Second Semester							
	Theory				Practical		
Course Name	**Hours/ Week L/T**	**Credit Theory**	**University Marks**	**Internal Evaluation**	**Hours/ Week L/T**	**Credit Practical**	**Marks**
Specialization Core-1 Computer Graphics	4-0	4	100	50	-	-	-
Specialization Core-2 Software Engineering	4-0	4	100	50	-	-	-
Elective (Specialization related) 1. Distributed Database System. 2. J2EE. 3. Information Extraction and Retrieval. 4. Fast Machine Learning.	4-0	4	100	50	-	-	-
Elective (Departmental related) 1.Data Ware Housing & Data Mining 2. Embedded System. 3. Cryptography. 4. Graph Theory.	4-0	4	100	50	-	-	-
Elective (from any department) 1. Mobile Computing. 2. Wireless Sensor Network. 3. Computational Finance. 4. Bio Informatics. 5. Digital Image Processing	4-0	4	100	50	-	-	-
Lab-2 (Specialization lab to be decided by the department)					4	4	150
Seminar/Project					4	4	150
Total							
Total Marks: 1050							
Total Credits: 28							

Computer Graphics

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Introduction: Display of entities, geometric computation and representation, graphics environments; Working principles of display devices: Refreshing Raster scan devices, vector devices, cathode ray tube terminals, plotters; Display of colors: Look-up tables, display of gray shades, half toning; Display and drawing of graphics primitives: Point, line, polygon, circle, curves, and texts;

MODULE-II

Coordinate conventions: World coordinates, device coordinates, normalized device coordinates, view-port and window, zooming and panning by changing coordinate reference frames; Computations on polygons: Point inclusion problems, polygon filling, polygon intersections, clipping, polygonization of a point set, convex hull computation, triangularization of polygons;

MODULE-III

Transformations in 2D and 3D: Translation, Rotation, Scaling, Reflection; Projection: Perspective and parallel projections, isometric projection, Transformation matrices; Volume and surface representation: Polygonal meshes, parametric curves and surfaces, Cubic and Bi-cubic Splines, Voxels, Octree and Medial axis representation, Sweep representation, surfaces and volumes by rotation of curves and surfaces, Fractal modeling;

MODULE-IV

Hidden surface and Line Elimination: Elimination of back surfaces, Painters' algorithms, Binary space partitioning tree; Rendering and visualization: Shading model, constant, Goraud and Phong shading, Ray tracing algorithm, Radiosity computation; Computer animation: Fundamental concepts.

Books:

1. Foley, "Computer Graphics: Principles and practice", 2nd Edition.
2. Mel Slater, "Computer Graphics and Virtual Environments 1/e", Pearson Education.
3. D.F.Rogers, "Procedural elements for Computer Graphics", Mc. Graw Hill, 1985.
4. K. A. Plastock and Borden Kelly: Schaum's Outline of Computer Graphics, 1986.
5. Newman and Sproull : Principles of interactive Computer Graphics, Mc. Graw Hill, International Students Edition, Kogakusha, 1981.
6. S. Harrington : Computer Graphics A Programming Approach, Mc. Graw Hill, 1986.

Software Engineering & Development Methodologies

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Evaluation of Software Design Technique: Adhoc Base, Control Base, Data Structure, Data Flow, Objective Oriented. Process Model: SDLC, Component Base Software Developer Model, Unified Model, Fountain Model, 4P Approach: People, Process, Project, Product. Software Metrics: Process Metrics: LOC, COCOMO, PF, OO Process Metric, Use Case Process Metric.

MODULE-II

Product Metrics: FP, Architectural Design Metrics, Metrics for OO Design, Class Oriented Metric, Coupling Metric, Cohesion Metric. Metrics for Testing. Project Metrics: Web Engg.
Object Technology: Object, Classes, Message, Class Hierarchy, Inheritance, Abstract, Encapsulation, Polymorphisms. Relationship: IsA, Has A, UsesA. Object Oriented Modeling:

MODULE-III

Booch Notation, Rumbaugh Object Modeling Technique, Jacabson Model: Use Case, Abstract Use Case, Actor, Abstract actor. Use case Model: Domain Object Model, Analysis Object Model, Design Model, Testing Model, Implementation Model
UML Diagram: Class Diagram, Object Diagram, Sequence Diagram, Collaboration Diagram, Activity Diagram, State Chart Diagram, Component Diagram, Deployment Diagram

MODULE-IV

Object Oriented Analysis: Class: Interface Class, Control Class, Entity Class.Developing Use Case: Use case Element, Description, Case Study (i.e ATM), Class Classification Approach, Noun Phase Approach, Classical Approach, Function Point Approach, Structural Approach, CRC Card.
Object Oriented Design: Component Level Design, Cohesive, Coupling
Object Oriented Testing: System Testing: Requirement Specification, Integration Testing: Sequence Testing, Inheritance Testing, Polymorphism Testing, Encapsulation Testing
Unit Testing: Class Testing, Method Testing

Text Book:

Software Engineering by Pressman McGraw Hill

Distributed Database System.

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Features of distributed databases, features of centralized databases, level of distributed transparency – Reference Architecture, types of Data Fragmentation, distribution Transparency, Access primitives, Integrity constraints.

MODULE-II

Distributed Database design – A frame work, the design of database fragmentation, the allocation of fragments.Translation of global queries into fragment queries, query optimization.

Distributed Transaction Management – A framework, transaction atomicity, 2-phase commit, concurrency control: fundations, distributed deadlocks, timestamps.

MODULE-III

Reliability: Basic concepts, commit protocols, consistent view of Network, Detection and Resolution of Inconsistencies, check points and cold restart.

Commercial Systems: Tranclem's ENCOMPASS

MODULE-IV

Distributed database systems, IBM's Inter system communication, feature of distributed ingres and Oracle.

Heterogeneous databases: General problems – brief study of multibase.

Text Book:

Ceri S. Pelagatti. G, Distributed Database systems Principles and Systems, McGraw Hill.

J2EE.

Theory L/T (Hours per week): 4/0, Credit: 4

Module-I:

Enterprise Java Programming: Overview, Java EE 6 API, Web Applications, Java Servlet Technology: - Lifecycle of a Servelet, Servelet API, Servlet Packages, Types of servlets, Database Access, Stateless and Stateful protocols, Session Tracking. JSP Technology: - Architecture & Anatomy of JSP Page, JSP life cycle, JSP with MVC Architecture, Dynamic webpage Creation, Scripting Elements, Session Tracking, Database access, JSTL, JavaServer Faces (JSF) Technology, Facelets, Ajax.

Module-II:

Web Services: JAX P: SAX,DOM,, JAX B:XJC, Marshaling , Unmarshaling , WSDL, JAX-WS: Apache axis 2 implementation contract first, contract last ,Building consumer , RPC encoded , RPC literal , Document /Encoded , Document /Literal, Document/Wrapped , SOAP. JAX-RS

Module-III:

Advanced Technologies – Frameworks:

Struts:Introduction,Features and Architecture,The MVC Design Pattern,

Hibernate: Introduction to O-R Mapping,Hibernate Basics, Hibernate Architecture,Hibernate Configurations, POJO (Plain Old Java Classes) classes and O/R Mapping, Hibernate Query Language.

Module-IV:

Spring :IOC, dependency Injection , Constructor injection, setter injection ,type, index ,name attributes , Collection injection , Bean inheritance, IDRef, Bean aliasing , Bean scopes , Automating,

Nested bean factories, dependency Check, dependency On, Aware interface, static factory method, Instance factory method, Factory Bean, Method replacement , look up method injection , Properties editors , Internationalizations(I18 N), Bean POST Processor , Bean factory POST Processor , Event Factory vs Application Context , Spring AOP, Spring Integration with Hibernate, Spring integration with Struts,Introduction to design pattern.

Books:

1. Eric Jendrock, D. Carson, I. Evans, D. Gollapudi, K. Haase, C. Srivastha, “The Java EE6 Tutorial”, Volume-1, Fourth Edition, 2010, Pearson India, New Delhi. Chapters: 1, 3, 4, 5, 7, 9 to 12, 14 to 16, 17, 19, 23, 26, 27, 28.
2. Ralph Moseley, “Developing Web Applications”, 2008, Wiley India, New Delhi.
3. Kongent S., “Java Server Programming (JEE 6) Black Book, Platinum Edition”, 2008, Dreamtech / Wiley India Pvt. Ltd.
4. David Geary, Cay S. Horstmann, “Core JavaServer Faces”, Second Edition, 2007, Pearson Education, Inc. New Delhi.
5. Java 7 JAX-WS Web Services by Deepak Vohra
6. Building a Restful Web Service with Spring by LudovicDewailly
7. Spring in Action by Craig Walls
8. Hibernate in Action by Christian Bauer Gavin King

Information Extraction and Retrieval.

Theory L/T (Hours per week): 4/0, Credit: 4

Module-I:

Introduction to Information Retrieval

The nature of unstructured and semi-structured text.Inverted index and Boolean queries.

Text Indexing, Storage and Compression

Text encoding: tokenization, stemming, stop words, phrases, index optimization. Index compression: lexicon compression and postings lists compression. Gap encoding, gamma codes, Zipf'sLaw.Index construction. Postings size estimation, merge sort, dynamic indexing, positional indexes, n-gram indexes, real-world issues.

Module-II:

Retrieval ModelsBoolean, vector space, TFIDF, Okapi, probabilistic, language modeling, latent semantic indexing.Vector space scoring.Thecosine measurEfficiencyconsiderations. Document length normalization.Relevance feedback and query expansion.Rocchio. Performance EvaluationEvaluating search engines.User happiness, precision, recall, F-measure. Creating test collections: kappa measure, interjudge agreement.

Module-III:

Text Categorization and Filtering

Introduction to text classification.Naive Bayes models. Spam filtering. Vector space classification using hyperplanes; centroids; k Nearest Neighbors. Support vector machine classifiers. Kernel functions. Boosting.

Text ClusteringClustering versus classification.Partitioningmethods.k-means clustering. Mixture of gaussiansmodel.Hierarchical agglomerative clustering.Clustering terms using documents.

Module-IV:

Advanced TopicsSummarization, Topic detection and tracking, Personalization, Question answering, Cross language informtion retrievalWeb Information RetrievalHypertext, web crawling, search engines, ranking, link analysis, PageRank, HITS.Retrieving Structured DocumentsXML retrieval, semantic web

Textbooks:

Introduction to Information Retrieval Manning, Raghavan and Schutze, Cambridge University Press, draft.

Modern Information Retrieval Baeza-Yates and Ribeiro-Neto, Addison Wesley, 1999.

A comprehensive survey by Ed GreengrassMining the Web, SoumenCharabarti, Morgan-Kaufmann, 2002.

Fast Machine Learning

Theory L/T (Hours per week): 4/0, Credit: 4

Module-I:

Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation.

Linear regression, Decision trees, over fitting.

Module-II:

Instance based learning, Feature reduction, Collaborative filtering based recommendation. Probability and Bayes learning.

Module-III:

Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM.

Neural network: Perceptron, multilayer network, back propagation, introduction to deep neural network.

Module-IV:

Computational learning theory, PAC learning model, Sample complexity, VC Dimension, Ensemble learning.

Clustering: k-means, adaptive hierarchical clustering, Gaussian mixture model

BOOKS:

1. Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997.
2. Introduction to Machine Learning Edition 2, by EthemAlpaydin

Data Ware Housing & Data Mining

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Introduction to Data Mining, Paradigm, Computing Paradigm, Business Paradigm, Business Problem Definition, Operational & informational Data stores, Data Warehouse Definition & characteristics, Data Warehouse Architecture, Client /Server Computing Model & Data Warehouse, Overviews of Client/server Architecture, Server specialization in client/server computing Environment, Server Function, Server H/W Architecture RISC verses CISC, Multiprocessor System, SMP implementation, Parallel Processors and Cluster Systems,

MODULE-II

Distributed Memory Architecture, Cluster System, Advances in Multiprocessing Architecture, Server Operating System, Operating System Implementation
Data Warehousing Component, Overall Architecture, Data Warehouse Database Sourcing, Acquisition, Cleanup &transformation Tools, Metadata, Access Tools, Data Marts, Data Warehouse Administration and Management, Information Delivery System, Business & Data Warehouse,

MODULE-III

Business Consideration :Return& Investment, Design Consideration, Implementation Consideration, Benefits of Data Warehousing, Mapping the Data Warehouse to Multi Processor Architecture, Database architecture for Parallel Processing, Shared Memory Architecture, Shared Disk Architecture, Shared Nothing Architecture, Combined Architecture

MODULE-IV

Introduction to Data Mining, Measuring Data Mining effectiveness: Accuracy , speed & Cost, Embedding Data Mining into your Business Process, Discovery verses Prediction, Comparing the Technology, Business Score Card, Application Score Card, Algorithm Score card, Decision Tree, CART, CHAID, Growing the Tree, When does the Tree stop growing, Strength & Weakness, Algorithm Score Card, Neural Network, Different types of neural N/W, Kohonen feature maps, Nearest Neighbor and Clustering, Business Score Card Where to use clustering & nearest neighbor prediction, Clustering for clarity, Clustering for out layer analysis, Nearest Neighbor for prediction, Application Score Card

Text Books :

Data Warehousing, Data Mining & OLAP by Alex & Stephen, McGraw Hill.

Embedded System.

Theory L/T (Hours per week): 4/0, Credit: 4

Module – I (12 Hours)

Introduction: Features of Embedded systems, Design matrices, Embedded system design flow, SOC and VLSI circuit.

ARM: An advanced Micro Controller, Brief history, ARM pipeline, Instruction Set Architecture ISA: Registers, Data Processing Instructions, Data Transfer Instructions, Multiplications instructions, Software interrupt, Conditional execution, branch instruction, Swap instruction, THUMB instructions. FPGA

Module – II (12 Hours)

Devices and device drivers, I/O devices, Serial peripheral interfaces, IIC, RS232C, RS422, RS485, Universal serial bus, USB Interface, USB Connector IrDA, CAN, Bluetooth, ISA, PCI, PCI – X and advance busses, Device drivers.

Real time operating system: Hard real time, firm real time, soft real time, Task periodicity: periodic task, sporadic task, aperiodic task, task scheduling, scheduling algorithms: clock driven scheduling, event driven scheduling.

Module – III (08 Hours)

Software and programming concept: Processor selection for an embedded system, State chart, SDL, PetriNets, Unified Modeling Language (UML).

Low power embedded system design: Dynamic power dissipation, Static power dissipation, Power reduction techniques, system level power management.

Module – IV (08 Hours)

Hardware and software partitioning: K-L partitioning, Partitioning using genetic algorithm, particle swarm optimization, Functional partitioning and optimization: functional partitioning, high level optimizations. Hardware software co-simulations

Text Books:

1. "Embedded System Design " by SantanuChattopadhay, PHI
2. "Embedded system architecture, programming and design" By Raj Kamal, TMH

Reference Books:

1. "Hardware software co-design of Embedded systems" By Ralf Niemann, Kulwer Academic.
2. "Embedded real time system programming" By Sriram V Iyer, Pankaj Gupta, TMH.

Cryptography

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Introduction to Cryptography: Basics of Symmetric Key Cryptography, Basics of Assymetric Key Cryptography, Hardness of Functions

Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption.

MODULE-II

Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations

Formal Notions of Attacks: Attacks under Message Indistinguishability: Chosen Plaintext Attack(IND-CPA), Chosen Ciphertext Attacks (IND-CCA1 and INDCCA2), Attacks under Message Non-malleability: NM-CPA and NM-CCA2, Interrelations among the attack model

Random Oracles: Provable Security and asymmetric cryptography, hash functions

One-way functions: Weak and Strong one way functions

MODULE-III

Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudorandom Functions (PRF)

Building a Pseudorandom Permutation: The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction

Left or Right Security (LOR)

MODULE-IV

Message Authentication Codes (MACs): Formal Definition of Weak and Strong MACs, Using a PRF as a MAC, Variable length MAC

Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing

Assumptions for Public Key Signature Schemes: One way functions Imply Secure One-time Signatures Shamir's Secret Sharing Scheme Formally Analyzing Cryptographic Protocols Zero Knowledge Proofs and Protocols

REFERENCE BOOKS:

1. Y. Daniel Liang**:** Introduction to JAVA Programming, 6th Edition, Pearson, 2007.

2. Chris Bates: Web Programming Building Internet Applications, 3rd Edition, Wiley India, 2006.

3. XueBai et al: The Web Warrior Guide to Web Programming, Thomson, 2003.

4. Hans Delfs and Helmut Knebl, Introduction to Cryptography: Principles and Applications, Springer Verlag.

Graph Theory

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Basic Concepts: Graphs and digraphs, incidence and adjacency matrices, isomorphism, the automorphism group; Trees: Equivalent definitions of trees and forests, Cayley's formula, the Matrix-Tree theorem, minimum spanning trees; Connectivity: Cut vertices, cut edges, bonds, the cycle space and the bond space, blocks, Menger s theorem; Paths and Cycles: Euler tours, Hamilton paths and cycles, theorems of Dirac, Ore, Bondy and Chvatal, girth, circumference, the Chinese Postman Problem, the Travelling Salesman problem, diameter and maximum degree, shortest paths;

MODULE-II

Matchings: Berge's Theorem, perfect matchings, Hall's theorem, Tutte's theorem, Konig's theorem, Petersen's theorem, algorithms for matching and weighted matching (in both bipartitie and general graphs), factors of graphs (decompositions of the complete graph), Tutte's f-factor theorem;

MODULE-III

Extremal problems: Independent sets and covering numbers, Turan's theorem, Ramsey theorems; Colorings: Brooks theorem, the greedy algorithm, the Welsh-Powell bound, critical graphs, chromatic polynomials, girth and chromatic number, Vizing's theorem; Graphs on surfaces: Planar graphs, duality, Euler's formula, Kuratowski's theorem, toroidal graphs, 2-cell embeddings, graphs on other surfaces; Directed graphs: Tournaments, directed paths and cycles, connectivity and strongly connected digraphs, branchings;

MODULE-IV

Networks and flows: Flow cuts, Max flow min cut theorems, perfect square; Selected topics: Dominating sets, the reconstruction problem, intersection graphs, perfect graphs, random graphs.

Text Books:

1. T. H. Cormen, C. E. Leiserson and R. L. Rivest, Introduction to Algorithms, Prentice Hall of India, 3rd ed, 2006.
2. N. Deo, Graph Theory with Applications to Engineering and Computer Science, Prentice Hall of India, 2004.

Reference Books:

1. D. B. West, Introduction to Graph Theory, 2nd Ed, Prentice Hall of India, 2007.
2. R. Diestel, Advanced Graph Theory, Springer Verlag Heidelberg, New York, 2005.
3. M. T. Goodrich and R. Tamassia, Algorithm Design: Foundations, Analysis, and Internet Examples, Wiley, 1st ed, 2001.

Mobile Computing.

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Overview of wireless technologies. Wireless multiple access protocols. Cellular systems: Channel allocation. Location management.

MODULE-II

Wireless LANs: Medium access, Mobile IP routing. TCP over wireless.Mobile ad hoc networking.

MODULE-III

Energy efficiency.Impact of mobility on algorithms and applications.

MODULE-IV

Disconnected operation of mobile hosts.Data broadcasting.Mobile agents.

References:

1. J. H. Schiller. Mobile Communications. Addison Wesley, 2000.
2. A. Mehrotra. GSM System Engineering.Artech House, 1997.
3. Charles Perkins. Mobile IP. Addison Wesley, 1999.
4. Charles Perkins (ed.) Adhoc Networks. Addison Wesley, 2000 Relevant RFCs, internet drafts and research papers.

Wireless Sensor Network

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Introduction: the vision, Networked wireless sensor devices, Applications, Key design challenges.

Network deployment: Structured versus randomized deployment, Network topology, Connectivity, Connectivity using power control, Coverage metrics, Mobile deployment.

MODULE-II

Localization: issues & approaches, Coarse-grained & Fine-grained node localization, Network-wide localization, Theoretical analysis of localization techniques.

Synchronization: Issues & Traditional approaches, Fine-grained clock synchronization, and Coarse-grained data synchronization.

MODULE-III

Wireless characteristics: Basics, Wireless link quality, Radio energy considerations, SINR capture model for interference.

Medium-access and sleep scheduling: Traditional MAC protocols, Energy efficiency in MAC protocols, Asynchronous sleep techniques, Sleep-scheduled techniques, and Contention-free protocols.

Sleep-based topology control: Constructing topologies for connectivity, constructing topologies for coverage, Set K-cover algorithms.

MODULE-IV

Routing: Metric-based approaches, Routing with diversity, Multi-path routing, Lifetime-maximizing energy-aware routing techniques, Geographic routing, Routing to mobile sinks.

Data-centric networking: Data-centric routing, Data-gathering with compression, Querying, Data-centric storage and retrieval, The database perspective on sensor networks.

Reliability and congestion control: Basic mechanisms and tunable parameters, Reliability guarantees, Congestion Control, Real-time scheduling.

Books:

1. Wireless Sensor Networks: Technology, Protocols, and Applications: KazemSohraby, Daniel Minoli, TaiebZnati , Wiley Inter Science.
2. Wireless Sensor Networks: Architectures and Protocols: Edgar H. Callaway, Jr. Auerbach Publications, CRC Press.
3. Wireless Sensor Networks: Edited by C.S Raghavendra, Krishna M, Sivalingam, TaiebZnati , Springer.
4. Networking Wireless Sensors: BhaskarKrismachari, Cambridge University Press
5. Distributed Sensor Networks: A Multiagent Perspective, Victor Lesser, Charles L. Ortiz, and MilindTambe , Kluwer Publications.
6. Wireless Sensor Networks: An Information Processing Approach- by Feng Zhao, Leonidas Guibas , Morgan Kaufmann Series in Networking 2004.

Computational Finance

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Introduction to Computational Methods in Finance

1-Quick Review of Matrices and Functions (2 Hours, IM) Terminology and definitions — vectors, matrices. Functions of a single variable; differentiability; convexity, concavity; determining minimum or maximum.

Functions of several variables; partial differentiation; gradient; Hessian; Taylor expansion; Newton's method.

Partial differential equations; finite difference method.

2. Probability and Optimisation (2 Hours, IM) Random variables, probability; distribution, moments. Optimisation.Linear and quadratic programming; feasible set; Lagrangean function; optimality conditions.

MODULE-II

Portfolio Theory and Risk Management

3-Introduction to Investment Theory (2 Hours, NG)

basic terminology and definitions — investment, financial markets, cash flows, risk aversion, pricing, hedging fundamental theorems and principals ,interest rate theory — present value, future value

4-Bonds, Stocks and Their Valuation (2 Hours, NG) Valuation of bonds, bond prices, yield to maturity, duration, convexity, term structure, spot and forward rates Valuation of common stocks, stock prices, stock returns and dividend yields.

5-Single-period Markowitz Model (2 Hours, BR) asset return, portfolio return and uncertainty maximum expected value minimum risk — variance, downside risk and may be credit risk, value at risk, Markowitz model- Various versions with different con straints.The efficient frontier.

MODULE-III

6-The Asset Pricing Models:Capital asset pricing modelFactor models-single and multiple factor models.Simple and multiple linear and non linearregression.Derivative Securities:

7-Introduction to DerivativesFinancial derivetives-futures, sweaps,option contracts (Vanilla,Exotic)

Time values of derivatives-arbitrage and risk-neutral valuation.

8-Introduction to Option TheoryModels of asset dynamics-binomial lattice,stochastic process, Brownian motion.

MODULE-IV

9-Option Pricing ModelsBlack-Scholes equation and its applications to valuations.Binomial pricing models.

10-Hedging and Risk Management:Financial risk management.Dynamic and static hedging strategies,bucket hedgingMeasuring risk-risk sensitivities(greeks),valus-at-risk,scenario analysis.

Managing risk for vanilla and exotic options.

Reference Books:

J.Hull,Options, Futures and Other Derivative Securities, Prentice Hall,2000.

D. Duffie, Dynamic Asset Pricing Theory, Princeton University Press,1996.

D.G. Luenberg, Investment Science, 1998.

P. Wilmott, Derivetives: The theory and Practice of Financial Engineering, 1998.

P. Wilmott, Option Pricing: Mathematical Models and computation, 1993.

S. Pliska, Discrete Time Models in Finance,1998.

E.J. , Elton, M.J. Gruber, Modern Portfolio Theory and Investment Analysis, 1995

Bio Informatics

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Sequence-alignment methodologies: Sequence databases; Similarity matrices; Pairwise alignment: Features of dynamic Programming, alignment by Bayesian Statistical Methods, multiple sequence alignment: local multiple sequence alignment: MEME, PSSM, HMM(algorithms and applications) Progressive methods for global multiple sequence alignment: CLUSTALW, PILEUP, T-COFFEE; Statistical significance of alignment results;

MODULE-II

Pattern analysis in sequences and Phylogenetic tree construction methods: Motif representation, Markov models; .Distance Based methods: clustering based methods,optimality based methods: Fitsch -Margoliash and Minimum evolution methods, Neighbor joining and related neighbor methods Character Based methods: Maximum parsimony methods, Maximum likely hood method, genetic algorithm, Phylogenetic tree evaluation: Boot strap analysis; dendrogram and applications .

MODULE-III

Structure-Prediction of Biomolecules with applications in Bioinformatics: Structure classification of proteins (SCOP, CATH); Secondary structure prediction of various protein categories (e.gtransmembrane proteins and helical proteins), RNA secondary structure prediction methods.

MODULE-IV

Patterns, motifs and Profiles in sequences: Derivation and search methods; Derived Databases of patterns, motifs and profiles e.gProsite, Blocks, Prints-S, Pfam; Overview of tertiary structure prediction methods; algorithms for modeling protein folding; algorithms for 3D structure prediction with representative examples Protein structure prediction by comparative modelling approaches (homology modeling and fold recognition); ab initio structureprediction methods.

Digital Image Processing

Theory L/T (Hours per week): 4/0, Credit: 4

MODULE-I

Digital Image Fundamentals, Image Transforms: Fourier, Hadamard, Walsh, Discrete cosine and Hotelling Transforms; Image Enhancement: Histogram modification, Histogram equalisation, Smoothing, Filtering, Sharpening, Homomorphic filtering. ;

MODULE-II

Image restoration, Segmentation: Pixel classification, Bi-level thresholding, Multi-level thresholding, P-tile method, Adaptive thresholding, Spectral & spatial classification, Edge detection, Hough transform, Region growing.

MODULE-III

Matching and Registration: Image modeling, Stereo mapping, Landmark matching, Rectification in geometric transformations, Match measurement, Matching of binary pattern, Distortion tolerant matching; Digital geometry and its applications: Neighborhood, Path, Connectedness, Holes and Surroundness, Borders, Distances, Medial Axis Transform (MAT), Shrinking and Expanding, Thinning.

MODULE-IV

Introduction to Mathematical morphology and its application, Morphological Operations, Dilation, Erosion, Opening, Closing, Smoothing, Extraction of connected components, Thinning.

TEXT BOOKS:

1. R.C. Gonzalez, R.E. Woods, Digital Image Processing, Pearson Prentice Hall, 2007.
2. B. Chanda, D.D. Majumder, Digital Image Processing and Analysis, Prentice Hall, 2007.

REFERENCE BOOKS:

1. W.K. Pratt, Digital Image Processing (Fourth Edition), John Wiley & Sons, Inc., 2007
2. A.K. Jain, Fundamentals of Digital Image Processing, Prentice Hall, 1988.