 75

TEXT BOOKS:

1. Thomas H. Cormen, Charles E. Leiserson and Ronald L. Rivest, "Introduction to Algorithms", PHI Learning, 2013.
2. Ghosh S. K., "Visibility Algorithms in the Plane", Cambridge University Press, 2007.
3. Naveed A. Sherwani, Algorithms for VLSI Physical Design Automation, Springer, 2013.

REFERENCES:

1. Anthony Bonato, The Game of Cops and Robbers on Graphs, AMS, 2011.
2. Mark De Berg, Computational Geometry Algorithm and Applications, Springer, 2010.

18XDAG GAME THEORY

3 2 0 4

INTRODUCTION: Game theory the theory of rational choice – Interacting decision makers. (2)

NASHEQUILIBRIUM: Strategic games – Best response – Dominance – Examples from economics, business, environment, military - Symmetric games and symmetric equilibria. Illustrations: Cournot's model of oligopoly, Electoral competition. (7)

MIXED STRATEGIES: Dominance – Equilibrium – Illustrations: Expert diagnosis, Reporting a crime – Formation of players' beliefs. (4)

EXTENSIVE GAMES WITH PERFECT INFORMATION: Strategies and outcomes – Nash equilibrium – Subgame perfect equilibrium - Stackelberg's model of duopoly, Buying votes – Illustrations: Entry into a monopolized industry, Electoral competition with strategic voters, Committee decision making. (7)

GAMES WITH IMPERFECT INFORMATION: Bayesian games – Examples – Strategic information – Transmission – Agenda Control with imperfect Information – Signaling games - Education as a signal of ability. (6)

REPEATED GAMES: The prisoner's dilemma – Finitely repeated and infinitely repeated – Strategies – Nash equilibrium – Subgame – Perfect equilibria and the one – deviation – Property – General results – Finitely replaced games – Variation on a theme: Imperfect observability. (6)

INTRODUCTION TO ALGORITHMIC GAME THEORY: Auction and mechanism design basics - the Vickrey auction - Sponsored Search Auction - Social choice theory - VCG mechanism. Algorithmic Aspects of Equilibria: Existence and computational complexity equilibria - Market Equilibrium - Correlated Equilibrium. Quantifying the inefficiency of equilibria: Routing Games and Congestion Games - Network Formation - Price of Anarchy and Price of Stability - Bandwidth Sharing. (13)

TUTORIAL PRACTICE:

Implement the following using GAMBIT Software.

1. Display the Normal Form game.
2. Find all strongly dominant strategies.
3. Find all weakly dominant strategies.
4. Find all very weakly dominant strategies.
5. Find Strongly dominant strategy equilibrium, if one exists.
6. Find Weakly dominant strategy equilibrium, if one exists.
7. Find Very Weakly dominant strategy equilibrium, if one exists.
8. Find all pure strategy Nash Equilibria, if they exist.
9. Displaying and solving the Extensive Form games.

Total: L: 45+T: 30 = 75

TEXT BOOKS:

1. Martin J. Osborne, "An Introduction to game theory", Oxford University Press, 2004.
2. Nisan N., Roughgarden T., Tardos E., Vazirani V., "Algorithmic Game Theory", Cambridge University Press, Cambridge, 2007.

REFERENCES:

1. Thomas L.C, "Games, Theory and Applications", Dover Publications, 2011.
2. Ken Binmore, "Playing for Real: A Text on Game Theory", Oxford University Press, 2007.
3. David Easley, Jon Kleinberg, "Networks, Crowds, and Markets: Reasoning About a Highly Connected World", Cambridge University Press, 2010.
4. Matthew O. Jackson, "Social and Economic Networks", Princeton University Press, 2008.
5. YoavShoham, Kevin Leyton-Brown, "Multiagent Systems: Algorithmic, Game-Theoretic, and Logical Foundations", Cambridge University Press, 2008.

18XDAH SOCIAL NETWORK DATA ANALYTICS

3 2 0 4

INTRODUCTION: On line Social Networks – Terminologies - Research topics. (5)

STATISTICAL PROPERTIES OF SOCIAL NETWORKS: Static properties – Dynamic properties. (5)

RANDOM WALKS IN SOCIAL NETWORKS – Random walks on graphs – Algorithms – Applications. (5)

COMMUNITY DISCOVERY IN SOCIAL NETWORKS: Communities – Core methods – Applications. (8)

NODE CLASSIFICATION IN SOCIAL NETWORKS: Methods using local classifiers – Random walk based methods – Algorithms - Applications - Node classification to large scale social networks. (10)

MODELS AND ALGORITHMS: Social influence analysis – Expert location in social networks – link prediction. (12)

TUTORIAL PRACTICE:

Do the following on Twitter, Facebook or any social network data set.

1. Study of the different metrics of social network.
2. Visualization of social network .
3. Power law distribution of social data.
4. Node classification using iterative method.
5. Node classification using label probagation.
6. Usage of Graph laplacian.

Total: L: 45+T: 30 = 75

TEXT BOOK:

1. Charu C. Aggarwal, "Social Network Data Analytics", Springer Publications, 2011.

REFERENCES:

1. Marshall Sponder "Social Media Analytics Effective tools for building, interpreting, and using metrics", McGrawHill, 2011.
2. Stanley Wasserman, Katherine Faust, "Social network analysis: Methods and applications ", Cambridge University Press, 1995.
3. Stephen Borgatti, Martin Everett, Jeffrey Johnson, " Analysing Social Networks", SAGE Publications Ltd., 2013.

18XDAI SURVIVAL ANALYTICS

3 2 0 4

INTRODUCTION: General features of survival data structure, Censoring, Time scale and the origin of time, Basic lifetime functions, Criteria for performing survival analysis (10)

DESCRIPTIVE APPROACHES: KapMeier estimates, Life table models, Group comparison of survival functions (5)

COX PROPORTIONAL HAZARD REGRESSION: The Cox semi-parametric hazard model, Estimation of Cox hazard model with tied survival times; The hazard rate model with time-dependent covariates, Stratified proportional hazard rate model (5)

COUNTING PROCESS AND DIAGNOSTICS OF COX MODEL: The martingale theory- Martingale central limit theorems, Cox-Snell residuals, Schoenfeld residuals, Score residuals, Deviance residuals, Residual analysis on the Cox model (10)

CLASSIFICATION: Classification and regression trees (CART), Chi-Squared automatic interaction detector (CHAID). (10)

CASE STUDIES (5)

TUTORIAL PRACTICE:

Implement the following problems using R/ Perl Programming

1. Classification Algorithms and Cox Model.
2. Extract information from customer support data.
3. KapMeier estimates, Life table models
4. Residual analysis on the Cox model

Total L: 45+T:30=75

TEXT BOOKS:

1. Jolliffe I. T., "Principal Components Analysis (Springer Series in Statistics)", Springer publications, 2013.
2. Xian Liu, "Survival Analysis: Models and Applications", John Wiley& Sons, 2013.

REFERENCES:

1. David G Kleinbaum, Mitchel Klein, Survival Analysis, Springer, 2012.
2. Johannes Ledolter, "Data Mining and Business Analytics with R", John Wiley & Sons, 2013.

18XDAJ DEEP LEARNING

3 2 0 4

INTRODUCTION — Neural networks **-** Deep Networks - Deep Feed forward Networks – Learning XOR, Gradient Based Learning – Hidden units , Design – Backpropagation - Regularization of deep learning, (5)

OPTIMIZATION FOR TRAINING DEEP MODELS – Challenges in neural network optimization - Basic algorithms – Parameter initialization strategies – Algorithms with adaptive learning rates – Meta algorithms (10)

CONVOLUTIONAL NETWORKS – Convolution operation - Motivation – Pooling – Variants of convolution function (8)

RECURRENT NETWORKS – Unfolding computational graphs – Recurrent neural networks(RNN) – Bidirectional RNNs - Deep recurrent network – Methodology – Applications, Long Short Term Memory (LSTM) (10)

DEEP LEARNING RESEARCH : Linear Factor Models, Auto encoders, Representational Learning, Structured probabilistic models for deep learning, Monte Carlo Methods**,** Deep generative models (8)

APPLICATIONS : Natural language processing, Big Data, Brain Computer Interface, Visual Data, IoT (4)

TUTORIAL PRACTICE:

1. Collect data sets from the url : http://deeplearning.net/datasets/
2. Use Tensor Flow library for visualization of data sets in different domains and analysis:
    a. Music
    b. Image processing using CNN
    c. Text analysis (Next word prediction,etc) using RNN
    d. Text classification using RNN
    e. Sentiment Classification using RNN
    f. Speech processing

Total L:45+T:30 =75

TEXT BOOKS:

1. Ian Goodfellow, YoshuaBengio, Aaron Courville , "Deep Learning", The MIT Press, 2016.
2. Yoshua Bengio, "Learning Deep Architectures for AI", Foundations & Trends in Machine Learning, 2009.

REFERENCES:

1. Adam Gibson, Josh Patterson "Deep Learning: A Practitioner's Approach ", OReilly, 2016.
2. Nicholas Locascio and Nikhil Buduma "Fundamentals of Deep Learning: Designing Next-Generation Machine Intelligence Algorithms", OReilly, 2017

18XDAK HEALTH CARE ANALYTICS

3 2 0 4

INTRODUCTION: Healthcare Data Sources and Basic Analytics – Applications and Practical Systems for Healthcare. (12)

HEALTHCARE DATA SOURCES AND BASIC ANALYTICS – Electronic Health Records - Components, Benefits, Challenges, Biomedical Image Analysis- Biomedical imaging modalities, Object Detection – Image Segmentation – Feature Extraction (12)

MINING OF SENSOR DATA – Biomedical Signal Analysis – Genome Data Analysis for Personalized Medicine (10)

NLP FOR CLINICAL TEXT – Social Media Analytics for Healthcare (Disease outbreak) - Temporal Data Mining (Disease Progression Modelling) (11)

TUTORIAL PRACTICE:

APPLICATIONS / CASE STUDIES - Data Analytics for Pervasive Health, Data Analytics for Pharmaceutical Discoveries, Clinical Decision Support Systems, Medical Imaging Case Studies (30)

Total L: 45+T:30 = 75

TEXT BOOK:

1. Chandan K. Reddy, Charu C. Aggarwal Healthcare Data Analytics Chapman and Hall/CRC, 2015

REFERENCES:

1. Hui Yang, Eva K. Lee, Healthcare Analytics: From Data to Knowledge to Healthcare Improvement, John Wiley & Sons, 2016.
2. Trevor L. Strome, Healthcare Analytics for Quality and Performance Improvement, 2013

18XDAL CYBER SECURITY ANALYTICS

3 2 0 4

INTRODUCTION - Cybersecurity -Data Mining- Machine Learning - Review on Cybersecurity Solutions - Proactive Security Solutions - Reactive Security Solutions - Successful ML applications in Cyber security (3)

SUPERVISED LEARNING FOR MISUSE/SIGNATURE DETECTION -Misuse/Signature Detection -Machine Learning in Misuse/Signature Detection -Machine-Learning Applications in Misuse Detection – Malware Analysis - Static – Dynamic – Smartphone security (9)

MACHINE LEARNING FOR ANOMALY DETECTION –Introduction -Anomaly Detection -Machine learning in Anomaly Detection Systems -Machine-Learning Applications in Anomaly Detection Supervised Anomaly detection - Spam detection - Unsupervised Anomaly Detection (8)

MACHINE LEARNING FOR PROFILING NETWORK TRAFFIC – Introduction - Network Traffic Profiling and Related Network Traffic Knowledge -Machine Learning and Network Traffic Profiling -Data-Mining and Machine-Learning Applications in Network Profiling - Network IDS – DDOS -Emerging Challenges in Intrusion Detection – Log Analysis (9)

BOTNETS AND INSIDER THREATS - Botnet topologies, botnet detection using NetFlow analysis - Botnet detection using DNS analysis, introduction to insider threats, Insider threat profiles -masquerader detection strategies - Using honey tokens for insider threat (8)

WEB SECURITY, EMAIL, SOCIAL NETWORK SECURITY: Web threat detection via web server log analysis - Alert aggregation for web security - Spam detection, Phishing detection -: Detecting compromised accounts, detecting social network spam . (8)

TUTORIAL PRACTICE:

CASE STUDIES

Total L: 45+T:30 = 75

TEXT BOOK:

1. Dua, Sumeet, and Xian Du. “Data Mining and Machine Learning in Cyber Security”, CRC press, 2016.

REFERENCES:

1. Jacobs Jay and Bob Rudis, “Data Driven Security Analysis, Visualization, and Dashboards”, John Wiley & Sons, 2014.
2. Stolfo, Salvatore J., Bellovin S M, Hershkop S., Keromytis, A.D., Sinclair S, Smith.S, “ Insider Attack and Cyber Security: Beyond The Hacker”, Springer, 2008.
3. Bhattacharyya, Dhruba Kumar, and Jugal Kumar Kalita. “Network Anomaly Detection: A Machine Learning Perspective”, CRC Press, 2013.

18XDAM INTERNET OF THINGS

3 2 0 4

INTRODUCTION TO IoT: Introduction to Internet of Things (IoT) – Machine to Machine (M2M) –- Features and Definition of IoT– Recent Trends in the Adoption of IoT – Societal Benefits. (2)

IoT ARCHITECTURE: Functional Requirements - IoT Enabling Technologies – IPv6 - Basic Architecture – Components of IoT: Embedded Computation Units, Microcontrollers, System on Chip (SoCs) - Sensors – Actuators – Communication Interfaces. (7)

RF COMMUNICATION TECHNOLOGIES IN IoT: Wireless Sensor Networks (WSN): Overview, Fault Tolerance - RFID – NFC - Low Power Personal Area networks (LowPAN): Overview, 6LowPAN,IEEE 802.15.4, BLE, Zigbee, Zwave, and Thread - Wi-Fi -Low Power Wide Area Networks (LPWAN): Concepts and features, SigFox, LoraWAN, LPWAN-3GPP,Comparing different LPWAN technologies. (7)

APPLICATIONLAYER PROTOCOLS IN IoT: Rest Architecture - HTTP – CoAP:Architecture, Features, Applications-MQTT: Architecture, Feature, Applications -Comparing different IoT Application Layer Protocols. (7)

MODERN NETWORKING: Cloud Computing: Introduction to the Cloud Computing, Cloud service options, Cloud Deployment models, Load balancing, Hypervisors, Comparison of Cloud providers - Introduction to SDN: Data Plane, Control Plane, Application Plane - OpenFlow Protocol – Relevance of SDN to IoT (8)

SECURITY IN IoT: IEEE 802.11 Wireless Networks Attacks: Basic Types, WEP Key Recovery Attacks, Keystream Recovery Attacks against WEP – RFID Security – Security Issues in ZigBEE: Eavesdropping Attacks, Encryption Attacks – Bluetooth Security: Threats to Bluetooth Devices and Networks – Blockchain in IoT security. (10)

PROTOTYPING: Prototyping embedded devices- Open Source versus Closed Source-Embedded Computing Basics-Arduino-Raspberry Pi- Implementation. (2)

APPLICATIONS INIoT: Smart homes – Energy – Health Care – Smart Transportation – Smart Living – Smart Cities- Smart Grid – Smart Agriculture. (2)

TUTORIAL PRACTICE:

1. Simulating Wireless Sensor Networks
2. Connected Vehicle applications
3. Traffic Signal Monitoring & Control System
4. Smart home automation
5. IOT Based Person/Wheelchair Fall Detection
6. Gas Pipe Leakage Detector using Robot
7. Smart Energy Meter Monitoring
8. IOT Based Fire Department Alerting System

Total L:45+P:30=75

TEXT BOOKS :

1. Dieter Uckelmann, Mark Harrison, Florian Michahelles, “Architecting the Internet of Things”, Springer, 2011
2. Adrian McEwen and Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons, 2014.
3. Olivier Hersent, David Boswarthick and Omar Elloumi, “The Internet of Things: Key Applications and Protocols”, John Wiley & Sons, 2012.

REFERENCES :

1. Michael Miller, "The Internet of Things" , Pearson Education, 2015.
2. Massimo Banzi, "Getting Started with Arduino", Shroff Publishers & Distributors, 2014
3 . Simon Monk, "Programming Arduino: getting started with sketches" McGraw Hill, 2012
4. Vedat Coskun, Kerem Ok, Busra Ozdenizci, "Near Field Communication from theory to practice", John Wiley &Sons, 2011

5. A Richard Wentk, "Teach yourself visually Raspberry Pi", John Wiley & Sons, 2014

OPEN ELECTIVES

18XDO1 COMPUTATIONAL FINANCE

3 2 0 4

INTRODUCTION : Law of one price – Risk neutral pricing – Arbitrage and Hedging – Financial Products and capital markets – Futures, Forwards and options – Options pricing problem and three types of solutions. (3)

MATHEMATICAL PRELIMINARIES : Conditional expectation – Sigma Algebra – Filtrations, Time series analysis - Covariance stationary – autocorrelations - MA(1) and AR(1) models, Stochastic Calculus - Random walk – Brownian motion – Martingales – Ito's Lemma. (12)

PORTFOLIO THEORY - Introduction - Portfolio theory with matrix algebra - Review of constrained optimization methods, Markowitz algorithm, Markowitz Algorithm using the solver and matrix algebra – Portfolio choice and linear pricing – Statistical analysis of efficient portfolios. (10)

BASIC OPTIONS THEORY – Definitions – Pay off diagrams – Single period binomial options theory – Multi period binomial options theory – Real options – American options, Simulation methods for options pricing – Random variable generation – simulation of stochastic processes. (10)

THE CAPITAL ASSET PRICING (CAP) AND RISK BUDGETING - Mean variance portfolio theory – Asset returns – Variance as a risk measure - The one and two fund theorems, The capital market line – CAP as a pricing formula – Systematic and unsystematic risk – Euler's theorem – Asset contributions to volatility – beta as a measure of portfolio risk , Limitations of mathematical models in finance. (10)

TUTORIAL PRACTICE:

1. Problems using Capital Asset Pricing model.
2. Problems using Auto correlation.
3. Plot time series data and find outliers
4. Problems using Autoregressive models
5. Problems using Moving average models
6. Monte Carlo Simulation of options pricing

Total L: 45+T:30 = 75

TEXT BOOKS:

1. David Ruppert, "Statistics and Data Analysis for Financial Engineering", Springer-Verlag, 2011.
2. Edwin J. Elton, Martin J. Gruber, Stephen J. Brown and William N. Goetzmann "Modern Portfolio Theory and Investment Analysis", John Wiley & Sons, 2014.

REFERENCES:

1. Simon Benninga, "Financial Modeling", MIT Press, 2014.
2. Steven E Shreve, "Stochastic Calculus for Finance – I" , Springer, 2012.

18XDO2 COMPUTATIONAL GEOMETRY

3 2 0 4

MATHEMATICAL & GEOMETRICAL REVIEW: Algorithm analysis – sorting, binary search, balanced binary search, divide and conquer, plane sweep, Kd-trees, Dijkstra's algorithm, points, lines and planes, basic geometric objects – polygons, polytopes, convexity, graphs - vertex coloring, planar, Euler's formula. (2)

CONVEX HULLS: Definition, lower bounds, algorithms - Graham's scan, divide and conquer, Jarvis march, 3D hulls. (5)

LINE SEGMENT INTERSECTION: Plane sweep algorithm, Doubly-connected edge list, computing overlay of two subdivisions, Map overlay algorithm, half-plane intersection, arrangements of lines. (8)

POLYGON TRIANGULATION: Art gallery problem – introduction, triangulation, bounds, partition into monotone pieces, triangulating monotone polygon, placement of guards. (8)

ORTHOGONAL RANGE SEARCHING: 1-D and 2-D range searching, range trees. (4)

VORONOI DIAGRAMS: Properties, beach line, computing Voronoi diagram, Delaunay triangulations, computing Delaunay triangulations. (8)

ROBOT MOTION PLANNING: Work space and configuration space, point robot, free space, Minkowski sums for convex and nonconvex polygons, translational motion planning, motion planning with rotations, Point location and trapezoidal maps. Visibility graphs - Shortest paths for a point robot, computing visibility graph, shortest paths for a translating polygonal robot. (10)

Total: L:45+T:30 = 75

TUTORIAL PRACTICE:

Implementation of various algorithms for the following problems.

1. Convex hull problems.
2. Line and half plane intersections.
3. Map overlay problems using Doubly-connected edge list.
4. Triangulation and Art gallery problem.
5. Orthogonal range searching (1D and 2D) using Kd-trees.
6. Construct Voronoi diagrams.
7. Translational algorithms for robot motion planning.

TEXT BOOKS:

1. M. De Berg, M. van Kreveld, M. Overmars and O.Schwarzkopf, "Computational Geometry - Algorithms and Applications", Springer Verlag, 2008.
2. Joseph O'Rourke, "Computational Geometry in C", Cambridge University Press, 2004.

REFERENCES:

1. Franco P. Preparata and Michael Ian Shamos, "Computational Geometry - An Introduction", Springer-Verlag, 2011 .
2. Goodman J E and O'Rourke, "Handbook of Discrete and Computational Geometry", CRC Press, 2004.
3. Subir Kumar Ghosh, "Visibility Algorithms in the Plane", Cambridge University Press, 2007.

18XDO3 RANDOMIZED ALGORITHMS

3 2 0 4

INTRODUCTION: Randomized algorithms, generation of random numbers, randomized quick sort, Karger's min-cut algorithm Las Vegas and Monte Carlo algorithms, computational models and complexity classes. (5)

PROBABILISTIC INEQUALITIES: Union bound, Markov and Chebyshev inequalities-Applications- Occupancy problem**,** randomized selection- coupon collector's problem, the Chernoff bound- routing in a parallel computer- a wiring problem. (6)

PROBABILISTIC METHOD: Overview of the method-maximum satisfiability – finding a large cut , Independent Sets (4)

MARKOV CHAINS AND RANDOM WALKS: Markov chains, Random walk on graphs – connectivity in undirected graphs – Expanders and rapidly mixing random walks, Probability amplification fo random walks on expanders (7)

DATA STRUCTURES AND GRAPH ALGORITHMS: Random Treaps, hashing – hash tables – perfect hashing, skip lists **–** Fast min-cut. (6)

ONLINE ALGORITHMS: Paging problem-adversary models- paging against an oblivious adversary-relating the adversaries-the adaptive online adversary, k-server problem. (4)

PARALLEL AND DISTRIBUTED ALGORITHMS: Sorting on a PRAM – Maximal Independent sets-parallel matching (5)

NUMBER THEORETIC ALGORITHMS:, Polynomial roots and factoring, primality testing. (4)

DERANDOMIZATION: The method of Conditional Probabilities – Derandomizing max-cut algorithm – Constructing pair wise independent values modulo a prime – Pair wise independent – large cut. (4)

TUTORIAL PRACTICE:

1. Find solution for s-t min-cut problem adapting min cut algorithm.
2. Problems using treap data structure.
3. Problems using randomized hash table.
4. Comparison of performance ana;ysis of Karger's min cut with fast min-cut algorithms.
5. Randomized primality testing.
6. Problem using K-server on-line algorithms.
7. Real time application of parallel algortithms for maximum independent set.

Total L:45+TP:30 = 75

TEXT BOOKS:

1. Motwani R and Raghavan P, "Randomized Algorithms", Cambridge University Press, 2010.
2 Michael Mitzenmacher and Eli Upfal, "Probability & Computing: Randomized Algorithms and Probabilistic Analysis", Cambridge University Press, 2009.

REFERENCES:

1. Thomas H Cormen, Charles E Leiserson and Ronald L Rivest, "Introduction to Algorithms", MIT Press, 2009.
2 James Aspens, "Notes on Randomized algorithms", Yale University, 2013,

18XDO4 PRINCIPLES OF MANAGEMENT AND BEHAVIOURAL SCIENCES

3 2 0 4

PRINCIPLES OF MANAGEMENT: Meaning, Definition and Significance of Management, Basic Functions of Management – Planning, Organizing, Staffing, Directing and Controlling. Organizational Environment – Social, Economic, Technological and Political. Corporate Social Responsibility - Case discussion.

(5)

INDUSTRIAL AND BUSINESS ORGANIZATION: Growth of Industries (Small Scale, Medium Scale and Large Scale Industries). Forms of Business Organizations. Resource Management – Internal and External Sources

(8)

ORGANIZATIONAL BEHAVIOUR: Significance of OB, Impact of culture on organization. Role of leadership and leadership styles. Personality and Motivational Theories. Attitudes, Values and Perceptions at work - Case discussion

(8)

GROUP BEHAVIOUR: Group dynamics, Group formation and development, group structure and group cohesiveness. Informal organization – Sociometry – Interaction analysis – Exercises

(8)

GLOBALISATION: Issues for global competitiveness, proactive and reactive forces of globalization. Cross cultural management – Management of work force diversity.

(8)

HUMAN RESOURCE MANAGEMENT: Objectives and Functions, Selection and Placement, Training and Development – Conflict management – Stress management - Human resource management in global environment - Human resource information system(HRIS) - Case discussion.

(8)

TUTORIAL PRACTICE:

1. Case study on human resource information system.
2. Case study on organizational behavior.
3. Case study on human resource information system.
4. Case study on organizational behavior.

Total L:45+T:30=75

TEXT BOOKS:

1. Harold Koontz, Heinz Weihrich and Ramachandra Aryasri, “Principles of Management”, Tata McGraw Hill, 2014.
2. Mamoria C B, “Personnel Management”, Sultan Chand & Sons, 2005.

REFERENCES:

1. John W Newstrom and Keith Davis, “Organizational Behavior”, Tata McGraw Hill, 2010.
2. Stephen P Robbins, ”Organisational behavior”, Prentice Hall, 2010.
3. Khanna O P, “Industrial Engineering & Management”, Dhanpat Rai Publications, 2010.

18XDO5 ENTREPRENEURSHIP

3 2 0 4

INTRODUCTION TO ENTREPRENEURSHIP: Definition – Characteristics and Functions of an Entrepreneur – Common myths about entrepreneurs – Importance or Entrepreneurship. Seminar in R5 & R6.

(5)

CREATIVITY AND INNOVATION: The role of creativity – The innovation Process – Sources of New Ideas – Methods of Generating Ideas – Creative Problem Solving – Entrepreneurial Process.

(6)

DEVELOPING AN EFFECTIVE BUSINESS MODEL: The Importance of a Business Model – Starting a small scale industry - Components of an Effective Business Model. (5)

APPRAISAL OF PROJECTS: Importance of Evaluating Various options and future investments- Entrepreneurship incentives and subsidies – Appraisal Techniques. (8)

FORMS OF BUSINESS ORGANIZATION: Sole Proprietorship – Partnership – Limited liability partnership - Joint Stock Companies and Cooperatives. (4)

FINANCING THE NEW VENTURE: Determining Financial Needs – Sources of Financing – Equity and Debt Funding – Case studies in Evaluating Financial Performance. **(**8)

THE MARKETING FUNCTION: Industry Analysis – Competitor Analysis – Marketing Research for the New Venture – Defining the Purpose or Objectives – Gathering Data from Secondary Sources – Gathering Information from Primary Sources – Analyzing and Interpreting the Results – The Marketing Process**.** (5)

INTELLECTUAL PROPERTY PROTECTION AND ETH ICS: Patents – Copyright - Trademark- Geographical indications – Ethical and social responsibility and challenges. (4)

TUTORIAL PRACTICE:

Case studies

Total L:45+T:30=75

TEXT BOOKS:

1. Donald F.Kuratko and Richard M.Hodgetts, “Entrepreneurship”, South-Western, 2003.
2. Vasant Desai, “The Dynamics of Entrepreneurial Development and Management”, Himalaya Publishing House, 2010.

REFERENCES:

1. S.L.Gupta, Arun Mittal, “Entrepreneurship Development”, International Book House, 2012.
2. G. S. Sudha, “Management and Entrepreneurship Development”, Indus Valley Publication, 2009.
3. V. Badi, N. V. Badi , “Business Ethics”, Vrinda Publication (P) Ltd.,, 2012.

4. Prasanna Chandra “Projects- Planning, Analysis, Financing, Implementation and review”, TATA McGraw Hill, 2012.

18XDO6 INFORMATION THEORY AND ERROR CONTROL CODING

3 2 0 4

MEMORYLESS FINITE SCHEMES : Self information measure – Entropy function – Conditional entropies – Characterisitics of entropy function – Derivation of the noise characteristics of a channel – Mutual information – Redundancy – Efficiency and channel capacity – Capacities of channels with symmetric noise structure. (10)

CONTINUOUS CHANNELS: Definitions of different entropies – Mutual information – Maximization of the entropy of a continuous random variable – Entropy maximization problems – channel capacity under the influence of additive white Gaussian noise – parallel Gaussian channel. (7)

ELEMENTS OF ENCODING : Source coding techniques – Necessary and sufficient conditions for noise less coding – Fundamental theorem of discrete noise-less coding – Fundamental theorem of discrete coding in presence of noise. (8)

ERROR CONTROL CODING – Need for error control coding – Linear block codes – Optimum soft decision decoding of linear block codes – Hard decision decoding – Polynomial representation of codes – Cyclic codes – Convolutional codes – viterbi decoding algorithm – Other decoding methods of convolutional codes – Galois fields – BCH Codes – Reed Solomon codes – Berlecamp Algorithm – Interleaving and concatenated codes – Turbo codes – Low density parity check codes. (10)

ITERATIVE DECODING – Serial concatenation using inner block codes – serial concatenation using inner convolutional codes – product codes – generalized array codes – applications of multi stage coding – The BCJR algorithm – use of extrinsic information – recursive systematic convolutional codes – MAP decoding of RSC codes – Interleaving and Trellis termination – The soft output Viterbi algorithm – Galleger codes – Serial concatenation with iterative decoding – Performance and complexity issues – application to mobile communication. (10)

TUTORIAL PRACTICE:
Case studies

Total L:45+T:30=75

TEXT BOOKS:
1. Reza F M, “ An introduction to Information theory”, McGraw Hill, 2012.
2. Joy A Thomas and Cover M, “ Elements of Information theory”, John Wiley & Sons, 2006.
3. Peter Sweeney, “Error Control coding from theory to practice”, John Wiley & Sons, 2002.

REFERENCES:
1. Salvatore Gravano, “ Introduction to Error Control codes”, Oxford University Press, 2001.
2. Viterbi A and Omura J K, “ Principles of Digital Communication and Coding”, McGraw Hill, 2009.

18XDO7 ACCOUNTING AND FINANCIAL MANAGEMENT

3 2 0 4

COST ACCOUNTING: Cost classification - significance of overhead Cost - Preparation of Cost sheet - Concept of cost volume profit analysis - Concept of variance - Principles of Job Costing, batch costing and Process costing - Operating Costing - Modern techniques/concepts of Cost Control/ Cost Management. (10)

FINANCIAL ACCOUNTING: Double Entry Book keeping concepts - Journalisation of Business Transactions - Subsidiary Books - Preparation of Profit and Loss Account and Balance sheet from Trial balance - Simple problems - Methods of depreciation. (10)

FINANCIAL RATIO ANALYSIS: Uses and Nature - preparation of Liquidity Ratios - coverage Ratios and profitability Ratios from profit & Loss Account and Balance sheet - common size Income statement and common size Balance sheet. (10)

GOALS AND FUNCTIONS OF FINANCIAL MANAGEMENT: Finance function - Importance of Corporation finance - objectives of Financial Management - organization of the finance function - concept of time value of money. (5)

PRINCIPLES OF CAPTIAL BUDGETING: Kinds of capital Budgeting Decisions - Evaluation of proposals from the given cash inflows - Net present value versus Internal rate of return method problems. (5)

WORKING CAPITAL MANAGEMENT: Definition and importance of working capital - factors affecting working capital - Inventory management - simple problems - Receivables Management - cash Budget Preparation - Estimate of overall working capital requirements - Various sources of financing . (5)

TUTORIAL PRACTICE:
Case studies

Total L:45+T:30=75

TEXT BOOKS :
1. Khan M Y, Jain P K, "Cost Accounting and Financial Management", Tata McGraw Hill, 2008.
2. Gupta R L, Radhaswamy M, "Advanced Accountancy", Sultan Chand & Sons, 2009.

REFERENCES :

1. Sharma R K and Shashi K Gupta, "Management Accounting - Principles and Practice", Kalyani Publishers, 2011.
2. Kuchal S C, "Financial Management", Chaitanya Publishing House, 2006.

18XDO8 WIRELESS NETWORKS

3 2 0 4

WIRELESS FUNDAMENTALS: Introduction to cellular networks,-wireless local area networks- Spectrum allocations – Radio propagation models-Narrowband digital modulation and wireless fading environments. – Modern Communications Systems – MAC – SDMA – TDMA – FDMA - CDMA - Cellular and Ad-hoc-Concepts. (7)

WLAN TECHNOLOGIES: wireless network architectures – 802.11 PHYs – 802.11 MAC – WPA and 802.11i: Security – 802.11e: MAC Enhancements for Quality of Service – Related Wireless Standards (Hyperlan, HomeRF, Bluetooth, Zigbee, Wireless USB)- WiFi and Wi MAX Standards. (8)

AD HOC AND SENSOR NETWORKS: Ad hoc Network- Characteristics- Table-driven and Source-initiated On Demand routing protocols, Hybrid protocols - Routing in intermittently connected mobile networks. Wireless Sensor networks- Classification, MAC and Routing Protocols. (8)

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-Selective Retransmission – Transaction Oriented TCP- TCP over 2.5 / 3G wireless Networks. (8)

WIRELESS PANs MANs – Physical and MAC layer details, Wireless PANs – Architecture of Bluetooth Systems, Physical and MAC layer details, Standards- WLAN deployment issues- Interference – Resource Allocation (6)

FUTURE TRENDS: Emerging WLAN Related Technologies – 802.11 Trends – Cellular – 802.16 – 802.20 – 802.22 – UWB, Cognitive Radios, RFID – 4G and Data Communications Convergence. (8)

TUTORIAL PRACTICE:

1. Study of NS-2 simulator.
2. Simulation of a IEEE 802.11 LAN under various conditions using NS-2 simulator.
3. Simulation of a priority MAC protocol using NS-2 simulator.
4. Simulation of different routing protocols using simulators.
5. Simulation of TCP over error-prone wireless network using NS-2 simulator.
6. Development of Mobile application using blue tooth.

Total: L:45+T:30 = 75

TEXT BOOKS:

1. Gary. S. Rogers and John Edwards, “An Introduction to Wireless Technology”, Pearson Education, 2012.
2. SivaRam Murthy C and B.S Manoj, “Ad hoc Wireless Networks Architecture and Protocols”, Pearson Education, 2005.
3. KavehPahlavan, Prashant K. Krishnamurthy, “Principles of wireless networks : A unified approach”, John Wiley & Sons, 2011.

REFERENCES:

1. William Stallings, “Wireless Communication and Networks”, Pearson Education, 2009.
2. Dharma Prakash Agrawal and Qing-An Zeng, “Introduction to Wireless and Mobile Systems”, Thomson Press, 2007.
3. Feng Zhao and Leonidas Guibas, “Wireless Sensor Networks-An Information Processing Approach”, Elsevier, 2004.
4. Clint Smith, P.E. and Daniel Collins, “3G Wireless Networks”, Tata McGraw Hill, 2007.
5. Ivan stojmenovic, “Handbook of wireless networks and mobile computing”, John Wiley& Sons, 2006.

18XDO9 ENVIRONMENTAL SCIENCE AND GREEN COMPUTING

3 2 0 4

NATURAL RESOURCES, ECOSYSTEMS AND BIODIVERSITY: Environment, Definition, Scope and importance, Forest resources, Use and overexploitation, Water resources: Use and over utilization. Eco system ; Structure and functions of an eco system, energy flow in the eco system. Bio Diversity; values of biodiversity, biodiversity at global, national and local levels – threats to bio diversity. Conservation of bio diversity – In-situ & Ex-situ conservation. (9)

ENERGY SOURCES: Growing energy needs, Renewable and non renewable energy sources, Hydro power, Solar Power: Photovoltaic Energy – Motivation for going Solar – Solar Electricity – PV cells. Wind Power: – Using the Wind: Generating Power at Remote Sites,– Measuring the Wind – Estimating the output. Use of alternate energy sources. (9)

SOCIAL ISSUES AND THE ENVIRONMENT: From unsustainable to sustainable development, Urban problems related to energy, Water conservation, Rain water harvesting, Watershed management, Environment and human health, Role of information technology in environment and human health. Environment Protection Act: Air (Prevention and Control of Pollution) Act – Water Act, Forest Conservation Act, Wildlife Protection Act, Introduction to EIA and ISO 14000. (9)

ENVIRONMENTAL POLLUTION AND DISASTER MANAGEMENT: Definition – causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution and nuclear hazards. Disaster management - floods,

earthquake, cyclone and landslides. Solid waste management - causes, effects and control measures of municipal solid wastes (Biomedical wastes, hazardous wastes). Role of an individual in prevention of pollution. (9)

GLOBAL ATMOSPHERIC CHANGE & GREEN FUNDAMENTALS: The Atmosphere of Earth – Global Temperature – Global Energy Balance, The Greenhouse Effect - Environmental Issues and Green Computing, Electronic waste management: Introduction;- Environment and society, producer responsibility legislation – the Waste Electrical and Electronic Equipment (WEEE) directive, Materials Composition of WEEE: Mobile Phones – Television – Washing Machines, - Current and new electronic waste recycling technology- Future perspectives of electronic scrap. (9)

TUTORIAL PRACTICE:
Case Studies

TEXT BOOKS:

1. Mackenzie L. Davis, and David A. Cornwell, “Introduction to Environmental Engineering”, Tata McGraw Hill, 2010
2. Chetan Singh Solanki, “Solar Photovoltaics”, PHI Learning Private Ltd., 2011.
3. Siraj Ahmed, “Wind Energy: Theory and Practice”, PHI Learning Private Ltd., 2011.

REFERENCES

1. William W. Nazarodd and Lisa Alvarez-Cohen, “Environmental Engineering Science”, Wiley-India, 2010
2. Anubha Kaushik and Kaushik C P, “Environmental Science and Engineering”, New Age International Pvt Ltd, 2005.
3. Martha Maeda, “How to Solar Power your Home”, Atlantic Publishing Group, 2011.
4. Paul Gipe, “Wind Power – Renewable Energy for Home, Farm and Business”, Sterling Hill Publications, 2008.
5. Klaus Hieronymi, Ramzy Kahhat, Eric Williams, “E-Waste Management : From Waste to resource”, Routledge – Taylor and Fransis, 2012.