M.Sc. COMPUTER SCIENCE with specialization in SOFT COMPUTING
(2018 Admission)

Semester I								
Course Code	Paper	Marks		Credit	Hours per week			
		Sessional	Final		L	P	T	Total
18-323-0101	Mathematical Foundations for Computer Science	50	50	4	4	3	1	8
18-323-0102	Operating System Concepts	50	50	4	4	3	1	8
18-323-0103	Data Structures and Algorithms	50	50	3	3	2	1	7
18-323-0104	Programming in Python	50	50	3	3	2	1	7
18-323-0105	Artificial Intelligence	50	50	3	3	2	1	7
18-323-0106	Data Structures and Programming Language Lab	50	50	1		2		2
18-323-0107	Mini Project	50		1		2		2
	TOTAL			19				
Semester II								
Course Code	Paper	Marks		Credit	Hours per week			
		Sessional	Final		L	P	T	Total
18-323-0201	Networks and Data Communications	50	50	4	4	3	1	8
18-323-0202	Database Management System	50	50	4	4	3	1	8
18-323-0203	Software Engineering	50	50	3	3	2	1	7
18-323-0204	Data Mining	50	50	3	3	2	1	7
	Elective I	50	50	3	3	2	1	7
18-323-0206	DBMS and Networks Programming LAB	50	50	1		2		2
18-323-0207	Mini Project	50		1		2		2
	TOTAL			19				
Semester III								
Course Code	Paper	Marks		Credit	Hours per week			
		Sessional	Final		L	P	T	Total
18-323-0301	Machine Learning	50	50	3	3	2	1	7
	Elective II	50	50	3	3	2	1	7
	Elective III	50	50	3	3	2	1	7
	Elective IV	50	50	3	3	2	1	7
	Elective V	50	50	3	3	2	1	7
18-323-0306	Seminar	50		1		2		2

18-323-0307	Mini Project	50		1		2		2	
	TOTAL			17					

Semester IV

Course Code	Paper	Marks		Credit
		Sessional	Final	
18-323-0401	Internship/Project Work	200	200	18
	TOTAL			18

LIST OF ELECTIVES (M.Sc. Computer Science with specialization in Soft Computing)

Second Semester

18-323- 0211 Distributed Computing
18-323- 0212 Intelligent System
18-323- 0213 Grid and Cloud Computing
18-323- 0214 Quantum Computing
18-323- 0215 Cryptography and Network Security

Third Semester

18-323- 0311 Big Data Analytics (Syllabus from MCA)
18-323- 0312 Deep Learning
18-323- 0313 Swarm Intelligence
18-323- 0314 Wireless Networks
18-323- 0315 Web Technology and Web Programming
18-323- 0316 Knowledge Based Systems
18-323- 0317 Fuzzy Logic
18-323- 0318 Evolutionary algorithms
18-323- 0319 Rough Set
18-323- 0320 Cyber Forensics
18-323- 0321 Pattern Recognition
18-323- 0322 Artificial Neutral Networks (Syllabus from MCA)
18-323- 0323 Information Retrieval systems
18-323- 0324 Digital Signal Processing
18-323- 0325 Natural Language Processing

18-323-0101 MATHEMATICAL FOUNDATIONS FOR COMPUTER SCIENCE
(January 2018 Revision)

UNIT I Foundation-Logic, Sets, Functions – Propositional Logic, Propositional equivalences, Predicates and Quantifiers, Sets, Set operations, Functions, Sequences and summation.

UNIT II Algebraic Structures: Properties, Semi Group, Groups, Subgroups, Abelian Group, Cyclic Groups, Lagarange's Theorem, Normal subgroups, Rings, Euclidean ring, Fields, Introduction to Vector Space – Basis , Dimension.

Introduction to automata theory and Significance, Regular Expressions, Finite state automata – DFA, NFA, Conversion of NFA to DFA, Mealy and Moore machine. Converting a DFA to Regular expression.

UNIT III Perfect numbers, Mersenne numbers , Carmichael numbers, Prime Number , Primality Testing, Divisibility, Modular Arithmetic, GCD, Euclidean algorithm, Linear Diophantine equations , congruences, linear congruences, Euler Phi function and properties, Fundamental Theorem of Arithmetic.

UNIT IV Probability, basics, Conditional Probability, Bayes Theorem, Distributions - Binomial, Poisson, Normal distributions and related problems.

UNIT V Matrices, determinants and inverse of a matrix. System of equations, Linear transformation - rank and nullity, Consistency and inconsistency of linear system of equations, rank nullity theorem, Echelon form of a matrix and Row-reduced echelon form of a matrix .Eigenvalues and eigenvectors.

Text Book:

1. Kenneth H. Rosen, "Discrete Mathematics And Its Applications", 7th Ed, McGrawHill, 2012.

2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 9th Edition 2011.

References:

1. Eric Lehman, F. Thomson Leighton, Albert R. Meyer, "Mathematics for Computer Science", MIT 7th Ed, 2015

2. William Stein, "Elementary Number Theory: Primes, Congruences, and Secrets": A Computational Approach Springer, 2008.

3. Sipser, "Introduction to the Theory of Computation, CENGAGE Learning, 2014. 4. Ernest Davis, "Linear Algebra and Probability for Computer Science Applications ", 1st Edition, CRC Press 2012.

4. Tom M. Apostol, "Introduction to Analytic Number Theory", Springer, 1998.

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18-323-0102 OPERATING SYSTEM CONCEPTS
(Subject name changed from January 2018)

UNIT I Overview of Operating System – Process Management, Processes, Threads, Process Synchronization, Memory Management – Main Memory, Virtual Memory.

UNIT II Virtual Machines – Overview, Benefits and Features, Building Blocks, Types and Implementation, Virtualization and OS Components.

UNIT III Distributed System – Advantages, Types of Network based OS, Network structure, Communication structure, protocols, TCP/IP, Robustness, Design issues, Distributed File System.

UNIT IV Linux System – Introduction to System programming, System calls, Concepts of Linux Programming, File I/O, Advanced File I/O.

UNIT V Process Management – Process ID, Running a Process, Terminating a Process, Users and Groups, Sessions and Groups, Threading – Models, Patterns, Synchronization.

Text Book:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne "OPERATING SYSTEM CONCEPTS", 9th Ed, Wiley, 2013.
2. Robert Love "Linux System Programming" 2Ed, Oreilly, 2013.

References:

1. Naresh Chauhan, "Principles of Operating Systems ", OXFORD, 2014.
2. Andrew S. Tanenbaum "Modern Operating Systems", 2014.
3. William Stallings "Operating Systems: Internals and Design Principles", 2014.
4. Ann McHoes , Ida M. Flynn, "Understanding Operating Systems" 7th Edition,CENGAGE Learning, 2014.
5. Robert Love, "Linux Kernel Development" 3rd Edition, Addison Wesley, 2010.

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18-323-0103 Data Structures and Algorithms
(January 2018 Revision)

UNIT I Algorithm Analysis: Mathematical Background - Complexity Analysis – Computational and Asymptotic Complexity, Asymptotic Notations – Big O, Big ϴ and Big ω, Running time calculations –General Rules, Solutions for the Maximum Subsequence Sum Problem, Logarithms in Running time.

UNIT II Linked List, Stack, Queue, Trees: Abstract Data Types (ADTs), List ADT – Array Implementation, Doubly Linked list, Circular Linked list, Stack ADT, Queue ADT, Trees – Binary trees, Binary Search Trees, AVL trees, Tree traversals, B trees, Red Black Tree.

UNIT III Heap, Hashing, Sorting: Hash function, Hash tables without linked list, Priority queues (heaps) – Binary heap, sorting – shell sort, heap sort, merge sort, quick sort. Binomial heaps, Fibonacci heaps.

UNIT IV Disjoint set class, Graph Algorithms: Disjoint sets – Union by rank and path compression, Graphs –Topological sort, shortest path algorithms, Network flow problems, Minimum spanning tree, Applications of DFS.

UNIT V Algorithm Design Techniques: Greedy Algorithm – Scheduling problem, Huffman codes, approximate bin packing, Divide and Conquer – Closest points problem, Selection problem, Dynamic Programming – All pairs shortest path.

Text Book: 1. Data Structures and Algorithm Analysis in C++, Mark Allen Weiss, 4th Ed., Pearson Education Asia, 2014.

References: 1.Data Structures and Algorithms in C++, Adam Drozdek, 4th Ed., Cengage Learning, 2013

2.Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson, 2012

3.Introduction to Algorithms, T.H.Cormen, C.E.Leiserson, R.L Rivest, 3rd Ed., MIT Press, 2009

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18-323-0104 Programming in Python
(January 2018 Revision)

UNIT I **Introduction to computer programming:** Brief discussion on algorithms, programs, programming languages and Python as a programming language

Introduction to Python: Python Data Types, Expressions, Variables, and Assignments, Strings, Lists.

Imperative Programming: Python Programs, Execution Control Structures, Decision (if-elif-else) and Looping (for variants and while), Using break, continue and pass statements in loops, User-Defined Functions, Python Variables and Assignments, Parameter Passing (thrusting mutable and immutable parameters). Recursion, Examples, Brief discussion on Memory Management During Recursive Function Calls Using Program Stack.

UNIT II **Strings and Lists:** Negative Indexing, String Methods. Formatted Output, Two Dimensional Lists, Iterating through Two Dimensional Lists.

Files: Opening and Closing a File, Opening Modes, Various Read and Write Methods.

Errors and Exceptions: Exception Types, Exception Handling using Try & Except.

Containers: Dictionaries, Tuples and Sets, Properties Operators and Methods of Containers.

Python Standard Library: Brief Discussion on Library Methods and Modules, Mention important methods from math, fractions and random modules.

UNIT III **Object Oriented Programming:** Objects and Classes, Defining a Class in Python, Constructors.

Inheritance: Multiple and Multilevel Inheritance, Modifying Built in Classes Using Inheritance, Operator Overloading (Integer Class Operators only) Using Inheritance, User Defined Exceptions.

Namespaces: Encapsulation in Functions, Global versus Local Namespaces, Exceptional Control Flow, Modules as Namespaces, Classes as Namespaces.

UNIT IV **Graphical User Interfaces:** Tkinter Widgets – Label, Text, Entry, Button, Canvas & Frames, Event-Based tkinter Widgets, Designing GUIs, OOP for GUIs.

Pattern Matching Using Regular Expressions: Python Standard Library Module RE.

UNIT V **Turtle Graphics:** Familiarization of various Turle Graphics Methods, Moving and Repositioning Pointer, Drawing Geometric Shapes, Colouring of Drawings.

NumPy: Creating Arrays (array() and arange), reshape(), sum(), min() and max() methods, Item wise arithmetic operations.

Database Programming in Python with sqlite3: Creating Tables, Querying (Inserting Tuples, Selecting Rows and Updating Tuples) Using Cursor to Iterate over Selected Tuples.

Text Book:

1. Ljubomir Perkovic, "Introduction to Computing Using Python: An Application Development Focus", Wiley, 2012

References:

1. Charles Dierbach, "Introduction to Computer Science Using Python: A Computational Problem-Solving Focus", Wiley, 2012
2. Dr. R. Nageswara Rao "Core Python Programming, 2ed" Wiley 2018

18-323-0105 Artificial Intelligence
(January 2018 Revision)

UNIT I What is AI, Intelligent Agents – Agents and environments – Good behavior – The nature of environments – Structure of agents – Problem Solving – Problem solving agents –Example problems .Uniformed search strategies-BFS,DFS, Iterative deepening depth-first search, Depth limited search, Uniform cost search, Bidirectional search. Informed Search Strategies – Greedy best-first search, A* search: Minimizing the total estimated solution cost, Heuristic function.

UNIT II Local search algorithms and optimization problems–Hill-climbing search, Local beam search, Genetic algorithms. Games – Optimal decisions in games –Alpha – Beta Pruning. Constraint satisfaction problems (CSP) –defining constraint satisfaction problems, constraint propagation: inference in CSPS, Backtracking search and Local search .

UNIT III Logical Agents-Knowledge based Agents, The Wumpus world. Logic-Propositional Logic, Propositional theorem proving. First order logic-syntax and semantics – Using first order logic –Knowledge engineering in FOL. Inference – Prepositional versus first order logic – Unification and lifting – Forward chaining – Backward chaining.

UNIT IV Planning: The planning problem – Planning with state space search – Partial order planning, planning graphs – Planning with propositional logic Knowledge representation – Ontological Engineering –Categories and objects – Actions – Simulation and events.

UNIT V Learning From Observations – forms of learning – Inductive learning - Learning decision trees – Ensemble learning.

Text Book:

1. Stuart Russell, Peter Norvig, 'Artificial Intelligence – A Modern Approach', 3rd Ed., Pearson Education, 2015.

References:

1. Nils J. Nilsson, 'Artificial Intelligence: A new Synthesis', Elsevier, 2000.
2. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3rd Ed., Tata McGraw Hill, 2009.

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18-323-0201 Networks and Data Communications
(January 2018 Revision)

UNIT I Protocols and Standards, The OSI Model and the TCP/IP Protocol Suite , Network Layer Services, Other Network Layer issues, IPv4 Addresses – Class full address, CIDR, Subnetting and Supernetting Internet Protocol Version 4 (IPv4), Address Resolution Protocol, ARP Package, Internet Control Message Protocol Version 4 Message, ICMP Package.

UNIT II Mobile IP – Addressing, Agent, Phases. Transport Layer – Services, Protocol. User Datagram Protocol Services, Package, Transmission Control Protocol (TCP) – Services, Features, segment, Connection, State transition diagram, Flow control, Error Control, Congestion control, TCP Package.

UNIT III Stream Control Transmission Protocol Services, Features, Packet format. Application Layer, File Transfer Protocol, TFTP, Electronic Mail – Architecture, User Agent, Message Transfer Agent – Simple Mail Transfer Protocol (SMTP).

UNIT IV Message Access Agent - POP, IMAP, MIME. Network Management: concepts, management components - SMI, MIB, SNMP, UDP Ports. IPv6 Addressing - Introduction, Address space allocation, Global Unicast addresses, auto configuration

UNIT V IPv6 Protocol – Packet format, Transition from IPv4 to IPv6. ICMPv6 – Introduction, Error messages, Information messages, Neighbor- discovery messages, Group membership messages. Introduction to NS2 Programming -

Text Book:

1. Behrouz A. Forouzan, “TCP/IP Protocol Suite”, Fourth Edition, Mc Graw Hill, 2010

References:

1. Teerawat Issariyakul, Ekram Hossain “Introduction to Network Simulator NS2”, Springer, 2012
2. Kevin R Fall, W. Richard Stevens, “TCP/IP Illustrated, Volume 1, The Protocols”, Second Edition, 2012
3. Jeffrey L Carrell, Laura A Chappell, Ed Tittel with James Pyles, “Guide to TCP/IP”, 4th edition, Cengage Learning, 2013

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18-323-0202 Data Base Management System
(January 2018)

UNIT I Introduction to Database Management Systems, Characteristics and Advantages of database approach, Database Users – Administrators, Designers, End Users, Analysts, Data Models, Schema, Instances, Database State, Three-Schema Architecture and Data Independence, DBMS Architecture.

Conceptual Database Design and Relational Model - Entity-Relationship (ER) Modeling, Relational Data Model - Concepts, Constraints, Mapping from ER to Relational Schemas.

UNIT II Relational Model: Languages - Relational Algebra, Relational Calculus, SQL, More SQL: Complex Queries, Triggers, Views and Schema Modification.

Functional Dependencies, Inference rules – Normalization, Relational Decompositions.

UNIT III Transaction Management and Concurrency - Introduction to transactions, States of a transaction, Desirable properties of transaction (ACID), Schedules.

Concurrent transactions – Serializability concepts, Testing serializability, Transaction support in SQL.

UNIT IV Concurrency control - Lock-based protocols: Two-phase locking techniques, Deadlock detection and prevention, Timestamp-based protocols.

UNIT V Distributed Database Concepts, NOSQL Databases and Big Data Storage Systems, Enhanced Data Models: Introduction to Active, Temporal, Spatial, Multimedia and Deductive Databases

Text Book:

1. Ramez Elmasri & Shamkant B. Navathe, Fundamentals of Database Systems, 7th Ed , Pearson Education, 2017

References:

1. Date C.J., An Introduction to Database Systems, 8th Ed., Addison Wesley, 2006.

2. Korth H F and A Silberschatz, Database System Concepts, 6 th Ed., MGHISE, 2010.
3. O'Neil Patrick et al., Database: Principles Programming Performance, 2 nd Ed., Morgan- Kaufmann, 2001.

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18-323-0203 Software Engineering
(January 2018)

UNIT I Introduction- The Software Engineering discipline-its evolution and impact, Software Development Projects, What is wrong with the exploratory style of Software Development?, Emergence of Software Engineering, Notable changes in Software Development Practices, Computer Systems Engineering.

UNIT II Software Life Cycle Models – Why use a Life Cycle Model?, Classical Waterfall Model, Iterative Waterfall Model, Prototyping Model, Evolutionary Model, Spiral Model, Comparison of different Life Cycle Model for a project.

UNIT III Requirements Analysis and Specification – Requirements gathering and Analysis, Software Requirements Specification, Formal System Specification, Axiomatic Specification, algebraic Specification.
Software Design – Outcome of a Design Process, How can we characterize a agood Software Design, Cohesion and Coupling, Layered arrangement of modules, Approaches to Software Design.

UNIT IV Object Modelling using UML – Unified Modelling Language (UML), UML Diagrams, Use Case Model, Class Diagrams, Interaction Diagrams, Activity Diagrams, State Chart Diagram, Postscript.

UNIT V Coding and Testing – Coding, Code Review, Software Documentation. Testing – Testing in the large Vs. Testing in the small, Unit Testing, Black Box Testing, White Box testing, Debugging, Integration Testing, System Testing, some general issues associated with Testing.

Text Book: Fundamentals of Software Engineering fourth edition by Rajib Mall, Prentice-Hall of India Pvt.Ltd; 2014

References:

1. Software Engineering: A Practitioner's approach 8th Edition by Roger S Pressman, McGraw-Hill Education 2014
2. Software Engineering 10th Edition by Ian Sommerville, Pearson, 2016

18-323-0204 Data Mining
(January 2018 Revision)

UNIT I Introduction to Data Mining and Data Warehousing: Definition of Data mining, Knowledge Discovery Process, Basic forms of data for Data Mining, Data Mining functionalities, Technologies for Data Mining, Application areas of Data Mining; Major issues in Data Mining; Getting familiar with data for Data Mining – Various type of attributes and data values, Basic statistical descriptions of data; Data Warehouse and OLAP Technology for Data Mining- Data Warehouse definition, Multidimensional Data Model, Schemas for Multidimensional Databases.

UNIT II Data Preprocessing: Introduction and need of Preprocessing the Data, Data Cleaning – Missing Values, Noisy Data, Data cleaning as a Process; Data Reduction – Overview , Wavelet Transforms, Principal Component Analysis, Parametric Data Reduction; Data Transformation and Discretization – Data Transformation Strategies Overview, Data transformation by Normalization, various methods of Discretization, Concept Hierarchy Generation for nominal data.

UNIT III Mining Frequent Patterns, Associations, and correlations: Basic Concepts – Market Basket Analysis, Frequent Itemsets and Association Rules; Frequent Itemset. Mining Methods - The Apriori Algorithm, Generating Association Rules from Frequent Itemsets, Finding Frequent Itemsets without Candidate Generation, FP-Growth, FP-Tree.

UNIT IV Classification - Basic Concepts, Decision tree induction, Bayes Classification, Rule Based Classification, Model evaluation and selection, Advanced Classification methods – Bayesian Belief Networks, Classification by Backpropagation, Support Vector Machines, Classification by Frequent patterns, Lazzy Classifiers.

UNIT V Cluster Analysis: Introduction to Cluster Analysis, Overview of Clustering Methods; Partitioning methods - k-Means, k-Medoids; Hierarchical methods - Agglomerative versus Divisive Clustering, Distance Measures, BIRCH, Chameleon, Probabilistic Hierarchical Clustering; Density based methods - DBSCAN, OPTICS, DENCLUE; Grid based methods – STING, CLIQUE; Evaluation of Clustering.

Text Book:

1. Jiawei Han, Micheline Kamber, Jian Pei, "Data Mining - Concepts and Techniques" - Morgan Kaufmann Publishers, Third Edition, 2012.

References:

1. Ian H. Witten, Eibe Frank, "Data Mining - Practical Machine Learning Tools and Techniques", Morgan Kaufmann Publishers, Third Edition, 2011.
2. Soman, Divakar and Ajay, "Data Mining – Theory and Practice", PHI, 2006.
3. Pang-Ning Tan, Michael Steinbach, Vipin Kumar, "Introduction to

Data Mining", *Pearson* Addison Wesley, 2006.
4. Arun K Pujari, "Data Mining Techniques", Universities Press, 2001.
5. Margaret H Dunham, "Data Mining: Introductory and Advanced Topics", Pearson Education India, 2006.

18-323-0301 Machine Learning
(January 2018 Revision)

UNIT I **FOUNDATIONS OF LEARNING**

Components of learning – learning versus design – characteristics of machine learning – learning models – types of learning – training versus testing – Features – error measures, Descriptive Statistics-Probability Distributions, Inferential Statistics-Inferential Statistics through hypothesis tests, Permutation & Randomization Test.

UNIT II **SUPERVISED LEARNING:**

Regression: Ordinary Least Squares, Ridge Regression, Lasso Regression, Linear Models for Regression – Polynomial Regression – overfitting Classification: Nearest neighbor models – Regression and Classification Trees– Logistic Regression – Naïve Bayes – Support Vector Machine, Bias-Variance Dichotomy, Model Validation Approaches, Linear Discriminant Analysis, Quadratic Discriminant Analysis.

UNIT III **UNSUPERVISED LEARNING:**

Clustering: Dimensionality reduction, Principal Component Analysis, K-means – clustering around medoids – hierarchical clustering – bagging and random forests – boosting .Association Rule Mining: Apriori Algorithm – Hidden Markov Model.

UNIT IV **SOFT COMPUTING TECHNIQUES**

Artificial Neural Networks – Fuzzy Sets & Fuzzy Logic – Rough Set Theory – Swarm Intelligence – Evolutionary Algorithms – Genetic Algorithms.

UNIT V **DEEP LEARNING & TRENDS IN MACHINE LEARING**

Deep Neural Network Components – Convolutional Neural Network – Deep Belief Networks – Recurrent Neural Network – Long short-term memory – Data Streams & Active Learning. Case study on Machine Learning Tools.

Text Book:

1. T. M. Mitchell, "Machine Learning", McGraw Hill, 2017.

References:

1. K. P. Murphy, "Machine Learning: A probabilistic perspective", MIT Press, 2012.
2. C. M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2007.
3. Fakhreddine O. Karray, Clarence De Silva, 'Soft Computing and Intelligent systems design', Pearson Education,
4. Yoshua Bengio, "Learning Deep Architectures for AI", Now Publishers Inc (2009)
5. Jeff Heaton, "Artificial Intelligence for Humans, Volume 3: Deep Learning and Neural Networks", Heaton Research, Inc.
6. Hastie, Trevor, et al. The elements of statistical learning. Vol. 2. No. 1. New York: springer, 2009.
7. Montgomery, Douglas C., and George C. Runger. Applied statistics and probability for engineers. John Wiley & Sons, 2010

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18-323- 0211 DISTRIBUTED COMPUTING

UNIT I Distributed Computing System - Introduction to distributed computing systems, Examples, Trends, Design challenges, System Models, Networking and Internetworking, Inter process communication, Remote Invocation.

UNIT II OS Support – Introduction, OS Layer, Protection, Processes and Threads, Communication, Invocation, Architecture. Distributed File System, File service architecture , Sun Network File System

UNIT III Distributed objects and Components, CORBA, Object to Components, Enterprise Java Beans and Fractals, Peer – to – Peer systems – Introduction ,Napster and its legacy ,Peer-to-peer middleware, Routing overlays

UNIT IV Web Services, Service descriptions and IDL for web services, A directory service for use with web services, XML security, Coordination of web services ,Applications of web services

UNIT V Introduction, Overview of security techniques, Cryptographic algorithms, Digital signatures, Needham–Schroeder, Kerberos, TLS, 802.11 WiFi2.

TEXT BOOKS

George Coulouris, Jean Dollimore , Tim Kindberg , Gordon Blair, " Distributed Operating Systems Concepts and Design", 5th Ed, Addison Wesely, 2012

REFERENCES

1. A. S. Tanenbaum , "Distributed Operating Systems " , Pearson, 2009.
2. ShubhraGarg , "Fundamentals of Distributed Operating Systems" , S.K. Kataria& Sons, 2013.

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18-323- 0213 GRID AND CLOUD COMPUTING

UNIT I Distributed System models and enabling technologies – Scalable computing over internet, Technologies for network based systems, system model for distributed and cloud computing, software environment for distributed systems and clouds. Clustering for Massive Parallelism, Computer Cluster and MPP Architecture, Design principles of Computer Clusters, Clusters job and resource management.

UNIT II Implementation Levels of Virtualization, Virtualization Structures / Tools and Mechanisms, Virtual Clusters and Resource Management, Virtualization for Data-Center Automation

UNIT III Cloud Computing and Service Models, Data-Center Design and Interconnection Networks, Architectural Design of Compute and Storage clouds, Public Cloud Platforms, Inter Cloud Resource Management, Cloud Security and Resource Management.

UNIT IV Services and service oriented architecture, Message oriented middleware, work flow in service oriented architecture, Features of cloud and grid platforms, parallel and distributed programming paradigms

UNIT V Grid Computing Systems and Resource Management – Grid Architecture and Service Modeling, Grid Projects and Grid System built, Grid resource management and brokering, software and middleware for computing, Grid application trends and security measures.

TEXT BOOKS

Kai Hwang, Geoffrey C Fox, Jack J Dongarra, "Distributed and Cloud Computing from Parallel processing to the internet of things, Elsevier, 2012.

REFERENCES

1. Nikos Antonopoulos, Lee Gillam, "Cloud Computing : Principles, systems and Applications (Computer Communications and Networks), Springer, 2010.
2. C.S.R Prabhu, "Grid and Cluster Computing", PHI Learning, 2008.

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18-323- 0313 Swarm Intelligence

UNIT I: Introduction to Swarm Intelligence – Essence of an Algorithm, Algorithms and Self –Organization, Links between Algorithms and Self-Organization, Characteristics of Metaheuristics; Swarm Intelligence based algorithms – Ant Algorithms; Bee Algorithms; Particle Swarm Optimization and Krill Herd Algorithms; Strategies for state space search in

AI- Depth First and Breadth First Search Heuristic Search- Best First Search and Hill Climbing.

UNIT II: Ant Colony Optimization (ACO) - Theoretical Considerations, Combinatorial optimization and meta heuristic, Stigmergy, Convergence Proofs, ACO Algorithm, ACO and Model Based Search, Variations Of ACO: Elitist Ant System (EAS), Minmax Ant System (MMAS) and Rank Based Ant Colony System (RANKAS), ACO Algorithm for Travelling Sales Person problem, ACO algorithm for feature selection.

UNIT III: Particle Swarm Optimization: Principles of Bird Flocking and Fish Schooling, Evolution of PSO, Operating Principles, PSO Algorithm, Neighbourhood Topologies, Convergence Criteria, Variations of PSO.

UNIT IV: Artificial Bee Colony (ABC) Optimization - Behaviour of real bees, ABC Algorithm, Variations of ABC: Abcgbest and Abcgbestdist, Case Study: Application of ABC algorithm in solving Travelling Salesman Problem, Knapsack Problem and for feature selection.

UNIT V: Krill Herd Optimization - Herding Behaviour of Krill Swarms, Lagrangian Model of Krill Herding, Methodology, Application of Krill Herd Algorithm in Feature Selection.

Text Books:

8. Xin-She Yang, Zhihua Cui, Renbin Xiao, Amir Hossein Gandomi, Mehmet Karamanoglu, "Swarm Intelligence and Bio-Inspired Computation, Theory and Applications", Elsevier 2013.
9. Marco Dorigo and Thomas Stutzle, "Ant Colony Optimization", MIT Press, Cambridge, England, 2004.

References:

2. Ben Coppin, "Artificial Intelligence Illuminated", Jones and Bartlett Publishers, 2004.
3. Kennedy J and Russel C Eberhart, "Swarm Intelligence", Morgan Kaufmann Publishers, USA, 2001.
4. Dervis Karaboga, Bahriye Akay," A comparative study of Artificial Bee Colony Algorithm" Applied Mathematics and Computation 214, Elsevier Publications, 2009.

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18-323- 0314 WIRELESS NETWORKS

UNIT I Introduction – The Cellular Revolution, the Global Cellular Network, Mobile device Revolution, Future Trends.
Transmission Fundamentals – Signals for Conveying Information, Analog and Digital Data Transmission, Channel Capacity, Transmission Media, Multiplexing. Communication Networks – LANs, MANs and WANs,
Switching Techniques – Circuit Switching, Packet Switching, Asynchronous Transfer Mode

UNIT II Elements of a wireless communication System – Antennas, Propagation Modes, Line-of-Sight Transmission, Fading in the Mobile Environment.
Signal Encoding Techniques – Signal Encoding Criteria, Digital Data Analog Signals, analog Data Analog Signals, Analog Data Digital Signals, OFDM, OFDMA, Single carrier FDMA

UNIT III Spread Spectrum – The Concept of Spread Spectrum, Frequency Hopping Spread Spectrum, Direct Sequence Spread Spectrum, Code Division Multiple Access, Generation of Spreading Sequences.
Coding and Error Control – Error Detection, Block Error Correction Codes, Convolutional Codes, Automatic Repeat Request.

UNIT IV Satellite Communications – Satellite Parameters and Configurations, Capacity Allocation – Frequency Division, Principles of Cellular Networks, Wireless Application Protocol
Wireless LAN Technology – Overview, Infrared LANs, Spread Spectrum LANs, Narrowband Microwave LANs

UNIT V Wireless LAN Technology – IEEE 802.11 Architecture and Services, Wireless LAN Standard, 802.11 MAC, IEEE 802.11 Physical layer, Gigabit Wifi, Other IEEE 802.11 Standards, IEEE Wireless LAN Security, Cellular Wireless networks, Fourth Generation Systems and LTE

TEXT BOOKS

1. Cory Beard, William Stallings, "Wireless Communication Networks and Systems", Pearson 2016.
2. William Stallings, "Wireless Communications and Networks" 2nd Ed, Pearson, 2008

REFERENCES

1. Roy Blake, "Wireless Communication Technology" CENGAGE Learning, Sixth Indian reprint 2010.
2. Singal T L, "Wireless Communication" Tata Mc Graw Hill Education Pvt. Ltd, 2011.
3. Dharma Prakash Agrawal, Qing-AnZeng, "Introduction to Wireless and Mobile Systems" CENGAGE Learning, First Edition 2012.

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18-323- 0315 Web Technology and Internet Programming

UNIT I An overview of Java – Basic JAVA programming, Object Oriented Concepts, Exception handling and Multithreading , Streams and I/O, Applets.Web 2.0: Basics, Understanding Internet - Internet technologies Overview , HTML , CSS , XHTML, Web site creation using HTML and CSS.

UNIT II Java Script: An introduction to JavaScript–JavaScript DOM Model-Date and Objects,-Regular Expressions- Exception Handling-Validation-Built-in objects-Event Handling-DHTML with JavaScript.

UNIT III Servlets: Java Servlet Architecture- Servlet Life Cycle- Form GET and POST actions-Session Handling- Understanding Cookies- Installing and Configuring Apache Tomcat Web Server;- DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example – JSP: Understanding Java Server Pages-JSP Standard Tag Library(JSTL)-Creating HTML forms by embedding JSP code.

UNIT IV An introduction to PHP: Creating simple web pages using PHP, Connecting to Database – Using Cookies. XML: Basic XML- Document Type Definition- XML Schema DOM and Presenting XML, XML Parsers and Validation, XSL and XSLT Transformation, News Feed (RSS and ATOM).

UNIT V AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods; Web Services: Introduction- Java web services Basics – Creating, Publishing ,Testing and Describing a Web services (WSDL)-Consuming a web service, Database Driven web service from an application – SOAP.

TEXTBOOKS

1. Deitel and Deitel and Nieto, "Internet and World Wide Web – How to Program", Prentice Hall, 5th Edition, 2011.
2. Herbert Schildt, "Java-The Complete Reference", Eighth Edition, Mc Graw Hill Professional, 2011.

REFERENCES

1. Stephen Wynkoop and John Burke "Running a Perfect Website", QUE, 2nd Edition,1999.
2. Chris Bates, Web Programming – Building Intranet Applications, 3rd Edition, Wiley Publications, 2009.
3. Jeffrey C and Jackson, "Web Technologies A Computer Science Perspective", Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.
5. Paul Dietel and Harvey Deitel, "Java How to Program", , 8th Edition Prentice Hall of India.
6. Mahesh P. Matha, "Core Java A Comprehensive Study", Prentice Hall of India, 2011.
7. Uttam K.Roy, "Web Technologies", Oxford University Press, 2011.

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18-323- 0317 Fuzzy Logic

UNIT I

Introduction: Fuzzy systems – Historical perspective, Utility and limitations, uncertainity and information, fuzzy sets and membership, Chance vs Fuzziness. **Classical sets and Fuzzy sets**: Classical set (Operations, properties, mapping to functions). Fuzzy sets (operations, properties, Alternative fuzzy set operations).

UNIT II

Classical Relations and Fuzzy relations: Cartesian product, crisp relations (cardinality, operations, properties, composition), Fuzzy relations (cardinality, operations, properties, Fuzzy Cartesian products and composition), Tolerance and equivalence relation, Crisp equivalence and tolerance relations, Fuzzy tolerance and equivalence relations, value assignments(Cosine amplitude, Max-min method), other similarity methods, other forms of composition operation.

UNIT III

Properties of membership functions, Fuzzification and Defuzzification: Features of the membership functions, various forms, Fuzzification, defuzzification to crisp sets, λ-cuts for fuzzy relations, Defuzzification to scalars. **Logic and Fuzzy systems:** Classical logic, proof, Fuzzy logic, approximate reasoning, other forms of the implication operation. Natural language, Linguistic hedges, Fuzzy rule based systems, Graphical techniques for inference.

UNIT IV

Development of membership functions: Membership value assignments (intuition, inference, rank ordering). **Extension Principle:** Crisp functions, Mapping and relations, Functions of Fuzzy sets-Extension principle, Fuzzy transform, practical considerations.

UNIT V

Fuzzy Arithmetic: Interval analysis, Approximate methods of extension-DSW and restricted DSW algorithms Fuzzy classification: Classification by equivalence relation(crisp and Fuzzy), Cluster analysis, cluster validity, C-means clustering(Hard and Fuzzy), Fuzzy c-means algorithm

Text Books:

1. Ross, Fuzzy Logic with Engineering Applications, 3rd Edn, Wiley India,2010.
2. Hajek P, Mathematics of Fuzzy Logic, Kluwer ,1998

References:

3. Rajasekharan and Vijyayalakshmi pai, Neural Networks, Fuzzy Logic and Genetic Algorithm, PHI, 2003.
4. Sivanandan and Deep, Principles of Soft Computing, John Wiley and Sons, 2007.

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18-323- 0318 Evolutionary algorithms

UNIT I

Introduction to Evolutionary Computation - Biological and artificial evolution, Evolutionary computation and AI, Different historical branches of EC, e.g., GAs, EP, ES, GP, etc., A simple evolutionary algorithm. **Evolutionary strategies-** Evolution in continuous variables. Transformations.

UNIT II

Search Operators - Recombination/Crossover for strings and real values. Mutation for strings, and real-valued representations. Why and how a recombination or mutation operator works

Selection Schemes - Fitness proportional selection and fitness scaling Ranking, including linear, power, exponential and other ranking methods Tournament selection. Selection pressure and its impact on evolutionary search. Adaptive representations.

UNIT III

Genetic Algorithms - Representation, operators, and standard algorithm. The building block hypothesis and the schema theorem.

Genetic Programming - Trees as individuals, Major steps of genetic programming, e.g., functional and terminal sets, initialisation, crossover, mutation, fitness evaluation, etc. Search operators on trees, Automatically defined functions, Issues in genetic programming, e.g., bloat, scalability, etc., Examples

UNIT IV

Swarm intelligence - particle swarm optimization, Ant colony optimization, Artificial bee colony algorithm, cuckoo search.

UNIT V

Multi - objective Evolutionary Optimization - Pareto optimality, Multi - objective evolutionary algorithms. **Modularity and regularity in evolution**. The scaling problem and the curse of dimensionality. Evolvability. Module acquisition. Developmental models. Compositional and hierarchical approaches.

Text Book:

2. Ashish M. Gujarathi, B. V. Babu," Evolutionary Computation: Techniques and Applications",CRC Press 2016.
3. X. Yao (ed)," Evolutionary Computation: Theory and Applications", World Scientific Publ. Co., Singapore, 1999.
4. Z. Michalewicz ," Genetic Algorithms + Data Structures = Evolution Programs (3rd edition)", Springer-Verlag, Berlin, 1996.

References:

1. D E Goldberg, "Genetic Algorithms in Search, Optimisation & Machine Learning", Addison-Wesley, 1989.
2. W Banzhaf, P Nordin, R E Keller & Frank D Francone," Genetic Programming: An Introduction", Morgan Kaufmann, 1999.
3. Thomas Baeck, D.B Fogel, et al," Evolutionary Computation 1: Basic Algorithms and Operators",Taylor and Francis,2000.
4. Haiping Ma, Dan Simon," Evolutionary Computation with Biogeography-based Optimization",Wiley,2017.

5. Dr. David B. Fogel Ph.D., M.S., B.S.," Evolutionary Computation: Toward a New Philosophy of Machine Intelligence",3rd Ed, EEE,2006.
6. **Coello Coello**, Carlos, **Lamont**, Gary B., **van Veldhuizen**, David A.," Evolutionary Algorithms for Solving Multi-Objective Problems", Springer, 2007

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18-323- 0319 Rough Set Theory

UNIT I : Introduction to Rough Set Theory

Introduction to Rough Sets, Properties of approximation, approximation and membership relation – Rough equality and inclusion, Information Systems-Definition, Decision Systems-Definition, Attributes, Approximation Spaces, Indiscernibility relations, Approximation of a set by A-Granules, Lower and Upper approximations, Rough sets – Definition – Examples for generating lower and upper approximations from Information / Decision Tables.

UNIT II : Reduct and Core

Accuracy of approximations - Approximating B-Granules by A-Granules, Quantitative Measures - Dependency Measure, Significance - Positive region, Boundary region and Negative region - Significance of attributes - Reduct, Core, Discernibility Matrix, Discernability formula, Types of reducts - Relative Reduct and Relative Core, Reduction of Categories. Demonstrate how a reduct is generated using Discernibility matrix from a decision table.

UNIT III : Decision Making

Simplification of decision tables - Decision Rules and Decision Algorithms, Incomplete information, Rule induction from decision table, Rule Reduction, Dependency of attributes.

UNIT IV : Probabilistic Rough Sets

Basics of Probabilistic version of rough set theory, One-way and two-way inter-set dependency measures, Probabilistic dependency measure-the monotonicity property.

UNIT V : Rough Set Models and Three Way Decisions

Probabilistic rough set models, Variable precision Rough sets. Machine Learning – Learning from examples, Three way decisions, Probabilistic Three way classifications, Evaluation based three way classifications.

Text Book:

2. Z. W. Pawlak, Kluwer ,"Rough Sets – Theoretical aspects of Reasoning about data", Academic Pub, 1991.
3. Aboul Ella Hassanien ,Dominik Slezak , Pawan Lingras," Rough Computing: Theories, Technologies, And Applications",IGI Global, 2007.

Reference:

3. Lin T. Y., Yao Y. Y., Zadeh A., Physica Verlag ,"Data Mining, Rough Sets and Granular Computing" , 2002.
4. Arun K Poojari , "Data Mining Techniques", Universities Press, Third Edition, 2013.
5. Probabilistic Rough Sets, Wojciech Ziarko, Part of the Lecture Notes in Computer Science book series (LNCS, volume 3641).

18-323- 0320 Cyber Forensics

UNIT I

Introduction to traditional Computer Crime, Problems associated with computer crime, Identity Theft, Identity fraud. Computer Forensics Fundamentals- Type of Computer Forensics Technology. Type of Vendor and Computer Forensics Services.

UNIT II

Computer investigation and Data Acquisition, Computer Forensics Evidence and Capture-Data Recovery-Evidence collection and Data Seizure-Duplication and preservation of Digital Evidence-Computer image verification and Authentication.

UNIT III

Introduction to Incident - Incident Response Methodology - Steps, Activities in Initial Response Phase after detection of an incident, Creating response toolkit, Computer Forensics Analysis- Discovery of Electronic Evidence- Identification of data- Reconstructing Past events.

UNIT IV

Initial Response & Volatile Data Collection from Windows system - Initial Response & Volatile Data Collection from Unix system - Forensic Duplication, Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic Duplicate, Forensic Duplicate of a Hard Drive.

UNIT V

Collecting Network Based Evidence - Investigating Routers - Network Protocols - Email Tracing - Internet Fraud. Hackers Tools. Cellphone and mobile device forensics. Forensics hardwares and softwares, Hands on training using hardwares in Cyber intelligence LAB.

Text Book:

1. John R. Vacca, Computer Forensics: Computer Crime Scene Investigation Laxmi Publications, 2015 reprint.

References

1. Dr.Darren R Hayes, A Practical guide to Computer Forensics investigation, Pearson 2015.

2. Aaron Philipp, David Cowen, Chris Davis , Computer Forensics Secrets & Solutions , McGraw-Hill Osborne Media, 2006
3. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group–2008.
4. Bill Nelson,Amelia Philips and Christopher Steuart, "Guide to computer forensics and investigations", Cengage Learning; 4th edition, 2009.
5. Dejey , Murugan ," Cyber Forensics", OXFORD,2018.

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18-323- 0321 Pattern Recognition

UNIT I

Introduction: Machine Perception, Image Processing and Pattern Recognition, Pattern Recognition Systems, Design cycle, Learning and Adaptation, Applications of pattern recognition;

UNIT II

Statistical Pattern Recognition: Probability theory basics, Probability density function, Normal density, Bivariate and Multivariate density functions; Classifiers: Naives Classifier, Bayes Classifier, Discriminant Functions, Decision Surfaces, Linear Discriminant Function based classifiers, Perceptron, Support Vector Machine, Applications

UNIT III

Non Parametric Decision Making: Histograms, Kernel density estimation, Nearest Neighbor Classification, Adaptive Decision Boundaries, Adaptive Discriminant Functions, Minimum Squared Error functions.

UNIT IV

Clustering: Similarity measures, Clustering criteria, Distance functions, Hierarchical clustering, Single Linkage, Average Linkage and Complete Linkage algorithms, Ward's Method. Partitional Clustering, Forgy's Algorithm, K-means algorithm, Fuzzy C means algorithm, ISODATA algorithm. Clustering Large Datasets, DBSCAN

UNIT V

Feature Extraction and Selection: Entropy minimization, Karhunen Loeve transformation, Feature selection through functions approximation, Binary feature selection. Recent advances in Pattern Recognition: Neural Network structures for Pattern Recognition, Self-organizing networks, Fuzzy pattern classifiers, Pattern classification using Genetic Algorithms, real life applications

Text books:

1. Earl Gose , Steve Jost, "Pattern Recognition and Image Analysis", PEARSON,2015.
2. Robert J.Schalkoff, Pattern Recognition Statistical, Structural and Neural Approaches, John Wiley & Sons Inc., New York, 1992

References :

1. R.O. Duda, P.E. Hart, D.G. Stork, "Pattern Classification", John Wiley and Sons, 2000.

2. V. S. Devi, M. N. Murty, "Pattern Recognition: An Introduction", Universities Press, Hyderabad, 2011.

3. Robert J. Schalkoff, "Pattern Recognition : Statistical Structural and Neural Approaches", John Wiley & Sons Inc., New York, 1992.

4. Tou and Gonzales, "Pattern Recognition Principles", Wesley Publications Company, London 1974.

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18-323- 0323 Information Retrieval systems

UNIT I

Introduction - Data Retrieval, Information Retrieval. An Information Retrieval System, Automatic Text Analysis, Index term weighting, Probabilistic Indexing.

UNIT II

Classification, Measures of Association, Cluster Hypothesis, Single Link Clusters, File Structures, Inverted Files, Index Sequential Files, Ring Structures, Doubly Chained Trees, Hash Addressing.

UNIT III

Modeling - Boolean Model - Vocabulary and Postings – Lists – Dictionaries and Tolerant Retrieval, Scoring and Vector space Model – Score Computation, Probabilistic Model- Language Models ,
Text Classification – Vector Space Classification, SVM Based Document Classification, Set Theoretical Models, Structured Text Retrieval Models, and Models for Browsing.

UNIT IV

Search Engines, Boolean Search, Matching Functions, Serial Search, Cluster Representatives, Cluster based retrieval, Latent Semantic Indexing – Web Search – Web Crawlers – Link Analysis – Unstructured Data Retrieval Semantic Web – Ontology - Implementations using Natural Language Toolkit.

UNIT V

Evaluation- – Relevance Feedback and Query Expansion ,XML Based Retrieval, Precision and Recall, Interpolation, Averaging techniques, The Swets Model .

Textbook:

1. C. Manning, P. Raghavan and H. Schütze, "Introduction to Information Retrieval",Cambridge University Press, 2008.

References:

1. R. Baeza-Yates and B. Ribeiro Neto, "Modern Information Retrieval: The Concepts and Technology Behind Search", Second Edition, Addison Wesley, 2011.
2. Stefan Büttcher , Charles L. A. Clarke, et al, "Information Retrieval – Implementing and Evaluating Search Engines (The MIT Press), 2016.

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18-323- 0324 Digital Signal Processing

UNIT 1

Basic elements of DSP, Concepts of frequency in continuous-time and discrete -time signals, Sampling theorem, Discrete-time signals and systems, Analysis of discrete time LTI systems, Z transform, Convolution and Correlation.

UNIT II

Introduction to DFT, Properties of DFT, Circular Convolution, Filtering methods based on DFT, FFT Algorithms, Use of FFT in Linear Filtering, DCT, Use and Application of DCT.

UNIT III

Structures of IIR, Design of IIR filters from analog filters, IIR filter design by Impulse Invariance, Bilinear transformation, Approximation of derivatives, frequency transformations.

UNIT IV

Structures of FIR, Symmetric and anti-symmetric FIR filters, Linear phase FIR filter, Filter design using window methods, Frequency transformation in the analog and digital domain

UNIT V

Binary fixed point and floating point number representations, Comparison, Quantization noise, truncation and rounding, quantization noise power, input quantization error, coefficient quantization error, limit cycle oscillations, dead band, overflow error, signal scaling.

TEXT BOOK:

1. John G. Proakis and Dimitris G.Manolakis, "Digital Signal Processing – Principles, Algorithms & Applications", 4th Ed, Pearson, 2014.

REFERENCES:

1. Emmanuel C.Ifeachor, and Barrie.W.Jervis, "Digital Signal Processing", Second Edition, Pearson Education, Prentice Hall, 2002.

2. Sanjit K. Mitra, "Digital Signal Processing – A Computer Based Approach", Third Edition, Tata Mc Graw Hill, 2007.

3. A.V.Oppenheim, R.W. Schafer and J.R. Buck, Discrete-Time Signal Processing, 8th Indian Reprint, Pearson, 2004.

4. Andreas Antoniou, "Digital Signal Processing", Tata McGraw Hill, 2006.

5. Tarun Kumar Rawat," Digital Signal Processing", OXFORD,2014.

6. Li Tan, Jean Jiang," Digital Signal Processing: Fundamentals and Applications", 2nd Ed, Academic Press, 2010

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18-323- 0325 Natural Language Processing

UNIT I Overview of Natural Language Processing,Natural Language Processing and Python: Under standing Natural language Processing and applications, NLTK, Corpus and Dataset, Understanding structure of sentence -Defining Context free grammar, Morphological Analysis

UNIT II Syntactic Analysis,Semantic analysis, Ambiguity resolution, Discourse integration Preprocessing - tokenization , stemming , lemmatization,Word tokenization and lemmatization

UNIT III Feature engineering and and NLP algorithms- parsers, context-free grammars,different types of parsers, POS tagging and different types of POS parsers.

UNIT IV Basic statistical features of NLP: TF-IDF, Vectoirization Encoders and Decoders, Normalization, Advanced feature engineering and NLP algorithms- Basics of Word2Vec

UNIT V Rule - Based system for NLP, Machine Learning for NLP problems, Applications of NLP - Text Summarization, Sentiment Analysis

TEXT BOOK

a. Thanaki J. Python Natural Language Processing. Packt Publishing Ltd; 2017.

REFERENCE

i. Jurafsky D. Speech & language processing. Pearson Education India; 2000.

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CAM 2313 ANDROID APPLICATION PROGRAMMING

UNIT I Getting Started With Android Programming – What is Android ?, Android SDK installation and configuration, Anatomy of an Android application, Activities, Fragments and Intents-Understanding Activities, Linking Activities using intents, Fragments, Calling Built in applications using intents, Displaying Notifications.

UNIT II The Android User Interface- Understanding the components of a screen, Adapting to display orientation, Managing changes to screen orientation, Creating the user interface programmatically, Listening for UI notifications, Designing User Interface with Views- Using basic views, Using Picker Views, Understanding Specialized fragments,

UNIT III Data Persistence – Saving and Loading User Preferences, Persisting Data to Files, Creating and sing Databases. Content Providers - Sharing Data in Android, Using a Content Provider, Creating Your Own Content Providers.

UNIT IV Messaging – SMS Messaging, Sending Email. Location-Based Services – Displaying Maps, Getting Location Data, Monitoring a Location.

UNIT V Networking – Consuming Webservices using HTTP, Consuming JSON Services, Sockets Programming, Developing Android Services – Creating Your Own Services, Establishing Communication between a service and an activity, Binding Activities to Services, Understanding Threading, Publishing Android Applications.

TEXT BOOKS

Wei-MengLee,"Beginning Android 4 Application Development", Wrox publications, 2012

REFERENCES

1. The Android Developer's Cookbook: Building Applications with the Android SDK James Steele, Nelson to Addison Wesley Publications 2010 First Edition.
2. Professional Android Application Development. Reto Meier, Wrox publications, 2009, Second Edition

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CAM 2316 OPERATIONS RESEARCH

UNIT I Linear programming: Mathematical Model, assumptions of linear programming, Solutions of linear programming problems – Graphical Method,Simplex method, Artificial Variable Method, Two phase Method, Big M Method, Applications, Duality ,Dual simplex method, Introduction to sensitivity analysis

UNIT II Special types of Linear programming problems- Transportation Problem – Mathematical formulation of Transportation Problem, Basic feasible solution in TP, Degeneracy in TP, Initial basic feasible solutions to TP, Matrix Minima Method, Row Minima Method, Column Minima Method, Vogel's Approximation Method, Optimal Solution to TP, MODI Method, Stepping Stone Method, Assignment problems – Definition, Hungarian Method

UNIT III Integer Programming: Pure Integer Programming, Mixed Integer Programming, Solution Methods – Cutting plane method, branch and bound method. Binary Integer Linear programming- Travelling salesman problems – Iterative method, Branch and bound method

UNIT IV Dynamic programming: Deterministic and Probabilistic Dynamic programming. Linear programming by dynamic programming approach.

UNIT V Queuing Model: Elements and Characteristics of queuing systems., Classification of queuing systems –Structures of Basic Queuing System, Definition and classification of stochastic processes- discrete- time Markov Chains – Continuous Markov Chains- The classical system-Poisson Queuing Sysetm – M/M/1: ∞/FIFO, M/M/1: ∞/SIRO, M/M/1: N/FIFO , Birth Death Queuing Systems, Pure Birth system, Pure Death system, M/M/C: N/FIFO, M/M/C: C/FIFO

REFERENCES

1. JK Sharma , "Operations Research – Theory and Applications ", 4th Ed, Mc Millan Publishing , 2009
2. Taha, 'Operations Research', 8th Ed., Mc Millan Publishing Company, 2007
3. Kantiswaroop, PK Guptha, Manmohan,"Operation Research", 13th Ed, Sulthan Chand &Sons 2007.
4. Beightler C S & Philips D T, 'Foundations of optimisation', 2nd Ed., Prentice Hall, 1979.
5. Mc Millan Claude Jr, 'Mathematical Programming', 2nd Ed. Wiley Series, 1979.
6. Srinath L.S, 'Linear Programming', East-West, New Delhi.
7. Gillet B G, 'Introduction to Operation Research: a computer oriented algorithmic approach', Mc Graw Hill Book Comp. 1976.

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18-323- 0215 CRYPTOGRAPHY AND NETWORK SECURITY

UNIT I Foundations of Cryptography and Security – Ciphers and Secret Messages, Security Attacks and Services, Mathematical Tools for Cryptography, Substitutions and Permutations, Modular Arithmetic, Euclid's Algorithm, Finite Fields, Polynomial Arithmetic, Discrete Logarithms, Conventional Symmetric Encryption Algorithms, Theory of Block Cipher Design, Feistel Cipher Network Structures, DES and Triple DES, Strength of DES.

UNIT II Modern Symmetric Encryption Algorithms, IDEA, CAST, Blowfish, Twofish, RC2, RC5, Rijndael (AES), Key Distribution, Stream Ciphers and Pseudo Random Numbers, Pseudo Random Sequences, Linear Congruential Generators, Cryptographic Generators, Design of Stream Cipher, One Time Pad.

UNIT III Public Key Cryptography – Prime Numbers and Testing for Primality, Factoring Large Numbers, RSA, Diffie-Hellman, ElGamal, Key Excahnge Algorithms, Public-Key Cryptography Standards

UNIT IV Hashes and Message Digests – Message Authentication, MD5, SHA, RIPEMD, HMAC, Digital Signatures, Certificates, User Authentication, Digital Signature Standard, Security Handshake Pitfalls, Elliptic Curve Cryptosystems.

UNIT V Authentication of Systems, Kerberos, Electronic Mail Security, Pretty Good Privacy, IP and Web Security, Secure Sockets and Transport Layer, Electronic Commerce Security, Electronic Payment Systems, Secure Electronic Transaction, Digital Watermarking.

TEXT BOOKS

Behrouz A Forouzan, "Cryptography and Network Security",2nd Ed Tata Mc Graw Hill, 2010

REFERENCES

William Stalings, Cryptography and Network Security, Principles and Practices.6th Ed., Pearson Education, 2013

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18-323- 0324 – DIGITAL SIGNAL PROCESSING

UNIT I Signals – Characterization and classification of signals, Signal processing operations, Discrete - Time signals in time domain – Representation, Sequence representation, Operations on sequences and finite length sequences, Discrete time systems – Classification, Properties of systems, Impulse and Step Responses, LTI systems, Properties of LTI system, Convolution sum.

UNIT II Discrete - Time signals in frequency domain – Continuous time Fourier Transform, Discrete time Fourier Transform, Z-transform – Definition, Rational z-Transforms, Region of Convergence, The Inverse Z-transform, Properties of Z-transform, Representation of LTI systems using difference equations, Causality & Stability of discrete LTI systems.

UNIT III The Discrete Fourier Transform, Relation between DTFT and the DFT and their Inverses, Circular Convolution, Properties of DFT, Filtering of long data sequence – Overlap Add and Overlap save, FFT – DIT and DIF FFT and calculation of inverse DFT using FFT.

UNIT IV Digital Filter Structures - Block Diagram Representation, Basic FIR Digital Filter Structures – Direct form, transposed form, Cascade Representation, Linear Phase FIR structures, Basic IIR Digital Filter Structures – Direct Form I, Direct form II, Parallel and Cascade Representation.

UNIT V Specification- IIR & FIR filters – Design of IIR filters - Analog filters approximations- Butterworth & Chebyshev approximations. Transformation – Bilinear & Impulse Invariant Transformation. Design of FIR filters – Fourier series method – Use of Window functions.

TEXT BOOKS

Sanjit K Mitra, **"Digital Signal Processing: A Computer Based Approach**", 4th Ed., Mc. Graw Hill, 2011

REFERENCES

1. Li Tan, Jean Jiang, "Digital Signal Processing, Fundamentals and Applications", 2nd Ed., Elsevier, 2013
2. John G. Proakis, Dimitris K Manolakis, "Digital Signal Processing", 4th Ed., Prentice Hall, 2013

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18-323- 0325 NATURAL LANGUAGE PROCESSING

UNIT I Introduction: Knowledge in Speech and Language Processing, Ambiguity, Models and Algorithms, Language, Thought, and Understanding, The State of the Art, Regular Expressions and Automata: Regular Expressions, Finite-State Automata, Regular Languages and FSAs.

UNIT II Morphology and Finite-State Transducers: Survey of English Morphology, Finite-State Morphological Parsing, Combining FST Lexicon and Rules, Lexicon-Free FSTs - The Porter Stemmer, Human Morphological Processing, N-grams: Counting Words in Corpora, Simple N-grams, Smoothing, Backoff, Deleted Interpolation, N-grams for spelling and Pronunciation, Entropy.

UNIT III Word Classes and POS Tagging: English Word Class, Tagsets for English, POS Tagging, Rule-Based POS tagging, Stochastic POS Tagging, Transformation Based Tagging, Context-Free Grammars for English: Constituency, Context-Free Rules and Trees, Sentence-Level Constructions, The Noun Phrase, Coordination, Agreement, The Verb Phrase and Subcategorization, Auxiliaries, Parsing with Context-Free Grammars: Parsing as Search, Probabilistic Context-Free Grammars.

UNIT IV Representing Meaning: Computational Desiderata for Representations, Meaning Structure of Language, First Order Predicate Calculus, Some Linguistically Relevant Concepts, Semantic Analysis: Syntax-Driven Semantic Analysis, Attachments for a Fragment of English, Lexical Semantics: Relations Among Lexemes and their senses, WordNet.

UNIT V Discourse: Reference Resolution, Text Coherence, Discourse Structure, Natural Language Generation: Introduction to Natural Language Generation, An Architecture for Generation, Surface Realization, Discourse Planning, Machine Translation: Language Similarities and Differences, The Transfer Metaphor, The Interlingua Idea-Using Meaning, Direct Translation, Using Statistical Techniques.

TEXT BOOKS

Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Pearson, Second Impression, 2009

REFERENCES

Allen, James, "Natural Language Understanding", Pearson, First Impression, 2007.

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